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Challenges and Opportunities of Japanese Higher Computer Science Education from the Graduates' Perspective

Centre for East Asian Studies

The Faculty of Social Sciences

Master's thesis

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This master's thesis is a pilot study that critically examines computer science education at the university level in Japan from the perspective of the graduates. It investigates the challenges and opportunities encountered by IT graduates during their educational journey and transition to the job market. While Japan has made significant progress in integrating computer science education at the elementary level and has developed various policies to enhance the quality of higher education in general, there is a lack of specific focus on computer science education at the tertiary level. This study aims to address this research gap by examining the challenges and opportunities faced by IT graduates during their educational journey and transition to the job market, providing valuable insights for policymakers and identifying areas that require improvement in Japanese higher computer science education. The findings also offer a platform for further investigations into aspects of computer science education in Japan that demand immediate reform. The conclusions emphasize the significance of developing both hard and soft skills for successful transitions from university to the workplace. While hard skills remain important, the study underscores the growing importance of soft skills such as cognitive and analytical abilities, emotional intelligence, interpersonal skills, flexibility, resilience, professional and social skills, and strategic and opportunistic thinking skills. To facilitate this balanced development, higher education institutions should reassess and refine their curricula, incorporating real-world scenarios, collaborative learning environments, and extracurricular activities. Collaboration among educators, policymakers, and employers is essential to ensure a smooth transition for computer science graduates, foster equal opportunities, and produce professionals equipped to contribute effectively to the evolving field of technology. By addressing these challenges, graduates can maximize their potential and achieve long-term success in their careers.

KEYWORDS: Japan, Japanese higher education, Japanese computer science education, transition to the job market

Table of Contents

1	Introduction	7
2	Existing Literature	9
2.1	Contemporary Perspectives on Education and Learning in a Changing World	9
2.2	Alignment in Higher Education: Enhancing Teaching Quality, Professional Preparation, and Societal Relevance.....	10
3	Conceptual Framework	13
3.1	The Concept of Education.....	13
3.2	Japanese Higher Education	15
3.3	Role of Education in Transition to the Job Market	16
3.4	Transition to the Job Market in Japan.....	18
4	Methodology	20
4.1	Research Design and Approach.....	20
4.2	Participants and Sampling Strategy	21
4.3	Data Collection Methods and Instruments.....	23
4.4	Data Analysis Procedures and Coding Techniques	24
4.5	Ethical Consideration and Research Rigor.....	27
5	Analysis of the 2015 Japanese Educational Guidelines	29
5.1	Overview of the Policies.....	29
6	Analysis of the Interviews	32
6.1	Overview of the Data Collected.	32
6.2	Key Empirical Findings	33
6.3	Challenges	34
6.3.1	Academic Challenges.....	34
6.3.2	Career Challenges.....	36
6.3.3	Financial Challenges	38
6.3.4	Social Challenges.....	39
6.4	Opportunities	41
6.4.1	Academic Opportunities	41

6.4.2	Social Opportunities	43
6.5	Essential Soft skills to Navigate the Job Market after Graduation	45
6.5.1	Cognitive and Analytical Skills.....	45
6.5.2	Emotional Intelligence and Interpersonal Skills.....	46
6.5.3	Adaptability and Resilience	47
6.5.4	Professional and Social Skills	47
6.5.5	Strategic and Opportunistic Thinking	49
6.6	Essential Hard Skills to Enhance Japanese Computer Science Education	49
6.6.1	Computational Thinking.....	50
6.6.2	Data Literacy	50
6.6.3	Web Development Skills.....	50
6.6.4	Low Relevance of Hard Skills.....	51
6.7	Summary of the Findings	51
7	Discussion.....	53
7.1	Overview of the Research	53
7.2	Graduates' Perceptions of their Educational Experience regarding their Transition to the Workforce.....	53
7.2.1	Academic Challenges.....	53
7.2.2	Career Challenges.....	58
7.2.3	Financial Challenges	59
7.2.4	Social Challenges.....	61
7.2.5	Opportunities	63
7.2.6	Hard and Soft Skills	66
8	Conclusions	71
9	Limitations and Suggestions for Further Research	72
	Bibliography.....	73
	Appendix: Interview Questions	81

List of Figures

FIGURE 1. EXTRACT FROM INITIAL CODES USING NVIVO SOFTWARE.	26
FIGURE 2. THE INITIAL CODES AFTER THEY WERE DIVIDED INTO THEMES AND SUB-THEMES.	26
FIGURE 3: KEY EMPIRICAL FINDINGS DIVIDED INTO THEMES AND SUB-THEMES	34
FIGURE 4. ACADEMIC CHALLENGES THEME DIVIDED INTO SUB-THEMES.	34
FIGURE 5. CAREER CHALLENGES THEME DIVIDED INTO SUB-THEMES.	37
FIGURE 6. FINANCIAL CHALLENGES THEME DIVIDED INTO SUB-THEMES.	38
FIGURE 7. SOCIAL CHALLENGES THEME DIVIDED INTO SUB-THEMES.	39
FIGURE 8. ACADEMIC OPPORTUNITIES DIVIDED INTO SUB-THEMES.	41
FIGURE 9. SOCIAL OPPORTUNITIES THEME DIVIDED INTO SUB-THEMES	43
FIGURE 10. SOFT SKILLS THEME DIVIDED INTO SUB-THEMES.	45
FIGURE 11. HARD SKILLS THEME DIVIDED INTO SUB-THEMES.	50

List of tables

TABLE 1. OUTLINE OF THE JAPANESE EDUCATIONAL POLICIES

29

TABLE 2. OVERVIEW OF THE PARTICIPANTS OF THE STUDY

32

1 Introduction

This master's thesis critically examines the state of computer science education at the university level from the graduates' perspective in Japan. Recently, a gap has been identified by the Japanese government regarding the deficiency of high-quality computer science professionals in the country. As a strategic response, the government has proposed to bridge this gap by actively promoting and "nurturing programming thinking" (MEXT, n.d.).

This decision finds its roots in the rapid evolution of information technology, which has triggered a fundamental shift in industrial structures and everyday life. In contemporary society, information technology exceeds the boundaries of information-related industries; it forms the core for the creation of new services through interconnections with various industries and fields. This demands the development of a society that works synergistically with information technology professionals.

The deep penetration of information technology in all aspects of society establishes a transformation in the human resources required. Children, who represent the future stakeholders of this digital society, should not merely be good at using IT-related equipment. Rather, there is a growing need for them to understand the underlying mechanisms of this equipment, that is, the basic principles of computer science.

Considering these developments, programming education was introduced as a mandatory part of the curriculum in elementary schools from the 2020 academic year. This initiative underscores the commitment to equip the next generation with the essential skills to navigate and contribute to an increasingly digital world (MEXT, n.d.).

While Japan has made significant steps in integrating computer science education at the elementary level and has developed various policies to enhance the quality of higher education in general, there is a visible absence of comprehensive reforms or white papers specifically addressing computer science education at the university level. This presents a risk of undermining the progress made at the elementary level, as the country's talented young minds may not receive the necessary specialized training at the tertiary level. Consequently, the Japanese government's primary goal of strengthening the IT industry may be jeopardized.

