

Research article

Development of Human Resources in the Industry 4.0: A Systematic Literature Review

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Abstract.

The world is ever-evolving, and organizations must adapt quickly to the changes to continue to grow or at the very least survive. One big external change that is currently happening is the industrial revolution 4.0. Therefore, a company's human resources must develop to accommodate the requisites of this new era. The objective of the current study was to seek the answer to the question: How can human resources be prepared for the industrial revolution 4.0? The study used a systematic literature review design. Based on the results, it is concluded that improving the quality of human resources, leadership, HR competencies, mastering technology, and data literacy can help prepare the workforce. Alternatively, strategies for developing human resources through education and training, continuing professional development, skills upgrading, or updating programs should also be considered. The implication is that organizations must develop their human resources by implementing strategies that fit the need of their trade to compete and thrive in industry 4.0.

Keywords: human resource development, industrial era 4.0, systematic literature review

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1. Introduction

Organizations are required to continue to make changes in order to continue to grow or at least to survive. Changes are made to adapt to changes in the internal or external environment. Changes in the organizational environment affect the running of the organization, it can have a positive or negative effect. Positive changes can be managed to increase strength and negative changes must be anticipated in order to avoid or minimize adverse impacts on the organization.[1]

The external change that is happening now is the industrial revolution 4.0. This industrial level creates a manufacturing system where the machines in the factory are equipped with wireless connectivity and sensors to monitor and visualize the entire production process. The industrial revolution 4.0 has caused disruption. [2] said that the era of disruption is a time that threatens and has serious challenges in human life, and

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people who are not able to adapt to change will certainly experience many difficulties in navigating the waves of daily life that are full of changes and full of competition. The impact of disruption can occur directly on the company's organization, namely in the field of the transformation process or indirectly, namely in the fields of finance, marketing and human resources in the company.

The company's human resource management must think about the need for developments in its human resources to prepare and meet the needs of companies that are required to be able to adapt to the environment of the industrial era 4.0. [3] said that training is a vehicle to build human resources towards the era of globalization which is full of challenges. Through training and development, the workforce will be able to work on, improve, and develop their work [4]. How are human resource developments in the industrial era 4.0? This research was conducted to answer the research questions above. The research was conducted using a systematic literature reviews method.

The use of systematic review means that research is carried out with a systematic method of identifying literature, explaining in the statement of objectives, materials and methods and development of research methodology and conclusions. The advantage of a systematic literature review approach is that it obtains valid and applicable findings from sources of research that has been done previously on a particular topic.

2. Literature review

2.1. Human resource management

Human resource management is a science or method of how to manage the relationship and the role of resources (labor) owned by individuals efficiently and effectively and can be used optimally so that the company, employees and society's common goals are achieved [5].

Human resource management is the science and art of managing the relationship and the role of the workforce to be effective and efficient in helping the realization of the goals of the company, employees, and society [6].

2.2. Human resource development

Human resource development is a form of individual preparation to assume different or higher responsibilities within the organization [7]. The purpose of employee development is to improve the effectiveness of employees' work in achieving predetermined

work results. Improvement of work effectiveness can be done by improving employee knowledge, employee skills and attitudes of employees themselves towards their duties [8].

The forms of human resource development are grouped into; formal and informal development [5]. HR development strategies according to Jons in [9] include: a. The training is aimed at developing individuals in the form of increasing skills, knowledge and attitudes. b. Education that aims to improve work skills, in the sense that development is formal and related to careers.

2.3. Industrial age 4.0

The term Industry 4.0 was born from the idea of the fourth industrial revolution. [10] said the industrial revolution 4.0 is an era marked by the existence of human, data, and machine connectivity in virtual form or known as cyber physical. In this industrial era 4.0 there is a shift in the trend of innovation towards digital technology. [11] explained that the industrial revolution 4.0 has fundamentally changed human life and work. New technological advances that integrate the physical, digital and biological worlds have affected all disciplines, economics, industry and government.

