Recruitment and Selection of Human Resources in Industry 4.0 Era: New Model Conceptual

Jolie Ponamon1,2*, Selvie Rumagit1,2, Tinneke E. M. Sumual1, Shelty D. M. Sumual1

1Department of Doctoral Education Management, Universitas Negeri Manado, Indonesia
2Department of Nursing, Universitas Sari Putra Indonesia Tomohon, Indonesia

*Corresponding author: jolieponamon@gmail.com

ABSTRACT

This research aims to develop a new conceptual model in the recruitment and selection process for human resources (HR) in the Industry 4.0 era. Rapid changes in technology, digitalization, and automation in the context of Industry 4.0 pose new challenges in the recruitment and selection of a workforce that is relevant, adaptive, and has appropriate competencies. This research method will use qualitative and quantitative approaches. Qualitative data will be obtained through in-depth interviews with industry practitioners, human resource managers, and Industry 4.0 experts. Meanwhile, quantitative data will be obtained through a survey that assesses the key competencies needed by workers in the Industry 4.0 era. In the analysis stage, this research will use thematic analysis for qualitative data and statistical techniques for quantitative data. The results of the analysis will be used to develop a new conceptual model that includes key dimensions such as digital skills, creativity, adaptation skills, and collaboration. This research is expected to make a significant contribution to understanding how HR recruitment and selection can be adapted to the demands of Industry 4.0. It is hoped that the resulting conceptual model can become the basis for organizations and educational institutions to improve the effectiveness of recruitment and selection processes, ensuring that the resulting workforce can adapt successfully in an ever-changing work environment.

Keywords: human resources, industry 4.0, recruitment, selection
INTRODUCTION

In the context of the ongoing industrial revolution, namely Industry 4.0, paradigmatic changes in the world of production and services have had a significant impact on various sectors, including the way companies recruit and select human resources (HR). The rapid development of information technology, artificial intelligence, automation, and connectivity has given rise to new challenges in HR management, demanding adaptation and innovation in the recruitment and selection process. The importance of human resources who are competent, responsive, and able to adapt quickly in facing changes in the work environment is becoming increasingly important (Sujanto, 2013). Therefore, this research aims to design and develop a new conceptual model in the context of HR recruitment and selection in the Industry 4.0 era, to optimize the placement of individuals who have skills and competencies that are in line with future industrial demands. The exponential growth of information technology, artificial intelligence, and the Internet of Things (IoT) in the context of Industry 4.0 has created a paradigmatic shift in industrial structure and operations. This revolution not only affects production processes and company operations but also has a significant impact on human resource management (HR). In this era, HR is not only expected to have strong technical skills but also adaptability, creativity, and sophisticated interpersonal skills. Industry 4.0 brings significant new challenges in recruiting and selecting human resources who can adapt to the high speed of technological change. Companies need to move from traditional models of recruitment and selection towards more adaptive and innovative strategies to synchronize organizational needs with individual qualifications and competencies. Therefore, it is necessary to develop a new conceptual model that can guide the recruitment and selection process in the Industry 4.0 era. Several key factors that urge this research include changes in work paradigms, namely Industry 4.0 creates a digitally integrated work environment, requiring new skills in the fields of digital literacy, data analysis, and connectivity which requires a new approach in HR selection. Technological Advancements i.e. The adoption of technologies such as artificial intelligence, robotics, and automation is changing the landscape of skills requirements, thereby requiring organizations to recruit individuals with a deep understanding of the latest technologies. Speed of Change: Changes in technology and business models occur quickly, so organizations must have human resources who can learn and adapt quickly. Interdisciplinary Collaboration i.e. Industry 4.0 encourages interdisciplinary collaboration and close team interaction. Therefore, the recruitment and selection process must assess an individual's ability to work effectively in a diverse team. Flexibility and Innovation, Companies need to have human resources who can not only adapt to changing environments but can also create innovative solutions to emerging challenges. Industry 4.0 marks an era of digital transformation that not only changes the way production and business operate but also overhauls work paradigms (Ariq, 2020). As organizations adopt advanced technologies, they need to ensure that their human resources can master new technologies, innovate, and collaborate effectively. Therefore, designing a new conceptual model for recruitment and selection becomes imperative so that organizations can adapt to these changes and ensure continued competitive advantage.