Given this context, my study aims to fill the research gap concerning higher computer science education in Japan. I propose the following research question: What do IT graduates identify as key challenges and opportunities during their educational journey and their transition to the job market?

This question seeks to uncover the main obstacles and prospects students encounter during their education and their subsequent transition into the workforce.

By exploring these issues, this study could serve as a valuable resource for Japanese policymakers, offering insights into the critical aspects that require improvement within Japanese computer science education at the tertiary level. Furthermore, given the growing attention to computer science education in Japan, the findings could also provide academia with a platform for further investigations into which aspects of Japanese computer science education demand immediate reform. Through this research, I aspire to contribute to the ongoing discourse on enhancing computer science education and strengthening Japan's IT sector.

2 Existing Literature

This chapter provides a comprehensive review of the existing literature related to the research question: "What do IT graduates identify as key challenges and opportunities during their educational journey and transition to the job market?". The purpose of this literature review is to explore and examine the existing body of knowledge in the areas of higher education worldwide and in Japan, and the transition from education to employment.

2.1 Contemporary Perspectives on Education and Learning in a Changing World

Gardner's (2008) emphasis on the social context of education highlights the importance of adapting educational practices to support the changing needs of society. As society evolves, the skills required for success also evolve. Gardner's argument underscores the necessity for individuals to possess not only domain-specific knowledge but also essential abilities such as collaboration, problem-solving, and creativity. By recognizing and nurturing these abilities, educators can foster a well-rounded and adaptable skill set that equips individuals to thrive in the complex and rapidly changing landscape of today's society. The study of Rosen (2010) compliments Gardner's research and presents distinctive characteristics of the current generation that set it apart from earlier generations, particularly regarding its attraction to technology and multimedia-based learning. Recognizing this generation's creative tendencies, educators have an opportunity to reshape education and create engaging learning environments that effectively harness the potential of various technologies. By integrating and leveraging current generation's attraction to multimedia elements, educators can foster a learning environment that correlates with this generation, empowering them to excel in their educational pursuits. Weimer (2003) adds up that addressing concerns about teaching effectiveness requires a shift towards prioritizing learning. This entails empowering students to take ownership of their learning, revisiting traditional instructional approaches, and making substantial changes to teaching practices. By emphasizing learning, educators can create more meaningful and engaging educational experiences that better equip students with the necessary skills for success in the modern world. Levine and Dean (2012) provide a convincing analysis of the characteristics and experiences of today's college students. It also emphasizes the urgent need for educational institutions to adapt and prepare students for the complex realities of the 21st century. By understanding and responding to the unique needs of this generation, higher education can play a pivotal role in empowering students to navigate an ever-changing world and contribute to its transformation.

In case of Japan, Aspinall's analysis (2012) highlights the complex dynamics between education policy and implementation in Japan. It underscores the need for policymakers to address institutional inactivity, re-evaluate teaching and learning practices, and promote a more inclusive and open approach to language education and cultural diversity. By aligning policy objectives with the realities and fostering an environment that embraces global perspectives, Japan can better navigate the challenges of globalization and enhance its educational landscape in an age of risk and uncertainty. Moreover, regarding internalization, Ota (2018a) highlights the challenges and limitations within higher education in Japan. While the government has initiated policies and funding programs, there is a need for a more comprehensive and transformative approach at the institutional level. This would involve a shift from inward-facing competition to fostering genuine international collaboration and initiatives that improve learning experiences in a globalized context. By addressing these challenges, Japanese higher education can better position itself for international competitiveness and relevance in an increasingly interconnected world. Additionally, according to Yonezawa (2023), Japan is experiencing various problems within higher education funding. The author (Yonezawa, 2023) writes about the complexities and challenges facing Japan's higher education policy in achieving global excellence. It underscores the influence of national policies, particularly economic and fiscal policies, while acknowledging the difficulties faced by universities in maintaining international competitiveness. The analysis prompts a reflection on the impact of these policies and offers insights into future directions for Japan's higher education system in the face of evolving global challenges.

2.2 Alignment in Higher Education: Enhancing Teaching Quality, Professional Preparation, and Societal Relevance

Biggs (2003) highlights the significance of constructive alignment in enhancing teaching quality and learning outcomes. By aligning learning objectives, instructional activities, and assessments, educators can create a cohesive and purposeful educational experience that supports student achievement. The emphasis on what students do and the thoughtful design of teaching and learning activities aims to create an environment that encourages deep and meaningful learning. By implementing the principles of constructive alignment, educators can create a more effective and impactful learning experience for their students.

Moreover, it is important to align education with one's future profession. Sternberg (2010) argues for a shift in the traditional notions of intelligence and a broader approach to college admissions, embracing diverse attributes and modified assessment tools. It calls for teaching methods that align

with students' learning styles and emphasizes the importance of nurturing creativity in education. By reimagining admissions, instruction, and assessment practices, colleges can better prepare students for success in a rapidly evolving world that values innovation and creative problem-solving. Billet (2009) also writes about a growing recognition of the importance of aligning higher education programs with professional practice. The aim is to provide students with meaningful and authentic experiences that prepare them for successful transitions into their chosen fields. To achieve this, careful attention must be given to curriculum design and pedagogic approaches. By integrating work experiences effectively, universities can ensure that students gain the necessary knowledge, skills, and competencies to thrive in their future professional endeavours. Rowe and Zegwaard's research (2017) also claims the importance of students' preparation for the workforce and underscores the importance of work-integrated learning in enhancing graduate employability. Their findings emphasize the need to embed work experiences in the curriculum, support them with appropriate pedagogical strategies, ensure quality assessment practices, and consider the resourcing implications. Watts' study (2006) supports the idea that effective career planning and development positively impact employee motivation, work satisfaction, and loyalty. Organizations that prioritize career planning and development initiatives are likely to experience higher levels of employee engagement, satisfaction, and commitment. These findings highlight the importance of incorporating career planning and development programs into educational strategies to foster a motivated workforce. By adopting a holistic approach that integrates employability and employment outcomes, educational institutions can better prepare students for the ever-changing demands of the workforce.

However, the issue of the gap between Japanese IT higher education and the needs of the workplace has been a significant area of research. Kuwamura (2013) asserts that IT departments in Japanese universities tend to have a strong emphasis on research and lack practical education components. Consequently, these departments struggle to produce highly skilled professionals who can effectively contribute to organizations like Google or IBM. In fact, even the production of average-skilled workers becomes a challenge for these departments. Supporting this viewpoint, Matsuura (2007) argues that to cultivate competent IT engineers who can meet industry demands, it is imperative to incorporate more practical learning experiences. Such experiences enable students to develop problem-solving skills in diverse situations by applying engineering knowledge, moving beyond traditional lecture-based teaching methods and simple exercises.

