
Transformation Of Students' Career Orientation in The Era of Artificial Intelligence: A Systematic Literature Review**Mimi Yupelmi¹, Ganefri², Muhammad Giatman³, Krismadinata⁴, Nurhasan Syah⁵**mimiyupelmi@fpp.unp.ac.id, ganefri@unp.ac.id, giaatman@ft.unp.ac.id, krisma@ft.unp.ac.id, nurhasan@ft.unp.ac.id,nurhasan@ft.unp.ac.id.^{1,2,3,4,5} Universitas Negeri Padang.

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Abstract

This research revolves around the challenges faced by students in aligning their career orientation with demands and changes, as many traditional jobs are threatened by AI technology. The aim of this study is to identify trends in the transformation of students' career orientation in the era of Artificial Intelligence (AI), map the career challenges for students in the AI era, analyze the skills and competencies required, and assess the role of educational institutions in supporting this career transformation. The research method applied in this study is a systematic literature review. The initial stages involve collecting literature sources from scholarly databases and proceeding with a screening process to select literature relevant to the research focus. Finally, in-depth analysis of selected literature is conducted to identify patterns, trends, and key points related to the research topic. The results of the study describe that the development of AI technology has a significant impact on students' career orientation in higher education. Furthermore, students also face career challenges such as competition with technology, uncertainty about future employment, and skills gaps. To address these challenges, students need to develop technical AI skills, ethical AI understanding, problem-solving abilities, and continuous learning skills to succeed in the AI job market. On the other hand, higher education institutions should play a proactive role in addressing these challenges by developing relevant curricula, organizing training sessions, collaborating with industries, and enhancing AI learning facilities. Further research is suggested to focus on the implementation of these strategies in the specific context of higher education institutions and evaluate their impact on student career preparedness in the evolving AI era.

A. Introduction

The era of Artificial Intelligence (AI) has brought significant changes in various aspects of life, including in education and the workforce [1], [2]. Students, as future workforce candidates, are confronted with new challenges and opportunities brought about by the development of AI. The transformation of students' career orientation becomes a crucial issue because AI not only changes the way work is done and the types of jobs available [3] but also influences the competencies and skills required [4].

The main issue faced is how students can align their career orientation with the demands and changes caused by AI [5]. Many traditional jobs are threatened by AI technology [6], while new jobs requiring specific skills in technology and data are emerging [7]. This raises concerns about skill gaps and the readiness of students to face an increasingly sophisticated and competitive job market [8]. AI interventions in the context of the workforce have wide and deep impacts. Students' unpreparedness for these changes can lead to increased unemployment rates among new graduates [9] and decreased competitiveness of the workforce globally [10]. Moreover, skill disparities can exacerbate economic and social inequalities [11].

1. Research Objectives and Scope

This research aims to identify trends in the transformation of students' career orientation in the era of Artificial Intelligence (AI), map the career challenges for students in the AI era, analyze the skills and competencies required, and assess the role of educational institutions in supporting this career transformation. This research also provides guidelines for relevant education and employment policies. The scope of the research includes a review of academic and non-academic literature in the past five to ten years, focusing on the global context and particularly Indonesia.

2. Significance of The Research

Research on the transformation of students' career orientation in the AI era is crucial for several reasons. First, this research can provide a clear picture of how students perceive and respond to the changes brought about by AI in the context of their careers. This information is also important for educational institutions in designing curricula and programs to prepare students for a rapidly changing job market. Second, this research can identify new skills and competencies needed in the AI era, and how students can acquire these skills. This is beneficial for students in planning their education and training more effectively. Third, the results of this research can serve as a guide for policymakers in formulating education and employment policies that are more adaptive and responsive to technological developments. Thus, efforts to reduce skill gaps and improve workforce readiness in the AI era can be more targeted and efficient. Finally, this research also contributes to academic literature by providing a systematic study of career orientation in the AI era, which can serve as a basis for further research and theory development in the fields of education and employment. With this background, research related to the transformation of students' career orientation in the era of artificial intelligence is expected to make a significant contribution to understanding and addressing the challenges faced by students in preparing for careers in the AI era.