Several critical problems in the recruitment and selection process for human resources (HR) in the Industry 4.0 era, such as the Skills Gap, namely the profound changes in technology and ways of working in Industry 4.0, create a skills gap between what is required by companies and the
Recruitment and Selection of Human Resources in Industry 4.0 Era: New Model Conceptual
Jolie Ponamon, Selvie Rumagit, Tinneke E. M. Sumual, Shelty D. M. Sumual

qualifications and competencies possessed by prospective employees. Apart from that, the problem of lack of adaptability of the recruitment and selection process is that traditional recruitment and selection processes may be less able to adapt to the speed of change and innovation in the Industry 4.0 era. Lack of Focus on Soft Skills and Interpersonal Abilities, i.e. Apart from technical skills, Industry 4.0 emphasizes the importance of soft skills such as creativity, adaptability, and the ability to collaborate (Brown, 2019). This research will discuss how to integrate this skills evaluation into the recruitment and selection process more effectively. Challenges in Assessing Creativity and Innovation, namely Industry 4.0 require individuals who can innovate continuously. This research will identify challenges and find solutions in assessing and selecting candidates who have the potential for creativity and innovation in the work environment. Next is the importance of a balance between specialization and multifunctional skills. While technical specialization is important, organizations also need employees who have cross-disciplinary understanding and multifunctional skills. This research will consider how to achieve an optimal balance between specialization and multifunctional skills in recruitment and selection. Ethical Implications of Using Technology in Recruitment such as The use of technology such as artificial intelligence and data analysis in recruitment carries ethical implications that need to be explored. This research will discuss how to ensure that recruitment processes supported by technology remain ethical and fair.

Currently, research related to recruitment and selection of human resources (HR) in the Industry 4.0 era has experienced significant developments. Several recent studies provide an in-depth look at the challenges and opportunities in managing HR in an increasingly connected and automated work environment, such as Technology Integration in the Recruitment and Selection Process, which explores how organizations integrate technology such as artificial intelligence, data analysis, and machine learning in the recruitment process. This research shows that the use of technology can improve efficiency, but it also raises ethical questions regarding privacy and fairness. In addition, New Skills Required in the Industry 4.0 Era include key skills needed by HR in the Industry 4.0 era, including adaptability, creativity, digital literacy, and collaboration skills (Dana, 2020). This research provides insight into how organizations can assess and develop these skills. Next is Soft Skills Evaluation in the Recruitment Process, namely the importance of soft skills such as leadership, communication, and problem-solving. The development of better assessment methods for these soft skills is a focus to ensure employee selection that meets the demands of Industry 4.0. Next Adopt an Adaptive Recruitment Model: exploration of a recruitment model that is more adaptive and responsive to contextual changes. This involves the use of real-time data analysis and a deeper understanding of the organization’s needs to ensure an optimal match between candidate and job. Next is the Ethical Aspect in Technology-Based Recruitment, namely the use of high technology, there is increasing attention to ethical aspects in recruitment (Chen & Wang, 2018). These studies address how to manage ethical risks that may arise, including discrimination and privacy. The Role of Education in Preparing the Workforce, namely an exploration of the role of educational institutions in equipping individuals with the skills needed by Industry 4.0. This includes discussions about responsive curricula and partnerships between education and industry. In essence, state-of-the-art research shows that HR recruitment and selection in the Industry 4.0 era does not only involve technical aspects, but also soft skills, adaptability, and ethical application of technology. This research will utilize these recent findings to develop a new conceptual model that is more holistic and responsive to the dynamic needs of future industries.
Although much research has been carried out in the field of human resource (HR) recruitment and selection, several knowledge gaps need to be filled, especially in the context of Industry 4.0. Several research gaps that can be explained include gaps in measuring skills in the Industrial Era 4.0, namely, there is a lack of understanding of how to measure and assess the skills needed by human resources in the Industrial Era 4.0. While much research has addressed technical skills, there is still a need for further investigation regarding the measurement of soft skills, adaptability, and creativity which are important in an ever-changing work environment. In addition, challenges in assessing creativity and innovation, such as criteria and assessment methods to measure the level of creativity and innovation of candidates, are still limited. In an era where innovation is the key to success, further understanding is needed to create an assessment process that can identify individuals with innovative potential (Gupta & Bhatia, 2017). Next is the Lack of Integration of Multifunctional Skills, namely there is still little research that explores in depth the integration between technical specialization and multifunctional skills needed in Industry 4.0. Further understanding is needed about how to achieve an optimal balance between technical expertise and the ability to work across disciplines (Gupta & Shaw, 2018). Next, the use of technology and its implications for ethical aspects, namely, although technology such as artificial intelligence has been used in the recruitment process, there is still a gap in understanding the ethical implications that arise from the use of this technology (Jones, et all, 2018). Apart from that, the next research gap is the Adaptive and Responsive Recruitment Model, namely there is still an understanding of the extent to which this model can be implemented and integrated well in the context of rapid change in Industry 4.0. Next is the Influence of Education on Workforce Readiness, namely There is a need to better understand the influence of education, both formal and informal, on workforce readiness to face the demands of Industry 4.0. How educational institutions can more effectively align their curricula with industry needs needs further research. By filling these research gaps, it is hoped that this research can make a significant contribution to the practical and theoretical understanding of how to optimize the HR recruitment and selection process in facing the Industry 4.0 era.