3. Research methods

This research was conducted using a Systematic Literature Review (SLR) approach with data sources from indexed journal literature that has an ISSN (International Standard Serial Number) printed or electronically published via the internet with the E-ISSN code. Data retrieval is done through internet surfing. The population of research data is journals with a focus on developing human resources in the industrial era 4.0, there are 12 indexed journals from various publishers or journal publishers. This systematic literature review was carried out by adopting a systematic literature review according to [11].

The Systematic Literature Review (SLR) is carried out in three stages, namely planning, implementing and reporting the results of the literature review. In the first stage the requirements for a systematic review are identified. Then, a systematic review on the problems of human resource development in the industrial era 4.0 was identified and reviewed. The review protocol was designed to guide the conduct of the review and reduce the possibility of researcher bias. In the second step, it defines the research question, search strategy, study selection process with inclusion and exclusion criteria,

quality assessment, and finally the data extraction and synthesis process. The third step is research reporting, by writing down the results of the research that has gone through the first and second stages of the process, then discussing the results of the research and making conclusions.

Research questions are needed to keep systematic reviews focused. The research questions were designed with the PICOC criteria [11], namely Population: Human resources in the industrial era 4.0; Interventions: Lack of HR competence; Comparison: Human resources without development; Results: capable HR in the industrial era 4.0; Context: HR market, company competition, performance. The research questions (RQ) that were built related to the development of human resources in the industrial era 4.0 in this study are as follows: RQ1: Which journal is an industrial era 4.0 HR development journal?; RQ2: Who is the most active and influential researcher in research?; RQ3: What research topics and trends did the researchers choose?; RQ4: What method is used most often?; RQ5: What method performs best?; RQ6: What method is proposed?; and RQ7: What kind of framework is proposed?. The research question is a method for predicting the need for human resource development in the industrial era 4.0 in Indonesia to answer questions in RQ4 to RQ7, then determine which ones are significant and which are not. These RQ4 to RQ7 are the main questions in this study, while other questions, namely RQ1 to RQ3 are used to assist in evaluating the research context.

The search strategy consists of several activities, namely selecting digital libraries, defining search strings, carrying out searches, refining search strings and retrieving a preliminary list of major studies from digital libraries relevant to the search string. The search string was developed according to the search term identification steps of the PICOC, mainly from Population and Intervention; identification of search terms from research questions; identification of search terms in relevant titles, abstracts and keywords; Identify synonyms, alternative spellings and antonyms of search terms. The database is searchable by title, keyword and abstract. The search was limited by the year of publication of the last 3 years of writing this study. Two types of publications namely journal and conference papers are included.

Inclusion and exclusion criteria were used to select the primary study. Inclusion Criteria: Academic studies; using large and small scale data sets; Studies on human resource development in the industrial era 4.0; studies with reference to conferences, thesis results, theses, dissertations and journals; ISSN indexed journals; the same publication, the most complete and most recent included. Exclusion Criteria: Studies without strong validation; the study only discusses human resource development; Studies are not written other than Indonesian and English

The selected main study was extracted and then collected data that contributed to answering the questions related in this study. data extraction was carried out iteratively. Four properties were used to answer the following research questions: Identification and publication projected RQ1, RQ2; Research Trends and Topics Projected RQ3; The industrial era 4.0 HR development method projected RQ4, RQ5, RQ6; The industrial era 4.0 HR development framework is projected RQ7.

Study quality assessments were used to guide the interpretation of the synthetic findings and to determine the strength of the conclusions outlined. The purpose of data synthesis is to collect evidence from selected studies to answer the research question. The extracted data are quantitative data and qualitative data. Various strategies were used to synthesize the extracted data relating to different types of research questions. In general, the narrative synthesis method is used. The data are tabulated in a manner consistent with the questions.

4. Results and Discussion

4.1. Significant journal publications

In this Systematic Literature Review (SLR), there are 12 journals that analyze HR development in the industrial era 4.0, the most research reports occurred in 2019, several journals with qualitative and quantitative approaches. List of journals as shown in table 1.