3. Research Questions

RQ1: How does the development of Artificial Intelligence (AI) technology affect students' career orientation at the higher education level?

RQ2: What are the main challenges faced by students in aligning their career orientation with the development of AI technology?

RQ3: What skills and competencies are required for students to succeed in the job market influenced by AI?

RQ4: How are higher education institutions currently preparing students to face the changes brought about by AI in the workforce?

B. Research Method

This research utilizes a Systematic Literature Review (SLR) approach to examine the transformation of students' career orientation in the era of Artificial Intelligence (AI). This methodology involves several steps, starting from determining search keywords, developing inclusion and exclusion criteria, searching literature in academic databases, to selecting studies based on relevance and quality [13]. Data from selected studies are extracted and analyzed using a thematic synthesis approach to identify main themes and sub-themes. The synthesis results will be reported in the form of descriptions of major findings, interpretations, and implications for students, educational institutions, policymakers, as well as recommendations for further research. This approach ensures systematic, transparent, and comprehensive research in understanding the impact of AI on students' career orientation.

1. Search Keywords

This research employs several keywords in the process of collecting data from academic databases. The search keywords used are as follows:

Student Career Transformation: These keywords are used to search for literature discussing changes or developments in students' career choices, aspirations, and professional orientation. Example keywords: "career transformation," "student career development," "career orientation change."

Artificial Intelligence (AI): These keywords are focused on literature exploring the impact of AI on various aspects of life, including education and employment. Example keywords: "artificial intelligence," "AI impact on careers," "AI in education."

Skills in the AI Era: These keywords are used to search for studies identifying the skills and competencies needed in the job market influenced by AI. Example keywords: "skills for AI era," "competencies in AI-driven job market," "future skills for students."

Skill Disparities: These keywords are used to find literature discussing skill disparities arising from the development of AI technology. Example keywords: "skill gap," "AI skill disparity," "skills mismatch in AI era."

2. Inclusion and Exclusion Criteria

The inclusion and exclusion criteria applied in this research are as follows:

Table 1. inclusion and exclusion criteria:

Inclusion Criteria	Exclusion Criteria
Types of Publications: Studies published in academic journals and conferences.	Type of Publications: Opinion articles, editorials, letters to the editor, and publications lacking a strong research basis.
Publication Period: Studies published within the last five to ten years (2014-2024).	Publication Period: Studies published before 2014, unless the research is considered seminal and highly relevant to the topic.
Subjects and Research Population: Research involving higher education students (undergraduates and postgraduates) as the main subjects.	Subjects and Research Population: Research not involving higher education students (e.g., high school students or working professionals).
Relevant Topics: Studies discussing career orientation transformation, skills needed in the AI era, the impact of AI on education and the workforce, and the role of higher education institutions in preparing students.	Irrelevant Topics: Studies that do not specifically address career orientation transformation in the AI era, or those focusing on AI technology aspects without direct relevance to students' career orientation.

3. Literature Selection Process

After applying the criteria for inclusion and exclusion, scholarly works are stored in a bibliography document. The selection process involves the following stages: First, the team conducts a review of the titles and keywords of the identified scholarly works. The next step is to analyze the summaries of the collected scholarly works. Finally, the team thoroughly examines the full text of the selected scholarly works for the final selection. By using this systematic approach, the research team aims to assess the reliability and authenticity of each scholarly work analyzed, ensuring that the process of selecting scholarly works is comprehensive.

4. Data Extraction Process

After selecting relevant literature, the research team develops a framework for the data extraction stage. This is aimed at ensuring that the data extraction process is conducted without bias, and the results of the systematic literature review can be trusted. The framework for the data extraction stage can be seen as follows:

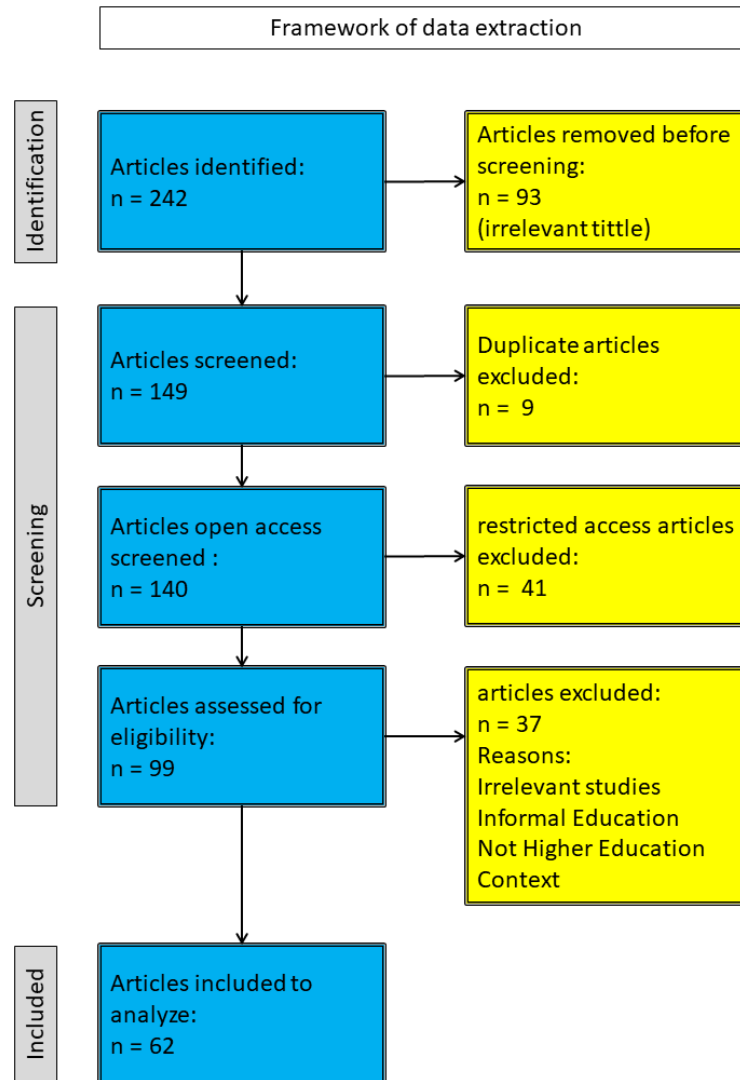


Figure 1. Framework of data extraction

C. Result

1. RQ1: How does the development of Artificial Intelligence (AI) technology affect students' career orientation at the higher education level?

The research findings describe several key points that can explain how the development of Artificial Intelligence (AI) technology affects students' career orientation at the higher education level. Here are some key points related:

Table 2. Effect of AI on students' career

No.	Crucial Aspects	Sources
1	Career Paradigm Shift	[14], [15], [16], [17], [18], [19], [20], [21]
2	Increased Interest in Technology Fields	[22], [23], [24], [25]
3	Diverse Career Choices	[6], [26], [27], [28], [29]
4	Changes in Skill Requirements	[17], [30], [31], [32]

a. Career Paradigm Shift

With the emergence of Artificial Intelligence (AI) technology, the traditional career paradigm has undergone a significant shift. Students are now more

interested in technology and data-based jobs compared to traditional professions [14], [15]. The current job market demand for technology skills, such as programming, data analysis, and AI development, is the primary driver of this change [16], [17]. Additionally, careers in technology and data offer higher salaries and better career prospects, thus attracting students seeking financial stability and growth opportunities [18], [19]. Furthermore, students are also interested in the innovation and impact they can make through AI technology, enabling significant contributions in various sectors such as healthcare, education, transportation, and others [20], [21].

b. Increased Interest in Technology Fields

The advancement of AI has spurred students' interest in developing technology skills and created a significant change in their career orientation. Industries worldwide are increasingly adopting AI technology, creating high demand for professionals with related skills such as programming, data analysis, and AI development [22], [23]. The presence of technology communities and startup ecosystems also plays a crucial role in boosting student interest [24]. For example, various technology platforms such as Meetups, hackathons, and technology conferences can facilitate students' interaction with industry professionals to share knowledge and skills [25].