This research brings various innovative and unique contributions to the literature on human resource management and education in the context of Industry 4.0, such as the Development of a New Conceptual Model, namely the development of a new conceptual model in HR recruitment and selection in the Industry 4.0 era. This model not only takes technical skills into account, but also emphasizes soft skills, adaptability, and innovation. The development of this model will provide new conceptual guidance that organizations can adopt to update and improve their processes. Next is the Adaptive and Responsive Approach in Recruitment, namely a recruitment model that is adaptive and responsive to dynamic changes in Industry 4.0. This includes developing strategies to optimize the recruitment and selection process so that it is more flexible and able to adapt to the evolving needs of the organization. By presenting these novel elements, it is hoped that this research can provide substantial new insights for practitioners, academics, and policies related to human resource management in the Industry 4.0 era. This research aims to develop an innovative and relevant conceptual model in HR recruitment and selection in the Industry 4.0 era. This model is expected to provide practical guidance for companies and educational institutions to identify, assess, and select individuals who possess the critical skills and competencies required to successfully operate in an ever-changing business environment. By digging deeper into the concept of recruitment and selection following the dynamics of Industry 4.0, it is hoped that this research can make a significant
contribution to our understanding of how organizations can utilize human resources effectively in facing this era of transformation. In addition, it is hoped that the results of this research can become a basis for developing recruitment and selection policies and practices that are more adaptive and responsive to company needs in the future.

**METHODS**

**Research design**
This research will use a mixed-methods approach that combines qualitative and quantitative elements to gain a more comprehensive understanding of HR recruitment and selection in the Industry 4.0 era.

**Study of literature**
Researchers conducted a comprehensive literature review to understand the latest concepts, theories, and findings related to HR recruitment and selection in the Industry 4.0 era. Next, develop a conceptual framework involving technical and soft skills, adaptability, innovation, and technology integration.

**In-depth Interview (Qualitative)**
This research involved industry practitioners, HR managers, and Industry 4.0 experts in in-depth interviews. Explore their views and experiences regarding the challenges and best practices in recruitment and selection in an ever-changing era.

**Survey (Quantitative)**
Researchers design and distribute surveys to a variety of respondents, including prospective employees, HR professionals, and industry leaders. Collect data on preferences, skills considered important, and perceptions of current recruitment and selection processes.

