Professional Engineering and World Class Perspectives of Industrial Engineering and Digital Transformation

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Abstract. This paper conveys the theoretical discourses of Industrial Engineering and Digital Transformation. It proposes perspectives of Professional Engineering and World Class’ Industrial implementation by combining Indonesian Local Wisdom and Global Benchmark Settings. The objective of this paper is to intertwine both theoretical and industrial implementation among Academician, Business and Government (ABG). Precisely, this harmonized industrial implementation is deemed indispensable by considering several pillars. First pillar constitutes the prior trigger of Industry 4.0 (IR 4.0), as one of Global Benchmark Settings. Subsequently, second pillar refers to the Indonesian Local Wisdom, in term of Making Indonesia 4.0 (MI 4.0). Ultimately, third pillars are pertaining global benchmark settings, in term of Industry X.0, Society 5.0, Hallyu 2.0. The research methodology in this paper refers to the quantitative method that enables the achievement of the objective of this paper. The discussion of this paper elaborates the methods and methodology to achieve the objective of this paper. Subsequently, the mentioned discussion proceeds to the necessity to have a holistic industrial implementation among ABG. The result of this paper is expected to equip current professional engineers and future generations. They are expected to be able to cope with new norm of new paradigm in the future.

1. Introduction
This paper conveys the theoretical discourses of Industrial Engineering and Digital Transformation. It proposes perspectives of Professional Engineering and World Class’ Industrial implementation by combining Indonesian Local Wisdom and Global Benchmark Settings.

Theoretical discourses of Industrial Engineering refer to the most cited scholarly works within Industrial Engineering, in particular within Industry 4.0 study, as illustrated in Table 1.

Those most cited scholarly works are originated mostly from the sources of the following but not limited to the Manufacturing Letters; Procedia CIRP; Business and Information Systems Engineering; Proceedings of 2014 IEEE Automation, Quality and Testing, Robotics, AQTR 2014; and eventually from IEEE International Conference on Industrial Engineering and Engineering Management.
### Table 1. Most Cited Scholar Works within Industrial Engineering – Industry 4.0

| No | Document title                                                                 | Authors                                                                 | Year | Sources                                | Number of Citation | Annual Citation |
|----|--------------------------------------------------------------------------------|-------------------------------------------------------------------------|------|----------------------------------------|--------------------|-----------------|
| 1  | A Cyber-Physical Systems architecture for Industry 4.0-based manufacturing systems | Lee, J., Bagheri, B., Kao, H.-A. [1]                                    | 2015 | Manufacturing Letters                  | 583                | 194             |
| 2  | Service innovation and smart analytics for Industry 4.0 and big data environment | Lee, J., Kao, H.-A., Yang, S. [2]                                       | 2014 | Procedia CIRP                          | 272                | 68              |
| 3  | Industry 4.0                                                                  | Lasi, H., Fettke, P., Kemper, H.-G., Feld, T., Hoffmann, M. [3]         | 2014 | Business and Information Systems Engineering Proceedings of 2014 IEEE Automation, Quality and Testing, Robotics, AQTR 2014 | 245                | 61              |
| 4  | Cyber physical systems in the context of Industry 4.0                         | Jazdi, N. [4]                                                          | 2014 | IEEE International Conference on Industrial Engineering and Engineering Management | 109                | 27              |
| 5  | Smart factories in Industry 4.0: A review of the concept and of energy management approached in production based on the Internet of Things paradigm | Shrouf, F., Ordieres, J., Miragliotta, G. [5]                           | 2014 |                                        | 109                | 27              |

Furthermore, the subsequent theoretical discourses of Digital Transformation refer to the most cited scholar works within Digital Transformation, through the lens of its Digital Transformation’s Systematic Literature Review, as illustrated in Table 2 [6].

### Table 2. Most Cited Scholar Works within Digital Transformation’s Systematic Literature Review

| No | Document sources                  | Authors                  | Year | Number of Citation | Annual Citation |
|----|-----------------------------------|--------------------------|------|--------------------|-----------------|
| 1  | Business and information Systems Engineering | C.Matt et al. [7]        | 2015 | 114                | 28.50           |
| 2  | Government Information Quarterly   | T.Janowski et al.[8]     | 2015 | 96                 | 24.00           |
| 3  | MIS Quarterly Executive           | T.Hess et al.[9]         | 2016 | 71                 | 23.67           |
| 4  | MIS Quarterly: Management Information Systems | A.Majchrzak et al [10]  | 2016 | 53                 | 17.67           |
| 5  | MIS Quarterly Executive           | R.Hansen et al [11]      | 2015 | 43                 | 10.75           |

The perspectives of Professional Engineering refer to the “primary project”, known as capstone project. As part of global citizen, professional engineers are required to perform several engineers’ quality of work. The aforementioned quality of work refers to the ability to solve a problem in which there are uncertain methods to implement, nor the appropriate solutions [12].