c. Diverse Career Choices

The presence of AI technology has opened doors to various career choices that students may not have previously considered. Students can now consider professions such as data scientists, AI developers, Big Data analysts, and artificial intelligence specialists. All of these professions offer attractive and dynamic career opportunities in various industry sectors [6], [26]. Furthermore, the diversity of these careers allows students to work in fields that align with their interests and expertise [27]. In this context, higher education institutions must respond to these changes by providing relevant educational programs and supporting the development of skills needed for students to succeed in these new careers [28], [29].

d. Changes in Skill Requirements

This research also describes how the development of AI has changed the landscape of skills required in the job market. Currently, students tend to seek opportunities to develop technical skills such as programming, data analysis, and understanding AI algorithms [17], [30]. Additionally, non-technical skills such as problem-solving, communication, and collaboration are also important in the context of increasingly integrated teamwork with AI [31], [32]. Some of these skills are the primary needs of the current job market that students must master.

2. RQ2: What are the main challenges faced by students in aligning their career orientation with the development of AI technology?

The research findings describe several key points that explain the main challenges faced by students in aligning their career orientation with the development of AI technology. Detailed elaboration can be observed as follows:

Table 3. Challenges faced by students

No.	Crucial Aspects	Sources
1	Competition with Technology	[33], [34], [35], [36], [37]
2	Uncertainty about Future Employment	[38], [39], [40], [41], [8]
3	Skill and Education Gap	[42], [43], [44], [45], [46].

a. Competition with Technology

Competing with technology poses a significant challenge for students in the AI era [33]. The advancements in AI technology have transformed the job landscape by replacing tasks previously performed by humans in various contexts. For example, in customer service sectors, AI chatbots can replace the role of human operators in providing customer service. In the manufacturing sector, robotics and process automation reduce the involvement of human labor [34], [35]. This impact has led to increasingly fierce competition in the job market, where students must compete with increasingly sophisticated AI systems for employment. Students need to prepare themselves by enhancing skills that are difficult to replace by AI, such as creativity, complex problem-solving, and interpersonal abilities [36]. Additionally, students also need to develop the ability to collaborate with AI technology, such as managing and optimizing AI systems to improve productivity and efficiency [37]. Thus, students are faced with the demand to continually develop themselves to remain competitive in the ever-evolving job market influenced by AI technology.

b. Uncertainty about Future Employment

The development of AI technology has brought significant impacts on the uncertainty of future employment [38]. This phenomenon creates worries among students. With the increasing capabilities of AI in performing specific tasks, students feel anxious about the sustainability of their careers amid competition with such technology [39]. Students worry that the jobs they are currently aiming for may be replaced by more efficient and accurate AI systems. This uncertainty creates confusion about the career direction they should take and increases concerns about the possibility of job loss in the future [40], [41]. This can significantly affect students' career orientation, leading them to choose fields perceived as more stable and less affected by the development of AI technology. On the other hand, some students may feel compelled to take proactive steps by acquiring skills and knowledge relevant to AI, as well as strengthening abilities that are difficult to replace by technology, such as creativity, leadership, and strategy [8]. Thus, uncertainty about future employment as a result of AI development plays a crucial role in shaping students' career orientation and also influences their decisions in choosing career paths to face future challenges.

c. Skill and Education Gap

The gap between the skills taught in higher education institutions and the rapidly evolving industry needs poses a challenge for students [42]. Although educational institutions strive to provide relevant curricula, industry developments progress rapidly, especially in AI technology, making curricula lag behind [43], [44]. This makes it difficult for students to adapt to the continuously changing job market needs. The solution lies in enhancing curriculum flexibility, providing more internship opportunities, and strengthening partnerships with industries [45], [46].