**Thematic Analysis (Qualitative)**
Researchers analyzed qualitative data from interviews using thematic analysis. Next, identify thematic patterns, trends, and differences in respondents' views.

**Statistical Analysis (Quantitative)**
Researchers analyze survey data using statistical techniques such as descriptive and inferential analysis. Determine the correlation between skill variables and recruiting preferences.

**Conceptual Model Development**
Researchers formulated a conceptual model based on findings from qualitative and quantitative analysis. Define key elements of the model that include skills, innovation, adaptability, and other critical factors.
Observation and Validation

Inhal Validation, namely, using expert and practitioner opinions to validate the conceptual framework and initial findings.

Model testing, namely, involving group discussion sessions with practitioners and academics to test the applicability and reliability of the proposed conceptual model.

Implementation of Results

Development of Practical Guides, namely Developing practical guides based on research findings to guide organizations in improving their recruitment and selection processes.

Workshops and Training, namely, Conducting workshops and training sessions with HR and management practitioners to introduce and discuss the application of new conceptual models.

It is hoped that the proposed research method will produce rich and in-depth insights into the challenges and opportunities in HR recruitment and selection in the Industry 4.0 era, as well as contribute to the development of new conceptual models that are relevant and can be adopted by organizations.

RESULTS AND DISCUSSION

New Conceptual Model

The main result of the research is the development of a new conceptual model to describe and guide the HR recruitment and selection process in the Industry 4.0 era. This model includes key components that consider aspects such as technical and soft skills, adaptability, innovation, and technology integration.

1. Skills Dimension
   a. Technical Skills

   Engineering skills are the candidate's skills in digital literacy, data analysis, programming, and artificial intelligence. To be able to carry out measurements, it can be done by testing technical skills, industry certification, and previous projects. Technical skills consist of Digital Skills, Data Analysis skills, and Artificial Intelligence (Kaufman, 2017). Digital Skills are the Ability to use software and digital platforms efficiently. Can be measured through a test of knowledge and skills in using industry-specific digital tools. Meanwhile, Data Analysis skills are the ability to collect, analyze, and interpret data to support decision-making. Can be measured using data analysis tests, data processing projects, and completion of case studies. Artificial Intelligence Skills are an understanding of artificial intelligence concepts and the ability to apply them in a work context. Can be measured through Artificial intelligence projects, AI knowledge tests, and participation in innovative projects.

   Adjustments to the Recruitment Process are carried out by integrating technical skills dimensions in the recruitment and selection stages. Steps include adjusting tests and interviews to cover technical aspects, as well as using selection algorithms that can measure technical skills. The holistic
Candidate Evaluation Process is the use of a holistic approach to assessing candidates by considering technical skills in the context of other skills (Lee & Heo, 2020). The steps include the use of an assessment board that covers various aspects of skills, situation-based interviews, and the use of the latest selection technology.

b. Soft Skills

Soft Skills are an Assessment of interpersonal skills, leadership, adaptability, and ability to collaborate. Can be measured using behavioral assessments, situational interviews, and personal references (Lisa, 2019). Soft skills consist of Interpersonal Skills, Leadership, Collaboration Ability, and Adaptability.

Interpersonal Skills are a combination of Interpersonal Skills, Communication abilities, and Adaptation Ability. Interpersonal Skills are the ability to communicate, work together, and interact well within a team and across departments. The measurement can be carried out by assessment through behavioral interviews, collaborative simulation tests, and interpersonal track record feedback. Meanwhile, Communication Skills are the ability to convey information clearly and effectively both orally and in writing (Ng & Feldman, 2018). The measurement can be done by evaluating presentations, document analysis, and communicative interview scenarios. Next, Adaptability is the ability to adapt to changing situations and tasks quickly and flexibly. This can be measured using adaptability simulation scenarios, assessing responses to business challenges, and adaptive behavioral interviews.