This paper is entitled Professional Engineering and World Class Perspectives of Industrial Engineering and Digital Transformation. The prior paragraphs elaborate Professional Engineering and its Perspectives of Industrial Engineering and Digital Transformation. Subsequently, the discourses of World Class Perspectives are as indispensable as the one of Professional Engineering’s Perspectives.
To some extent, the World Class Perspectives are intertwined with its orchestrated title with World Class Manufacturing, as the result of Bibliometric Analysis from 2000 until 2016. The aforementioned intertwined aspects refer to three categories. First, it refers to merely the Title of either Knowledge Management or World Class Manufacturing. Second, it refers to combination of Title, keyword or abstract of World Class Manufacturing. Third, it refers to the merely title of Knowledge Management and World Class Manufacturing. Fourth, it refers to the combination of Knowledge Management and World Class Manufacturing.

The Bibliometric Analysis from 2000 until 2016 is elaborated and discussed in its illustration within Table 3 pertaining the academic papers within scholar works. Its triangulation database and terms are further elaborated by discourses of World Class in term of sustainability [13] and [14].

### Table 3. Academic Papers on Combination of Knowledge Management and World Class

| DATABASE SOURCES | Knowledge Management (Merely Title) | World Class Manufacturing (Merely Title) | World Class Manufacturing (Combination of Title, keyword or abstract) | Knowledge Management + World Class Manufacturing (Merely Title) | Knowledge Management + World Class Manufacturing (Combination of Title, keyword or abstract) |
|------------------|-----------------------------------|----------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
| Emerald          | 1375                              | 11                                     | 110                                                           | 0                                                             | 5                                                             |
| SciELO           | 376                               | 0                                      | 5                                                             | 0                                                             | 0                                                             |
| Spell            | 170                               | 0                                      | 0                                                             | 0                                                             | 0                                                             |
| Ebsco            | 1880                              | 7                                      | 24                                                            | 0                                                             | 0                                                             |
| Web of Science   | 3783                              | 14                                     | 261                                                           | 1                                                             | 2                                                             |
| Scopus           | 6913                              | 41                                     | 508                                                           | 1                                                             | 3                                                             |
| TOTAL            | 14497                             | 73                                     | 908                                                           | 2                                                             | 10                                                            |

2. Methodology

The research methodology in this paper refers to the quantitative method that enables the achievement of the objective of this paper. Subsequently, the quantitative method is augmented its quality through the bibliometric analysis to generate the timeline perspectives on the theoretical discourses and its empirical implementation [15], [16], [17], [18].

Both theoretical discourses and empirical implementations provide the cutting edge discussion in this paper toward the Professional Engineering and Digital Transformation Perspectives of Industrial Engineering and Digital Transformation.

The discussion of this paper elaborates the methods and methodology to achieve the objective of this paper. Subsequently, the mentioned discussion proceeds to the necessity to have a holistic industrial implementation among Academician, Business and Government.

The result of this paper is expected to equip current professional engineers and future generations. They are expected to be able to cope with new norm of new paradigm in the future.

3. Results and Discussion

The discussion of this paper elaborates the methods and methodology to achieve the objective of this paper. Subsequently, the mentioned discussion proceeds to the necessity to have a holistic
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The discussion in prior paragraphs further more orchestrates the three pillars that were mentioned before. First pillar constitutes the prior trigger of Industry 4.0 (IR 4.0), as one of Global Benchmark Settings. Subsequently, second pillar refers to the Indonesian Local Wisdom, in term of Making Indonesia 4.0 (MI 4.0). Ultimately, third pillars are pertaining global benchmark settings, in term of Industry X.0, Society 5.0, Hallyu 2.0.

4. Conclusion

This paper conveys the theoretical discourses of Industrial Engineering and Digital Transformation. It proposes perspectives of Professional Engineering and World Class’ Industrial implementation by combining Indonesian Local Wisdom and Global Benchmark Settings.

The objective of this paper is to intertwine both theoretical and industrial implementation among Academician, Business and Government (ABG). Precisely, this harmonized industrial implementation is deemed indispensable by considering several pillars. First pillar constitutes the prior trigger of Industry 4.0 (IR 4.0), as one of Global Benchmark Settings. Subsequently, second pillar refers to the Indonesian Local Wisdom, in term of Making Indonesia 4.0 (MI 4.0). Ultimately, third pillars are pertaining global benchmark settings, in term of Industry X.0, Society 5.0, Hallyu 2.0.

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