3. RQ3: What skills and competencies are required for students to succeed in the job market influenced by AI?

In the job market influenced by AI, there are several key skills and competencies that are essential for students' success. The following is a detailed explanation of the required skills and competencies:

Table 3. Required Competencies

No.	Crucial Aspects	Sources
1	Technical Skills in AI and Data Analysis	[47], [48], [49], [50]
2	Understanding AI Ethics and Policies	[51], [52]
3	Problem-Solving Skills	[53], [54], [55], [56], [57], [58]
4	Continuous Learning Ability	[59], [60], [61], [62], [63], [64], [65]

a. Technical Skills in AI and Data Analysis:

The first competency that students should master in the AI-driven work era is strong technical skills related to AI and data analysis to remain competitive [47], [48]. Moreover, mastering programming languages like Python and R is imperative, as both are commonly used languages in AI application development and data analysis [49]. Additionally, a deep understanding of machine learning algorithms is highly required [50]. By mastering these skills, students can become more competitive in entering the job market increasingly influenced by AI technology.

b. Understanding AI Ethics and Policies

Understanding AI ethics and policies is crucial for students in the context of competing in an AI-influenced workplace. The concept of data privacy is crucial because AI often relies on sensitive data [51]. Students must understand how data is collected, stored, and used by AI systems, as well as the privacy implications associated with it. In the social context, students should be aware of how AI implementations can affect jobs, economies, and society as a whole. This includes considerations of potential job displacement by AI automation, changes in economic structures, and social issues such as potential inequality issues that may arise [52]. By understanding these concepts, students can positively contribute to the responsible development and implementation of AI technology.

c. Problem-Solving Skills

Problem-solving skills are essential for students who want to succeed in an AI-influenced work environment [53], [54]. These skills involve the ability to clearly identify problems, analyze situations effectively, and design effective solutions [55]. In the context of AI, students need to be able to identify complex challenges that may arise in the development and implementation of AI technology [56]. This also relates to issues such as algorithm bias and data security [57], [58]. The ability to address these problems critically and creatively is highly required. By developing these problem-solving skills, students will be better prepared to face complex challenges in the AI-influenced work environment and can make valuable contributions to problem-solving and driving innovation.

d. Continuous Learning Ability

The ability to learn continuously is key to success in a rapidly evolving technological era [59], [60]. Students must have an open attitude towards new

learning and be prepared to face rapid changes in the field of technology [61]. This involves the ability to learn independently, seek additional educational resources, and keep up with the latest developments in the industry [62]. Additionally, students must have strong adaptation skills, being able to adapt to new technologies, new working methods, and new job demands [63], [64]. Moreover, students should be proactive in identifying opportunities to develop new skills and take advantage of opportunities for additional learning, such as online courses, seminars, or professional training [65]. The ability to learn continuously is crucial for students to remain relevant and competitive in a rapidly changing job market.

4. RQ4: How are higher education institutions currently preparing students to face the changes brought by AI in the workforce?

Higher education institutions have adopted various strategies to prepare students to face the changes brought by AI in the workforce. The following is a detailed explanation along with real examples related to efforts made by educational institutions:

Table 3. Higher education strategies

No.	Crucial Aspects	Sources
1	Development of Relevant Curriculum	[2], [66], [67]
2	Training Programs and Certifications	[68], [69], [70], [71]
3	Collaboration with Industry	[72], [73], [74], [75], [76]

a. Development of Relevant Curriculum

Developing a curriculum that is relevant to AI technology is a crucial step for higher education institutions in providing education that meets the evolving demands of the job market [2]. This step involves integrating the learning process with AI technology [66]. This integration encompasses all aspects of learning, from basic concepts to practical applications in various fields. Additionally, an inclusive and practical teaching approach can help students better understand complex concepts and develop the technical skills needed in the workforce [67]. Therefore, the development of a curriculum relevant to AI technology plays a key role in preparing students for success in the job market influenced by AI.

b. Training Programs and Certifications

Additional training and certification programs in the field of AI technology are one of the effective strategies for preparing students to meet the evolving demands of the job market [68], [69]. Higher education institutions provide these programs as supplements or complements to regular curricula aimed at providing the necessary technical skills in the workforce. Training programs can cover various topics, ranging from AI programming to the development of AI-based applications and data analysis. Through these programs, students have the opportunity to develop the required technical skills and expand their professional networks in the AI industry [70], [71]. Thus, training and certification programs play a crucial role in helping students achieve success in their careers in the AI era.