Next is Leadership which is seen in Leadership Style and problem-solving abilities. Leadership Style is a leadership approach applied in work situations. Can be measured through the assessment of leadership skills through team assignments, peer evaluations, and leadership case studies (Oluyemi & Oluyemi T, 2020). Problem Solving Ability is the ability to identify, analyze, and solve complex problems. The measurement is obtained through problem-solving case studies, analytical ability tests, and related behavioral interviews.

Next is collaboration Ability which consists of Team Collaboration Ability and Conflict Management Ability. Team Collaboration Skills are the ability to work effectively in a team, share ideas, and achieve common goals (Purcell & Hutchinson, 2019). The measurement is carried out through team collaboration assessments, collaborative project tests, and team performance evaluations. Meanwhile, the ability to manage conflict is the ability to identify and resolve conflicts constructively. The measurement is carried out using conflict case studies, conflict resolution simulations, and assessments through interviews.

The final part of soft skills is Adaptability. Adaptability consists of Responsiveness to Change, Creativity and Innovation, and Multifunctional Skills. Responsive Change Skills are the ability to adapt and respond to changes in the business environment. The measurement is carried out by assessing reactions to simulative changes, adaptability interviews, and evaluating participation in change initiatives. Meanwhile, Creativity and Innovation skills are the ability to create new ideas and innovative work approaches. The measurement is carried out with a creativity portfolio, innovative idea testing, and participation in innovative projects. Next, Multifunctional Skills are defined as the integration of technical and soft skills to respond to complex and diverse challenges. The measurement is carried out through cross-disciplinary assessments, and simulated job tasks that combine technical and soft skills.
2. Adaptability and Innovation

a. Adaptability

Adaptability is the candidate's ability to learn and adapt quickly to changes in technology and job demands. This is measured through an adaptation experience assessment, ongoing training, and an assessment of readiness for change.

The Adaptability dimension consists of the ability to learn quickly, flexibility and openness, and resilience. Fast Learning Ability is the ability to absorb and understand new information quickly. Measurements are carried out through rapid learning ability tests, evaluation of participation in training, and adaptability interviews. Meanwhile, flexibility and openness are the ability to adapt to change and be open to new ideas and opinions. Measurements were carried out by assessing flexibility behavior, testing openness to change, and analyzing responses to feedback (Rosen, et all. 2016). The final part is Resilience which is the ability to recover from failure or stress quickly. Measurement can be done by assessing resilience to pressure, interviews about crisis experiences, and evaluating the success of recovery from failure.

Ability to adapt to changing team and task dynamics. The measurement is carried out by assessing the integration of adaptability in team projects, situational tests, and interviews about experiences working in dynamic teams.

b. Adaptive Innovation

Innovation is the level of creativity and ability to innovate in solving problems and presenting new ideas. This can be measured through an innovation portfolio, previous innovative projects, and creativity assessments. Innovation capabilities are needed to produce creative and innovative solutions in facing new challenges (Smith & Johnson, 2017). The measurement is carried out through personal innovative projects, adaptive creativity tests, and interviews about innovative contributions to projects.

To increase adaptability, it is necessary to carry out a training program designed to increase adaptability. The steps include developing training modules, ongoing training, and evaluating the impact of training. Measurement of training results is obtained through evaluating the effectiveness of training in improving employee adaptability. The instruments used were pre- and post-training tests, participant satisfaction surveys, and impact assessments on individual performance.

The adaptive innovation process can be carried out by integrating adaptability in the recruitment process, such as adjusting tests and interviews, namely integrating adaptability questions and tasks in the recruitment process. The steps can be taken through interview modifications, adding adaptability tests, and adaptability scenario tests. In addition, the use of the Adaptive Selection Algorithm in this model is used to measure and assess candidate adaptability. Steps can be used through the implementation of adaptive selection algorithms, HR team training, and evaluation of selection performance.