4.2. Active researcher

From the selected primary studies, researchers who contribute to research in the field of HR development in the industrial era 4.0 can be identified. The researchers all conducted research in the field of HR development in the industrial era 4.0 once. Total of 8 studies were produced by researchers who conducted research independently and 4 studies were carried out in team work.

4.3. Research topic

Human resource development in the industrial era 4.0 is a significant research topic in the field of human resource management, in detail it is shown in table 2 below. The analysis of the selected primary studies reveals that research on human resource

TABLE 1: Significant journal publications

No.	Name of Publishe	Category and Years
1	Semarang State University	ISSN 2686-6404 (2019)
2	ESENSI: Jurnal Manajemen Bisnis	ISSN : 1410- 8992 (2019)
3	Jurnal al-karim : jurnal pendidikan, psikologi dan studi islam	ISSN : 2656-078X (2020)
4	'Adliya: jurnal hukum dan kemanusiaan	ISSN : 19788312 (2019)
5	KREATIF : Jurnal Ilmiah Prodi Manajemen Universitas Pamulang	ISSN : 2339 – 0689 (2020)
6	Jurnal BPPK	ISSN : 2085-3785 (2020)
7	Jurnal ilmu kepolisian	ISSN : 2620-5025 (2019)
8	Seminar Nasional - Jurusan Administrasi Pendidikan Fakultas Ilmu Pendidikan Universitas Negeri Malang	2019
9	SNPPM : Seminar Nasional Penelitian dan Pemberdayaan Masyarakat	ISBN : 978-623-90328-2-1 (2019)
10	JIMEA : Jurnal Ilmiah MEA (Manajemen, Ekonomi, dan Akuntansi)	ISSN; 2541-5255 (2020)
11	Journal of maritime issues, sea transportation and management	ISSN : 1693-9484
12	Jurnal Manajemen	ISSN 2627-7872 (2018)

development in the industrial era 4.0 focuses on 5 topics as follows: 1) Identify the role of HR development; 2) Identify competencies; 3) Identify methods; 4) Disadvantages of not developing; 5) Identify strategies

The first topic is identifying the role of human resource development for industrial era 4.0 companies. about the role of human resource development as a strategic action in social transformation [12]. [13] and [14] highlight the preparation of human resources to be able to compete and survive in the industrial era 4.0.

The second topic discusses industry 4.0 competencies. Human resources in the industrial era 4.0 must: [15] skills, competencies, capabilities and knowledge and moral ethics; [16] knowledge, skills, values and behavior related to performance, emotional stability and openness to experience, emotional intelligence, spiritual intelligence, relationship skills, communication and personality, friendliness; [17] HR has a growth mindset; [18] adaptability, leadership and professionalism; [19] competence according to technological sophistication and data literacy.

The third topic is the method of human resource development . Human resource development is carried out by: [12] and [20] education and training; [21] improving the

quality and quantity of creative educational institutions as well as increasing the capacity of creative workers; [17] adjustment to the development of digital transformation, increasing creativity, changing mindsets from a fixed mindset to a growth mindset, Adaptive to Change, Skillful and Creativity, Time Oriented and Fancy Environment, Use Technology, Networking; [18] HR development with action plan, CDP (Continuing Professional Development); [22] highlighted that the implementation of on the job training for employees contributes to improving employee performance.

The fourth topic is about a person's loss if they do not master the competencies of the industrial era 4.0 HR change and find it difficult to embrace digital transformation, especially if they do not have sufficient technical knowledge to understand the scope of change and its impact on the organization [23]

The fifth topic is HR development strategy. In developing human resources [15] based on company analysis, employee qualification analysis and employee performance analysis and made [18] action plans, developing CDP (Continuing Professional Development), with the aim of [19] implementing up-skilling or renewal of skills (reskilling) of the workforce or university graduates based on the current needs of the industrial world, through education and training, either formally or informally.

4.4. Research methods

Research reports from search results that were reviewed from 2018 to 2020 used descriptive and quantitative qualitative approaches. The most research was 7 studies using descriptive qualitative methods with observation, in-depth interviews and phenomenology, while 4 studies used library research methods and 1 research using quantitative methods [22].