Enhancing teaching quality and preparation for the job market align with the broader trend of universities adapting to the changing needs and expectations of the society, aiming to produce

graduates who are well-equipped for contributing to the well-being of the country. In terms of Japanese higher education, research suggests that education should be aligned with the needs of the society. Goodman et al. (2005) suggests that higher education reform in Japan encompasses and reflects the broader changes occurring in Japanese society. It addresses challenges such as demographic shifts, low-quality education, bureaucratic reforms, and the need for global competitiveness. Understanding and analysing these reform efforts, the author provides valuable insights into the overall trajectory of societal change in post-bubble Japan. Moreover, due to globalization the number of international students is growing. However, the study by Sato et al. (2022) emphasizes the challenges faced by international graduate students in Japan and identifies themes related to loneliness, the importance of extracurricular activities, and language barriers/cultural differences. The findings underscore the importance of providing support and creating an inclusive environment that values and embraces the languages and cultures of international students. By addressing these aspects, Japanese universities can enhance the study abroad experiences and overall well-being of international graduate students that can contribute greatly to Japanese society.

The Japanese government's efforts to promote study abroad opportunities have resulted in significant growth in short-term study abroad participation (Ota, 2018a). Despite the challenges faced by international students, the Japanese government managed to improve the situation with Japanese students going abroad. According to Ota's study, the expansion of funding and support for study abroad programs indicate a commitment to enhancing international experiences for Japanese students. Further research is needed to understand the impact and outcomes of these study abroad initiatives on the students' educational and personal development (2018a).

To conclude, the literature review emphasizes the need for higher education in Japan to adapt to the changing societal landscape and demands. The integration of practical learning experiences, innovative teaching methods, and support for internationalization is crucial for preparing students for the challenges of the modern world. The reviewed studies highlight the importance of bridging the gap between academia and the workplace, addressing the challenges faced by international students, and promoting study abroad opportunities. By addressing these issues and incorporating the recommendations provided in the literature, higher education institutions in Japan can enhance their quality, relevance, and global competitiveness, ultimately equipping students with the necessary skills and knowledge for success in their careers and contributions to society.

3 Conceptual Framework

In order to answer the research question: “*What do IT-graduates identify as key challenges and opportunities during their educational journey and transition to the job market?*”, the conceptual framework for this research is designed around four core concepts: education, Japanese higher education, the role of education in the transition to the job market, and the transition to the job market in Japan. These concepts form a comprehensive picture of the educational journey and job market transition faced by IT graduates in Japan.

The concept of education will provide a broad understanding of the role and purpose of education, offering a foundation from which to explore the other concepts in more depth. It will cover various theories and perspectives on education, its goals, and its outcomes.

The concept of Japanese higher education will investigate the specifics of higher education in Japan, including its brief history, structure, and unique cultural elements. It will provide an understanding of the educational environment in which IT graduates study.

Role of education in transition to the job market will explore how education prepares students for the job market, focusing on the development of both hard and soft skills, as well as other forms of career preparation. It will look at the link between educational attainment and employment outcomes, and discuss the challenges and opportunities presented by the transition from education to employment.

Transition to the job market in Japan will examine the specific processes and challenges involved in transitioning to the job market in Japan. It will cover aspects such as the unique Japanese recruitment practices, societal expectations, and the impact of economic and industry trends on job seekers.

3.1 The Concept of Education

The purpose of education in society is complex, as it encompasses not only the acquisition of knowledge and skills but also the cultivation of critical thinking, creativity, and social responsibility (Dewey, 2011). In his foundational work that was published in 1916, Dewey (2011) explores the relationship between education and democratic society, arguing that education should be a means of fostering critical thinking, problem-solving, and active participation in the community. Bloom (1956) introduces a hierarchical model, known as Bloom's Taxonomy, which classifies learning objectives into six levels of cognitive complexity: knowledge, comprehension, application, analysis,

synthesis, and evaluation. This hierarchy ranges from basic recall of information (knowledge) to deeper intellectual tasks like critical judgment (evaluation). Bloom's Taxonomy has greatly influenced curriculum development and assessment practices, shifting the focus from simple memorization to higher-level thinking skills. It continues to serve as a key framework for educators in setting learning objectives, designing activities, and evaluating student learning. Therefore, education encompasses various attributes that are essential in preparing individuals to navigate complex global challenges and contribute to the improvement of society (Freire, 2014).

Educational theories and philosophies, such as constructivism and behaviourism, have significantly influenced the development of teaching and learning approaches. Constructivism emphasizes the active role of learners in constructing their knowledge and understanding, often through problem-solving and collaborative activities (Fosnot, 1996). Vygotsky explores the social and cultural factors that shape cognitive development and argues that learning is a collaborative process that occurs through interaction with others (Vygotsky et al., 1978). In contrast, behaviourism focuses on the reinforcement of specific behaviours in response to stimuli, with an emphasis on the role of the teacher in shaping students' learning experiences (Fosnot, 1996). The belief that learning occurs through observation, clear communication with educators, and practice sessions with feedback is a common assumption among scholars. This approach, demonstrated by Bloom and Gagne's works (Bloom, 1956; Gagne, 1985), they suggest that mastery of skills is essential to building a comprehensive understanding of a topic. Moreover, the view that learners are passive, needing external motivation, and responsive to reinforcement is also widely accepted, as postulated by Skinner (1953). As a result, educators put significant effort into designing a structured curriculum and determining how to assess, motivate, reinforce, and evaluate learners. These theories, along with others, have contributed to the diverse range of pedagogical strategies utilized in contemporary education.

Effective learning environments are characterized by several key components. Engaging curricula are designed to stimulate students' interests and foster a deep understanding of subject matter, often through real-world applications and interdisciplinary connections (Schlechty, 2011). Schlechty (2011) argues that engaging curricula are essential for promoting student motivation, deep learning, and the development of critical thinking skills. Fink (2013) claims that creating significant learning experiences requires a shift away from traditional lecture-based approaches to teaching and towards a more student-centred approach that emphasizes active learning, collaboration, and reflection. Supportive infrastructure includes resources such as well-equipped classrooms, access to technology, and robust libraries, which facilitate learning and research (Ark et al., 2020). A positive

atmosphere that promotes intellectual and emotional growth involves cultivating a sense of belonging and inclusion, encouraging open dialogue, and fostering a growth mindset among students and educators alike (Coyle & Damron, 2018). Coyle (2018) argues that successful organizations and groups have a strong culture that is based on shared values, beliefs, and practices, and that this culture plays a crucial role in driving success and high performance. This holistic approach to education ensures that students are well-prepared for their future endeavours, both academically and personally.

3.2 Japanese Higher Education

The history and evolution of higher education in Japan began with the establishment of its first modern universities in the late 19th century, such as the University of Tokyo in 1877. This period marked the beginning of Japan's efforts to modernize and adopt Western educational models, while still preserving elements of its traditional culture and values (Jansen, 2002).