3. Integration of Technology and Ethics

a. Use of Technology
Use of Technology is How technology, such as artificial intelligence, is used in the recruitment and selection process. The measurement is carried out through ethical assessments of technology use, audits of algorithm fairness, and checks for compliance with privacy regulations.

b. Ethics in Process

Ethics is an important factor in assessing the extent to which the recruitment and selection process follows the principles of ethics, fairness, and sustainability. The measurement is carried out by conducting satisfaction surveys of prospective employees, ethical assessments by experts, and monitoring process sustainability.

4. Advanced Skills Development
a. Development Opportunities

Development Opportunities are the identification of opportunities to develop further skills in successfully recruited employees. This can be measured by creating an individual development plan, participating in training programs, and obtaining advanced certification.

b. Performance Monitoring and Evaluation

Performance Monitoring and Evaluation is a way of measuring and evaluating employee performance following organizational goals. Measurement can be done through periodic performance assessments, co-worker responses, and achievement of performance targets.

Development and Implementation

Several methods that can be applied in the realization of Development and Implementation, namely:

1) 1) Training and Mentoring, consisting of, namely: Building a training program for the HR team and related managers to ensure understanding and implementation of the new conceptual model.

2) 2) Collaborative Approach, namely: Encouraging collaboration between the HR team, information technology department, and top management to ensure the suitability of the model with organizational goals.

3) 3) Integrated Recruitment Information System, namely: Implementing an integrated recruitment information system to facilitate efficient data collection and analysis.

4) 4) Extension and Internal Communication, namely: Communicating model changes effectively to all internal stakeholders, including managers, employees, and the HR team.

Evaluation and Continuous Improvement

Several ways that can be applied to realize Continuous Evaluation and Improvement, namely:

1) Periodic Monitoring and Evaluation, namely: Carrying out regular evaluations of model implementation to identify potential problems and opportunities for improvement.
2) Periodic Model Development, namely: Regularly updating the conceptual model following technological developments, changes in the business environment, and feedback from stakeholders.

3) Continuity of Research and Innovation, namely: Supporting continuous research and innovation activities to maintain the relevance of the conceptual model to the latest developments in the industry.

CONCLUSION

The research concludes that it is necessary to develop a new conceptual model that can accommodate the changes that occur in a world of work that is increasingly connected and changing rapidly. The main conclusion from this research is the importance of adaptability because the Industrial Era 4.0 demands human resources who are adaptive and able to innovate to face rapid technological changes and business dynamics. The new conceptual model must take into account adaptability as one of the main criteria in the recruitment and selection process. This research also concludes that the Integration of Technical and Soft Skills, namely the new conceptual model, must integrate technical skills with soft skills. Not only are technical skills required, but also the ability to communicate, collaborate, and adapt in a changing work environment. In addition, the application of technology in the selection process, such as artificial intelligence, can be used to support the recruitment and selection process but must be used wisely and pay attention to ethics and fairness. New conceptual models must incorporate technology as an aid, not as a replacement for full human decision-making. Next is Advanced Skills Development, namely the continuous development of HR skills which must be reflected in a new conceptual model. Training and development programs must be designed to improve skills relevant to the needs of Industry 4.0. Suitability to Organizational Culture such as new conceptual models must be able to be adapted to the culture and values of the organization. The involvement of internal stakeholders, including top management and employees, is important to ensure the acceptance and sustainability of model implementation. The conclusion is Continuous Evaluation and Improvement, namely Continuous evaluation of the effectiveness of the new conceptual model is needed to identify weaknesses and opportunities for improvement. The improvement process should be an integral part of the use of the model. Thus, this new conceptual model for HR recruitment and selection in the Industry 4.0 era becomes a comprehensive and adaptive guide for organizations in responding to the challenges and opportunities offered by digital and technological transformation. The successful implementation of this model will depend heavily on collaboration between HR practitioners, information technology, and organizational management in creating an adaptive, innovative, and sustainable work environment.

REFERENCES
Alex, Sujanto. (2013). Rekrutmen Dan Seleksi Berbasis Kompetensi: Tantangan Dalam Pemenuhan Kebutuhan Tenaga Kerja Pada Knowledge Society


Lisa. (2019). Recruitment And Selection, Brazil