Qualitative research methods are used to obtain broad and in-depth information about the issue of human resources development in the industrial era 4.0. Meanwhile, quantitative research methods can prove the answers to research questions statistically and mathematically. The use of quantitative methods produces a measurable analysis of the description of human resource development and its effectiveness in industrial era 4.0 companies. Research methods that combine qualitative and quantitative can produce a complete analysis. So mixed methods would be very good to use.

[16] conducted research using the interview method with competent experts in the field of HR education and strengthened by analysis of literature sources found that workers must master science, have skills, values and behaviors related to performance, and workers maintain emotional stability and openness to experience, emotional

TABLE 2: Researchers and research topics.

No.	Researcher	Topics
1	Santi Riana Dewi (2018)	Innovation-based human resource development facing the industrial revolution 4.0
2	Agus Sutanto (2019)	Development of human resources advancing in the 4.0 era
3	Eko Indra Heri (2019)	The challenge of developing human resources for the police in the era of the industrial revolution 4.0
4	M.P. Rezky, Joko Sutarto, Titi Prihatin, Arief Yulianto, Irajuna Haidar (2019)	Transformation of human resources to face the labor market in the era of the industrial revolution 4.0
5	Susi Adiawaty (2019)	HR Transformation in Facing the Challenges of the 4.0 Revolution in the Port Sector
6	Wafa Abdullah Faqih A (2019)	HR development strategy in facing the challenges of the era of disruption 4.0
7	Ading Sunarto (2020)	Readiness to face the era of the digital revolution in the field of education through the development of human resources
8	Emillia, Dwina Kuswadani, Dharni Johar Damiri (2020)	Human resource development in the era of globalization
9	Himawan Aditya Pratama, Heni Dwi Iryanti (2020)	The Dominance of the Effect of On The Job Training on Improving Performance Quality
10	Ita Hartatia, Arfin (2020)	HR competencies facing the industrial era 4.0
11	Nasrika (2020)	HR development strategy in business competition Creative industries in the digital era
12	Yusup Umar (2020)	Implementation of HR in the field of education in the industrial era 4.0

intelligence, spiritual intelligence, managing good relationships, communication and personality skills, friendliness. [12] in his research said that human resource development can be done through education and training, either formally or informally. [22] in his research with quantitative methods proved that training made a significant contribution to improving employee performance in the industrial era 4.0.

5. Conclusion

This literature review reveals about the development of human resources in the industrial era 4.0 as evidenced by studies. HR development has an important role, namely as a strategic action in social transformation in preparing human resources to be able to

compete and survive in the industrial era 4.0. HR development is carried out with the aim of employee mastery of competencies consisting of skills, capabilities and knowledge, as well as moral ethics, values and behavior related to performance, emotional stability and openness to experience, emotional intelligence, spiritual intelligence, relationship skills, communication and personality, friendliness ; growth mindset; adaptability, leadership and professionalism that reflect technological sophistication and data literacy.

Human resource development is carried out through formal or informal education and training methods, improving the quality and quantity of creative educational institutions as well as increasing the capacity of creative workers, adjusting to the development of digital transformation, increasing creativity, changing mindsets from a fixed mindset to a growth mindset, Adaptive to Change, Skillful and Creativity, Time Oriented and Fancy Environment, Use Technology, Networking; CDP (Continuing Professional Development)

Human resources that are not developed according to the demands of the industrial era 4.0 are not resistant to change and find it difficult to adapt to digital transformation, especially those who do not have adequate technical knowledge in understanding the scope of change and its impact on the organization.

A strategy is needed in HR development, including HR development, it must be based on company analysis, employee qualification analysis and employee performance analysis and an action plan is made, developing CDP (Continuing Professional Development), with the aim of increasing skills (up-skilling) or updating skills (reskilling). workers or university graduates based on the needs of the industrial era 4.0, through education and training, either formally or informally.

The implication of this research is that organizations must develop their human resources by implementing strategies that are in accordance with their organizations so that organizations can survive and have strong competitiveness in industry 4.0.

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