The structure and organization of Japanese universities are influenced by national policies, academic traditions, and cultural factors. National policies, such as the Ministry of Education, Culture, Sports, Science, and Technology's (MEXT) Education Policy Bureau, shape the overall direction, curriculum, and accreditation standards for higher education institutions (MEXT, n.d.; Goodman et al., 2005). Academic traditions, including the long-standing emphasis on research and the pursuit of excellence, have contributed to the development of highly specialized and rigorous programs in various fields (Beauchamp & Vardaman, 1996).

Government policies and regulations play a significant role in shaping higher education in Japan, particularly through funding and quality control measures. Public funding for higher education institutions is provided by MEXT, and the allocation of these funds is often tied to institutional performance and research output. Additionally, Japanese higher education institutions are subject to periodic assessments by MEXT to ensure adherence to national standards and to promote continuous improvement (MEXT, n.d.).

Japanese culture exercises considerable influence on the educational experiences of students, through various social norms, values, and expectations. For example, according to Allen (2016), the phenomenon known as "shiken jigoku" or "examination hell" in Japan, which is commonly experienced by high school graduates, is a manifestation of the deeply ingrained cultural value placed on education and hard work, influenced by Confucian principles. This period of rigorous preparation for entrance exams, seen as a pivotal moment in an individual's life path, holds great

importance within the society. Moreover, the cultural emphasis on group harmony and collective effort often translates into collaborative learning environments and group-oriented projects. The importance of respect for authority and hierarchy in Japanese society is also reflected in the relationships between students and teachers, with students typically displaying deference and formality towards their instructors. These approaches often result in teacher-centred education when students do not question their mentors (McVeigh, 2002). Furthermore, the emphasis on conformity, patience, persistence, and attention to detail is seen as a reflection of broader Japanese societal values. However, this approach may not necessarily foster a learning environment that encourages critical thinking, curiosity, or active engagement with contemporary issues (Rohlen, 1983).

3.3 Role of Education in Transition to the Job Market

Education plays a crucial role in equipping students with the hard and soft skills necessary for their professional lives. Therefore, education serves as a mediator between social origin and occupational destinations (Shavit & Müller, 1998). Hard skills, also known as technical skills, are specific, teachable abilities related to a particular job or field, such as programming, data analysis, or graphic design. In contrast, soft skills, sometimes referred to as interpersonal or transferable skills, are less tangible but equally important qualities that enable individuals to interact effectively with others, manage their work, and adapt to different situations (Laker & Powell, 2011).

Employability skills and attributes have become increasingly important as the job market evolves, and employers seek well-rounded candidates who can demonstrate a wide range of abilities (Harvey et al., 1997). Key employability skills include problem-solving, communication, teamwork, and adaptability (Harvey et al., 1997). Employability is also referred to as a set of “skills needed for life-long learning and a successful business career” (Stoner & Milner, 2010, p.123). These skills are highly valued by employers across various industries and can significantly enhance a candidate's competitiveness in the job market.

Networking and mentorship are essential components of career development, as they can significantly impact students' career trajectories by providing connections, guidance, and support (Ferrazzi & Raz, 2005; Johnson & Ridley, 2018). Networking, the process of building and maintaining professional relationships, can open doors to job opportunities, industry insights, and collaborative projects (Ferrazzi & Raz, 2005). Mentorship, on the other hand, is a more structured form of support, wherein experienced professionals share their knowledge, expertise, and advice with less-experienced individuals, helping them navigate their careers and overcome challenges (Johnson & Ridley, 2018).

Preparing students for job searches, interviews, and career development requires a comprehensive approach that includes building confidence, self-awareness, and resilience (HILTON, 2015). Confidence is essential for presenting oneself effectively in job applications and interviews, while self-awareness helps individuals identify their strengths, weaknesses, and areas for growth. Resilience, or the ability to cope with setbacks and persevere in the face of adversity, is crucial for long-term career success, as it enables individuals to learn from their experiences, adapt to change, and maintain a positive outlook (Chowdhury et al., 2002).

Universities, as primary providers of higher education, plays a significant role in preparing students for the transition to the job market (Beers, 2011). They achieve this through various means, including curriculum design, practical training, career services (Dey & Cruzvergara, 2014), and extracurricular activities (Monteiro & Almeida, 2015). Curriculum design that balances both theoretical knowledge and practical applications allows students to develop a strong foundation in their field while also gaining hands-on experience (Alismail & McGuire, 2015). Incorporating real-world projects, case studies, and simulations within the coursework can help students understand the relevance of their learning and develop skills that are directly applicable to the workplace (Katajavuori et al., 2006). Rowe & Zegwaard (2017) highlight the significance of integrating work-integrated learning into the curriculum and supporting it with appropriate pedagogical strategies. Additionally, the provision of quality assessment is emphasized to ensure positive employability outcomes.

Practical training, such as internships, co-op programs, and work placements, provides students with valuable opportunities to apply their learning in professional settings and develop industry-specific skills (Sides & Mrvica, 2017). These experiences can also help students build professional networks and gain insights into potential career paths, further facilitating their transition to the job market (Holzer, 2015).

Universities often provide career services to support students in their job search and career development efforts. These services may include career counselling, resume and cover letter assistance, interview preparation, job fairs, and workshops on various job search strategies. By offering these resources, universities help students develop the necessary tools and strategies to effectively navigate the job market (Dey & Cruzvergara, 2014).

Extracurricular activities, such as clubs, societies, and volunteer work, can also contribute to students' preparedness for the job market by fostering the development of soft skills and providing additional opportunities for networking and mentorship. Involvement in such activities can enhance

students' communication, teamwork, leadership, and problem-solving abilities, all of which are highly valued by employers (Guilmette et al., 2019; Rubin et al., 2002).

Incorporating these elements, universities play a vital role in preparing students for a successful transition to the job market, ensuring they are equipped with the necessary hard and soft skills, as well as the confidence, self-awareness, and resilience required to thrive in their professional lives.

3.4 Transition to the Job Market in Japan

The transition to the job market in Japan has traditionally been characterized by unique cultural, societal, and economic phenomena that distinguish it from the job markets in other countries (Kawanishi, 2020). The Japanese hiring process, 'shin-sotsu ikkatsu saiyō,' involves mass recruitment of new graduates annually. The job hunt, or 'shūkatsu,' is a crucial transition into adulthood, marking individuals as 'shakai-jin,' or fully employed members of society. This transition is a one-way journey with significant societal expectations attached. The pressure is immense, as young adults must make critical, long-lasting career choices in their early 20s. Any misstep during this period is feared to lead to a label of failure (Kawanishi, 2020).