c. Collaboration with Industry

Collaboration between industry and higher education institutions is a strategic step to ensure the relevance and timeliness of the curriculum to the needs of the job market in the AI era [72], [73]. This collaboration allows for the exchange of information and experiences between higher education and related

industries, enabling educational institutions to better understand what the workforce needs [74], [75]. Through this collaboration, the curriculum can be tailored to the latest trends and technologies used in the industry, including AI technology and other related fields. Higher education institutions can also leverage this collaboration to provide internship opportunities and collaborative projects with these companies. Collaborative projects allow students to work with industry professionals to solve complex challenges, thereby enhancing students' skills and expanding their professional networks [76].

D. Discussion

The significant development of Artificial Intelligence (AI) technology has greatly influenced the career orientation of students at the higher education level, and several previous studies support this finding. According to research, automation and AI have changed students' perspectives on traditional careers, directing them towards more dynamic and challenging technology-based jobs [77]. Furthermore, student interest in courses and programs related to technology in line with the high demand for these skills in industries [33]. Additionally, the diversity of career choices is also an important impact of AI development. Studies found that AI creates various new roles and expands the spectrum of careers that students can pursue, such as data scientists and AI developers, which were previously non-existent [78], [79]. Finally, research finding emphasizes the importance of soft skills such as problem-solving, creativity, and adaptability in the AI era [80].

Findings of this research also describe the major challenges faced by students in adjusting their career orientation to the development of AI technology. These challenges include competition with technology, the emergence of uncertainty about the future of work, and the gap between skills taught in educational institutions and industry needs. Some previous studies are also consistent with these research findings. Research revealed that AI and automation replace routine jobs, requiring students to compete with sophisticated technology and develop unique skills that are not easily automated [81]. Other research also describe that uncertainty about the future of work is also a challenge and causes anxiety among students [82]. Finally, research finding that is align with this study identified a significant gap between the skills taught in educational institutions and industry needs, prompting the need for curriculum updates and relevant practical training [83].

Furthermore, this research finding also describe the competencies required for students to succeed in the job market influenced by AI. Some of these skills include technical skills in AI and data analysis, understanding of AI ethics and policies, problem-solving ability, and lifelong learning skills. Some previous studies also emphasize several important points that align with these findings. A study emphasizes the importance of technical skills such as programming and data analysis due to the increasing demand for these skills [84]. Additionally, other research indicates that understanding of AI ethics and policies, including data privacy, is crucial in the workplace [85] while problem-solving skills are also crucial because non-routine jobs require high levels of critical and analytical thinking [86]. Lastly, previous research also emphasizes the importance of lifelong

learning skills, given the rapidly evolving technology demands workers to continuously update their skills and adapt to changes [87].

Lastly, the research findings also describe several strategies that higher education institutions should adopt to address the changes brought by AI in the workplace. These strategies include developing relevant curriculum, organizing training and certification programs, and designing collaboration programs with industries. Some previous studies also support these research findings. One of them is the development of relevant curriculum should emphasize the integration of AI and related technologies into the curriculum to ensure that students are prepared for evolving industry needs [66], [88]. Additionally, training and certification programs are key to preparing students to face the challenges and opportunities in the AI-influenced workplace [89].

E. Conclusions

The conclusion of this research underscores the significant impact of Artificial Intelligence (AI) technology development on students' career orientations at the higher education level. Factors such as shifts in career paradigms, increased interest in technology fields, diversity of career choices, and changes in skill requirements are highlighted as major challenges faced by students. These challenges include competition with technology, uncertainty about future job prospects, and the gap between skills taught and industry needs. To succeed in the AI-influenced job market, students need to develop technical skills in AI and data analysis, an understanding of AI ethics and policies, problem-solving abilities, and lifelong learning skills. Therefore, higher education institutions need to take proactive steps, such as developing relevant curricula, organizing training and certification programs, forming collaborations with industries, and investing in AI-based learning facilities and laboratories. Further research could focus on implementing these strategies in the specific context of higher education institutions and evaluating their impact on students' career readiness in the rapidly evolving AI era.

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