The Japanese job market has traditionally been characterized by a system of 'lifetime employment', where employees remain with the same company for their entire career. This system, which has its roots in the post-WWII economic boom, has provided job stability but can also limit mobility and flexibility (Gerlach, 1987). In recent years, there has been a shift towards more flexible employment practices, partly in response to economic pressures and changing societal attitudes (Matsumoto et al., 1996; Pejović, 2014). Nonetheless, the transition from university to the job market still often involves a one-time, high-stakes job hunting process, known as 'shūshoku katsudō' or 'job-hunting activity' (Cofre Gonzalez, 2015). Transitioning to the job market in Japan can present several challenges for new graduates. The highly competitive and structured job-hunting process often requires substantial time and resources, and success is heavily influenced by the prestige of the university attended and the student's academic performance (Kawaguchi & Ono, 2013). Moreover, it's crucial for graduates to display their universal traits and personal characteristics, aligning them with the current organizational culture of their prospective company. Through the process of job hunting, they determine the company that suits them most appropriately and learn how to showcase that they are the best fit for the company (Saito & Pham, 2019). Given the importance of on-the-job training over academic proficiency, employers usually have limited expectations based on academic performance during university. Although economic downturns have reduced the resources and time companies can afford to invest in on-the-job training for their new employees, academic

achievements continue to hold less weight in the job market, with students instead required to demonstrate adaptability in a variety of situations (Moriguchi, 2014). Additionally, due to historical and cultural complexities in the relationship between Japanese industries and universities, employers tend not to rely heavily on university education. They favour the provision of on-the-job training and, during the hiring process, they do not significantly emphasize the academic qualifications of prospective employees (Saito & Pham, 2019). In addition, changes in the economy, such as the shift towards a more service-oriented and tech-driven economy, have led to a mismatch between the skills produced by higher education institutions and the skills demanded by employers (Pilz et al., 2015). Therefore, despite the development in the employment sector, recruitment practices have lagged, creating a significant mismatch. This difference has left many young individuals unable to find employment within the rigid system, causing them to drop out of the employment track altogether. Additionally, the inflexible and demanding work culture, coupled with a prolonged economic downturn, has been a deterrent for some young people. As a result, these individuals either voluntarily choose or are unconsciously forced to stay outside the conventional full-time, lifelong employment paradigm (Honda, 2005).

The transition to the job market in Japan is shaped by a complex interplay of cultural, educational, and economic factors. As Japan's economy and society continue to evolve, so too will the challenges and opportunities faced by new graduates entering the job market. It is therefore crucial for higher education institutions, policymakers, and employers to work together to ensure that graduates are well-prepared to navigate this transition effectively.

4 Methodology

4.1 Research Design and Approach

Phenomenology is a research design that seeks to understand the subjective experiences of individuals in various contexts. In this study, phenomenology is used to investigate the challenges and opportunities within Japanese computer science education regarding the job market transition from graduates' perspective.

Phenomenology as a research design emphasizes the study of lived experiences and how people make sense of them. Interpretative Phenomenological Analysis (IPA), a specific approach within phenomenology, aims to explore individuals' subjective experiences and meaning-making processes through in-depth interviews and a rigorous process of interpretation. IPA is particularly useful for studying complex or sensitive topics where people's subjective experiences and perspectives are central to the research question, such as in the case of investigating challenges and opportunities within Japanese computer science education regarding the job market transition through graduates' perspective.

Smith, Flowers, and Larkin (2009) argue that IPA provides a structured yet flexible framework for conducting phenomenological research. The method involves a systematic process of analysis that emphasizes the researcher's engagement with the data, including repeated readings and noting of initial impressions, identification of emergent themes and patterns, and linking these themes to the broader theoretical and conceptual frameworks. The authors also stress the importance of reflexivity and acknowledging the researcher's own subjectivity and influence on the analysis.

Overall, IPA offers a valuable approach for investigating the subjective experiences and meaning-making processes of individuals, which can provide rich insights into complex and nuanced phenomena. In the case of investigating challenges and opportunities within Japanese computer science education, phenomenology and IPA can help to uncover the ways in which graduates navigate and make sense of their experiences within this context.

In-depth interviews are the primary data collection method used in this research paper. This method is well-suited for phenomenological research because it allows participants to describe their experiences in their own words and provides the opportunity for the researcher to probe deeper into specific aspects of those experiences (Moustakas, 1994).

The goal of this pilot study is to gain a deeper understanding of the challenges and opportunities faced by computer science graduates in Japan as they transition from higher education into the job market. The study will focus on exploring the subjective experiences of these individuals, including the factors that influenced their educational experience, the challenges they faced during their education, and the opportunities that helped them transit smoothly to the Japanese job market. The motivation of this pilot study is to conduct an in-depth investigation of the distinct phenomena characterized by a lack of detailed preliminary research (Streb, 2012). The objective here is not to generalize or form a new theory, but to gain a deeper understanding of the real-world experiences and challenges of these individuals, which have not been thoroughly explored previously. Therefore, this pilot study will serve as a first step for future research endeavours, as pilot studies are often utilized to identify and define ideas and hypotheses for future, more comprehensive studies (Streb, 2012). The outcomes of this study are expected to provide valuable insights and direction for future research in this field, ultimately contributing to the body of knowledge on the experiences of computer science graduates in Japan.

To conclude, this research design and approach will provide a detailed understanding of the experiences of computer science graduates in Japan as they navigate the transition from higher education to the job market. By using phenomenology as the research design and in-depth interviews as the primary data collection method, this study will provide valuable insights into the challenges and opportunities within Japanese computer science education and the job market from the perspective of those who completed their studies.

4.2 Participants and Sampling Strategy

The participants for this study were individuals who met the following criteria: they had a computer science degree from a Japanese university and work experience in a Japanese company. A purposive sampling strategy was used to identify and recruit participants who could provide rich and diverse insights into the research topic.

Purposive sampling is a non-probability sampling strategy that involves selecting participants based on specific criteria or characteristics that are relevant to the research question (Bryman, 2016). Also known as judgmental or selective sampling, purposive sampling allows researchers to focus on the most informative participants for their research objectives (Creswell, 2014).

Purposive sampling is particularly useful in qualitative research, where the goal is to obtain in-depth, rich and detailed data about a specific phenomenon or population. The strategy allows

researchers to target participants who have knowledge or experience related to the research topic and can provide valuable insights for the study (Palinkas et al., 2015). In this way, purposive sampling helps to ensure that the data collected is relevant and informative for the research objectives.

There are different types of purposive sampling techniques that researchers can use depending on their research goals and the characteristics of the population. For example, maximum variation sampling involves selecting participants who have diverse backgrounds or experiences related to the research topic, while typical case sampling involves selecting participants who are most representative of the population (Creswell, 2014). Critical case sampling involves selecting participants who have experienced a particular event or phenomenon, and snowball sampling involves selecting participants who can refer the researcher to other potential participants (Palinkas et al., 2015). Expert sampling involves selecting participants who have specialized knowledge or experience in the research topic (Creswell, 2014).

Purposive sampling has several advantages over other sampling techniques. It allows researchers to target participants who have relevant knowledge or experience related to the research question, and thus ensure that the data collected is informative and relevant to the research objectives (Creswell, 2014). Moreover, it can be a more efficient and cost-effective sampling technique than probability sampling, as it requires less time and resources to recruit and select participants (Bryman, 2016).

However, it is important to acknowledge that purposive sampling has some limitations. The sample obtained through purposive sampling may not be representative of the wider population, and thus the generalizability of the findings may be limited (Palinkas et al., 2015). Also, there is a risk of bias in the selection of participants, as the researcher's judgment and expertise may influence the selection process (Bryman, 2016). Therefore, it is important to clearly describe the sampling strategy and its limitations in the methodology section of the research report, to ensure transparency and validity of the study.

A total of four participants were recruited for the study, consisting of two European nationals and two Japanese nationals. The participants were selected based on their availability, willingness to participate, and their ability to provide relevant and insightful information related to the research question. To identify potential respondents, I leveraged my personal network, specifically a friend who works at a Japanese company in Sweden. Through this connection, I was able to establish initial contact with the respondents, who were then further assessed for their suitability and interest in participating in the study. This approach allowed me to gather diverse perspectives from

individuals with varying backgrounds and experiences in the field of Japanese higher computer science education.

The sample included an equal number of males and females to ensure gender balance and to capture potential gender-related differences in experiences and perspectives related to the research topic.

The use of a small sample size in qualitative research is not uncommon and can still provide rich and detailed insights into participants' experiences and perspectives (Guest et al., 2006). In this study, the sample size of four participants was deemed appropriate for the exploratory nature of the research and the in-depth nature of the data collection method.

Overall, the selected participants and sampling strategy were designed to provide a diverse range of experiences and perspectives related to the research question and to ensure that the findings are representative of the broader population of individuals who have a computer science degree from a Japanese university and work experience in a Japanese company.

4.3 Data Collection Methods and Instruments

In this study, the data collection methods included in-depth semi-structured interviews and document analysis. In-depth interviews are a commonly used method in qualitative research that allows for the exploration of participants' perspectives and experiences (Smith et al., 2009).

The interviews were conducted using a semi-structured interview guide that was designed to explore the challenges and opportunities within Japanese higher computer science education from the graduates' perspective. The interviews were conducted in English and Japanese, depending on the preference of the participants. The interviews were audio-recorded and transcribed verbatim for later analysis.

Semi-structured interviews are a type of qualitative research method in which the interviewer has a flexible framework of questions to ask the participant, allowing for open-ended responses that can provide rich and detailed information about the research topic (Galletta, 2013). In this method, the interviewer has a set of pre-determined questions, but they also have the flexibility to ask follow-up questions to clarify or expand upon the participant's responses.

One of the key advantages of using semi-structured interviews is that they allow for a deep exploration of participants' experiences, opinions, and perspectives on a particular topic (Flick, 2013). Semi-structured interviews provide a level of detail and nuance that cannot be captured by other data collection methods such as surveys or questionnaires. Additionally, the flexibility of the

semi-structured interview method allows the researcher to adjust the questions based on the participant's responses, which can lead to unexpected and valuable insights (Braun, 2013).

However, there are also limitations to the use of semi-structured interviews. One limitation is that the researcher must have strong interpersonal skills to create a comfortable and open environment for the participant to share their thoughts and experiences (Flick, 2013). Another limitation is that the analysis of the data can be time-consuming, as it requires the researcher to carefully review and code each interview transcript.

Despite these limitations, semi-structured interviews remain a valuable method for qualitative research, particularly when exploring complex and nuanced topics. They can provide rich data that is both detailed and contextually specific, allowing for a deep understanding of participants' experiences and perspectives.

In addition to the interviews, document analysis was used to collect data. This method involved the review and analysis of relevant documents related to Japanese higher computer science education, such as policy documents, reports, and curriculum materials. The document analysis was conducted to provide additional context and support for the findings from the interviews.

Overall, the use of multiple data collection methods, including in-depth interviews and document analysis, provides a comprehensive understanding of the challenges and opportunities within Japanese higher computer science education from the graduates' perspective.

4.4 Data Analysis Procedures and Coding Techniques

The data analysis procedures for this study will utilize inductive coding techniques with the assistance of the NVivo software. Inductive coding is a bottom-up approach to data analysis, which involves identifying patterns and themes within the data and allowing these to emerge rather than imposing pre-existing categories or frameworks onto the data (Thomas, 2006). This approach is appropriate for the study's research question, which aims to identify the challenges and opportunities within Japanese higher computer science education from the perspective of graduates regarding the job market transition.

Inductive and deductive coding are two popular approaches to data analysis in qualitative research. Inductive coding involves deriving themes and categories directly from the data, while deductive coding involves applying pre-existing theoretical frameworks or concepts to the data (Charmaz, 2006).

While deductive coding can be useful in confirming or refuting hypotheses, it has limitations in terms of its ability to capture the complexity and nuance of data. Inductive coding, on the other hand, allows for a more nuanced understanding of the data by letting the themes and categories emerge from the data itself (Thomas, 2006).

Inductive coding has been found to be particularly effective in exploratory research, where the goal is to gain a deeper understanding of a phenomenon (Saldaña, 2016). It can also be useful in situations where existing theoretical frameworks do not fully capture the complexity of the data or where the research question is open-ended.

Several scholars have argued in favour of the inductive approach to coding. For example, Thomas (2006) stated that inductive coding allows for the fullest possible exploration of the data and that it is better suited for rich, thick descriptions of social phenomena. Similarly, Saldaña (2016) argued that inductive coding allows for a more nuanced understanding of the data.

Therefore, one of the advantages of using inductive coding techniques is the ability to uncover unexpected themes or patterns in the data that may not have been previously considered. This approach allows for a more comprehensive understanding of the research topic, which can lead to more insightful findings. Additionally, the use of NVivo software increased the reliability and validity of the analysis, as it allows for transparent documentation of the coding process.

However, one limitation of inductive coding is the potential for researcher bias in the identification and interpretation of themes. To address this limitation, the coding process could be reviewed by my academic supervisor to ensure consensus and reduce the potential for subjectivity. Furthermore, the sample size of four participants may limit the generalizability of the findings, as the results may be specific to the participants in this study and may not be representative of the broader population.

Using the NVivo software for coding facilitated the management and organization of the data, allowing for efficient analysis and interpretation of the interview transcripts and. This software provides a user-friendly interface for organizing and labelling the data, as well as the ability to visualize the coded data through graphs and charts.

The coding process began by familiarizing with the data, which involved reading through each interview transcript and document multiple times to gain an overall understanding of the data. Initial codes were then developed by highlighting and labelling sections of the data that appeared to be relevant to the research questions.

Name	References	Created on	Created...	Modified on	Modified by
<input type="radio"/> a positive classroom climate	1	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:52	DK
<input type="radio"/> a positive learning experience	3	8 Mar 2023, 19:00	DK	8 Mar 2023, 01:17	DK
<input type="radio"/> a research-intensive environment	1	8 Mar 2023, 19:00	DK	8 Mar 2023, 01:18	DK
<input type="radio"/> a strong mentor-mentee relationship.	5	8 Mar 2023, 19:00	DK	7 Mar 2023, 23:24	DK
<input type="radio"/> academic credentialism as a negative factor	1	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:14	DK
<input type="radio"/> academic favoritism as a positive factor	2	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:15	DK
<input type="radio"/> anachronism in Japanese educational policy	2	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:17	DK
<input type="radio"/> analytical thinking	5	8 Mar 2023, 19:00	DK	8 Mar 2023, 01:03	DK
<input type="radio"/> balance of theory and practise	2	8 Mar 2023, 19:00	DK	7 Mar 2023, 21:37	DK
<input type="radio"/> balancing national and regional needs in japanese education policy	1	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:19	DK
<input type="radio"/> balancing specialization and generalization in Japanese education policy	1	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:52	DK
<input type="radio"/> bias	1	8 Mar 2023, 19:00	DK	7 Mar 2023, 20:52	DK
<input type="radio"/> collaborative learning environment	2	8 Mar 2023, 19:00	DK	8 Mar 2023, 01:03	DK
<input type="radio"/> communication as a soft skill	1	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:21	DK
<input type="radio"/> comparison to previous experience	1	8 Mar 2023, 19:00	DK	6 Mar 2023, 22:15	DK
<input type="radio"/> compassion as a soft skill	3	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:22	DK
<input type="radio"/> computational thinking as a hard skill	3	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:22	DK
<input type="radio"/> conservatism in Japanese education policy	4	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:23	DK
<input type="radio"/> creativity as a soft skill	1	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:23	DK
<input type="radio"/> cross-cultural communication as a positive factor	5	8 Mar 2023, 19:00	DK	8 Mar 2023, 18:24	DK
<input type="radio"/> data literacy	1	8 Mar 2023, 19:00	DK	7 Mar 2023, 23:21	DK
<input type="radio"/> dedicated teachers	1	8 Mar 2023, 19:00	DK	7 Mar 2023, 21:21	DK
<input type="radio"/> depth of study	1	8 Mar 2023, 19:00	DK	6 Mar 2023, 22:14	DK
<input type="radio"/> derailing your career	1	8 Mar 2023, 19:00	DK	7 Mar 2023, 01:00	DK
<input type="radio"/> developing effective assessment methods	2	8 Mar 2023, 19:00	DK	8 Mar 2023, 01:15	DK
<input type="radio"/> easy graduation requirements	1	8 Mar 2023, 19:00	DK	7 Mar 2023, 20:58	DK
<input type="radio"/> educational deficiency	1	8 Mar 2023, 19:00	DK	6 Mar 2023, 22:17	DK
<input type="radio"/> examination culture	1	8 Mar 2023, 19:00	DK	7 Mar 2023, 00:47	DK
<input type="radio"/> expensive exchange studies	1	8 Mar 2023, 19:00	DK	7 Mar 2023, 22:34	DK
<input type="radio"/> extracurricular activities	1	8 Mar 2023, 19:00	DK	7 Mar 2023, 21:00	DK
<input type="radio"/> fear of missing out on academic opportunities,	1	8 Mar 2023, 19:00	DK	7 Mar 2023, 00:59	DK
<input type="radio"/> fieldwork experience	1	8 Mar 2023, 19:00	DK	7 Mar 2023, 01:10	DK
<input type="radio"/> focus on memorization	1	8 Mar 2023, 19:00	DK	8 Mar 2023, 01:03	DK

Figure 1. Extract from Initial Codes using NVivo Software.

After the initial coding, codes were grouped into broader categories, and relationships between categories were examined. As new data was analysed, these categories were further refined and reorganized until a comprehensive and coherent set of themes emerged.

Name	References	Created on	Created...	Modified on	Modified by
<input type="radio"/> Challenges	62	9 Mar 2023, 12:58	DK	11 Mar 2023, 14:57	DK
> <input type="radio"/> Academic Factors	49	9 Mar 2023, 13:03	DK	11 Mar 2023, 14:51	DK
> <input type="radio"/> Career factors	5	9 Mar 2023, 13:16	DK	9 Mar 2023, 13:21	DK
> <input type="radio"/> Financial Factors	2	9 Mar 2023, 13:17	DK	11 Mar 2023, 15:46	DK
> <input type="radio"/> Social Factors	6	9 Mar 2023, 13:20	DK	9 Mar 2023, 13:21	DK
<input type="radio"/> hard skills	6	9 Mar 2023, 12:58	DK	9 Mar 2023, 01:20	DK
<input type="radio"/> computational thinking as a hard skill	3	9 Mar 2023, 12:58	DK	8 Mar 2023, 18:22	DK
<input type="radio"/> data literacy	1	9 Mar 2023, 12:58	DK	7 Mar 2023, 23:21	DK
<input type="radio"/> no hard skills needed	1	9 Mar 2023, 12:58	DK	8 Mar 2023, 01:06	DK
<input type="radio"/> web-development skills	1	9 Mar 2023, 12:58	DK	8 Mar 2023, 01:06	DK
<input type="radio"/> Opportunities	27	9 Mar 2023, 12:58	DK	11 Mar 2023, 14:55	DK
> <input type="radio"/> Academic Factors	10	11 Mar 2023, 22:16	DK	23 Mar 2023, 00:08	DK
> <input type="radio"/> Social factors	17	11 Mar 2023, 22:14	DK	Today, 13:46	DK
<input type="radio"/> soft skills	33	9 Mar 2023, 12:58	DK	9 Mar 2023, 01:20	DK
> <input type="radio"/> adaptability and resilience	3	23 Mar 2023, 10:11	DK	23 Mar 2023, 10:12	DK
> <input type="radio"/> cognitive and analytical skills	7	23 Mar 2023, 10:09	DK	23 Mar 2023, 10:11	DK
> <input type="radio"/> emotional intelegence and interpersonal skills	11	23 Mar 2023, 10:10	DK	23 Mar 2023, 10:11	DK
> <input type="radio"/> professional and social skills	10	23 Mar 2023, 10:12	DK	23 Mar 2023, 10:16	DK
> <input type="radio"/> Strategic and Opportunistic Thinking	2	23 Mar 2023, 10:15	DK	23 Mar 2023, 10:16	DK

Figure 2. The Initial Codes after they were Divided into Themes and Sub-themes.

Generally, the inductive coding approach allowed for a thorough and detailed understanding of the data, as it enabled the emergence of themes and patterns that may not have been apparent using a deductive approach. The use of NVivo software facilitated the organization and management of the data, allowing for efficient and effective coding and analysis.

4.5 Ethical Consideration and Research Rigor

Ethical considerations are an essential part of any research study, and this study is no exception. The following measures were taken to ensure that ethical considerations were thoroughly addressed throughout the research process.

Firstly, participants were provided with a detailed explanation of the study, including the purpose, procedures, and potential risks and benefits. This ensured that participants were fully informed about the study before deciding to participate. In addition, the study's objectives, procedures, and data collection methods were clearly explained to the participants to help them understand the study's purpose.

Secondly, consent was obtained from all participants before data collection and the recording began. Before obtaining consent from my participants, I informed them of their rights, including the right to withdraw from the study at any time without consequences. I also stated that participation was voluntary and that refusal to participate would not affect them.

Thirdly, confidentiality and anonymity were ensured by assigning unique identification numbers to participants, and all data collected was kept strictly confidential. The data was stored in a password-protected file, accessible only to the researcher, and all identifying information was removed from the data before analysis. This ensured that the participants' privacy was protected and that their responses could not be linked to them.

To ensure the rigor of this research, several measures were taken during the data collection, analysis, and interpretation stages.

In order to guarantee the reliability and validity of the data, the study used multiple sources of data, including in-depth interviews and document analysis. The purposive sampling technique was used to select participants who had a computer science degree from a Japanese university and work experience in a Japanese company. This ensured diversity in the sample and provided a wide range of perspectives on the topic of investigation. Data saturation was achieved, as the sample size of four participants provided sufficient data for the analysis.

To make sure that the analysis of the data is systematic and efficient, the coding software NVivo was utilized. This software enabled to organize and manage the data effectively. Additionally, the inductive coding technique was used to allow for themes and patterns to emerge from the data, ensuring the findings were grounded in the data.

To ensure the objectivity and accuracy of the research, reflexivity was employed. This included acknowledging the researcher's biases and assumptions and constantly reflecting on the research process. The researcher ensured that their personal biases did not affect the interpretation of the data.

To validate the consistency and rationality of the findings, triangulation was employed. This involved checking the consistency of the findings through multiple sources of data and methods. This ensured that the findings were supported by evidence from the data, increasing the validity of the research.

Overall, these measures ensured that the research was rigorous and provided credible findings.

5 Analysis of the 2015 Japanese Educational Guidelines

In order to better understand the educational policies of Japan and to create meaningful interview questions, I utilized and analysed the Japanese educational guidelines. These guidelines serve as a comprehensive summary of the recommended policies for universities in Japan, covering the formulation and implementation of three key policies: the Diploma Policy, Curriculum Policy, and Admission Policy. As part of my research, I asked respondents to reflect on these guidelines by providing them with an extensive outline of the policies, in order to gain insights into how they are perceived and implemented in practice. Through the analysis of these guidelines, I hoped to gain a deeper understanding of the Japanese educational system and the ways in which it is evolving to meet the needs of students and society.

5.1 Overview of the Policies

These guidelines were issued by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT, 2015) to help universities understand the significance of integrating the three policies - Diploma Policy, Curriculum Policy, and Admission Policy - based on the Central Council for Education's recommendations. The integration is crucial for universities, prospective students, parents, high school officials, and society.

For universities, integrating the three policies enables faculty members to have a common understanding, improves resource allocation, and showcases their individuality and characteristics. For prospective students, parents, and high school officials, it clarifies expectations, promotes career guidance, and helps students understand the learning processes and achievements required.

Table 1. Outline of the Japanese Educational Policies

Diploma Policy	Determines what kind of abilities students should have in order to be awarded a degree, based on the educational philosophy of each university, and also serves as a goal for students' academic achievements.
Curriculum Policy	Determines how to organize the educational curriculum and what kind of educational content and methods to implement to achieve the Diploma Policy.
Admission Policy	A basic policy for admitting students, considering the educational philosophy, Diploma Policy, and curriculum content of each university, and indicating the required learning outcomes for students to be admitted.

The significance for society lies in improving the connection between universities and society by visualizing the type of education provided and fostering collaboration between local communities,

international communities, industries, and universities. By implementing these policies, universities can enhance students' academic achievements and produce talented individuals for society.

The guidelines also highlight the importance of organizational structure and key points to consider when formulating these three policies. Organizational structure should involve the university president in determining the basic policy direction and formulation units. Developing an institutional research system is crucial. Formulation units should be based on degree programs for each major field of study.

Key points to consider while formulating the policies include:

1. Developing coherent and unified policies, ensuring their content is understandable for diverse stakeholders.
2. For the Diploma Policy, outline required academic achievements, focusing on qualities and abilities students should acquire, and considering societal needs and students' career paths.
3. For the Curriculum Policy, specify the organization of the educational program, emphasizing active learning, improving the quality of university education, and considering various perspectives for constructing a systematic educational program.
4. For the Admission Policy, demonstrate the abilities students should possess before and after admission. Specify evaluation methods and their weights in the selection process to embody the Admission Policy.

The guidelines also discuss key points to consider when implementing the three policies:

1. Establish university-wide educational management based on the three policies by creating a PDCA (Plan, Do, Check, Act) cycle for each policy unit.
2. Implement organized and systematic education and evaluate student learning outcomes. This includes curriculum planning, syllabus creation, curriculum mapping, enhancing the credit system, utilizing GPA, enhancing learning methods, developing materials, creating environments conducive to active learning, and expanding programs like study abroad and internships.
3. Ensure all faculty and staff share a common understanding of the three policies and work together to provide high-quality education. Enhance Faculty Development (FD) and Staff Development (SD), improve evaluations of faculty's educational activities, establish

specialized staff for educational management, and strengthen educational support staff like Teaching Assistants (TAs).

4. Conduct self-assessment, improvement, and proactive dissemination of information based on the three policies. This includes evaluating efforts for university entrance selection, curriculum, learning outcomes, faculty organization, facilities, and connections with society; involving external perspectives for objectivity; and addressing university-wide or cross-program issues using feedback from graduate tracking surveys and other sources.
5. Proactively disclose and disseminate information about university education based on the three policies to gain stakeholders' understanding and promote collaboration with society.

In conclusion, the formulation and implementation of policies in higher education should consider several key points to ensure coherence, effectiveness, and alignment with the needs of stakeholders. The guidelines suggest that policies should be clear, understandable, and address diverse perspectives. For the Diploma Policy, the focus should be on defining desired academic achievements and aligning them with societal needs and students' career paths. The Curriculum Policy should emphasize active learning and the construction of a systematic educational program. The Admission Policy should outline the desired abilities of students and specify evaluation methods in the selection process.

By considering these guidelines, Japanese higher education institutions can respond to existing challenges and enhance the quality, relevance, and effectiveness of their policies and educational practices, ultimately providing students with valuable learning experiences and preparing them for success in their academic and professional pursuits (MEXT, n.d.).

6 Analysis of the Interviews

6.1 Overview of the Data Collected.

This chapter presents the findings of a qualitative study that aims to explore the challenges and opportunities within Japanese computer science education concerning the transition to the job market from the perspective of graduates. The research question driving this study focuses on understanding the experiences and perceptions of computer science graduates in Japan and identifying the factors that contribute to their successes and challenges in both academia and the workplace. To answer “*What do IT graduates identify as key challenges and opportunities during their educational journey and their transition to the job market?*”, a methodology centered around in-depth interviews was employed.

Table 2. Overview of the Participants of the Study

	Job Title	Scale of the company	Year of Graduation	Gender	Nationality
Participant 1	Web Developer	Large	2015	Male	German
Participant 2	Data Scientist	Large	2021	Female	Japanese
Participant 3	Data Scientist	Large	2019	Male	Swedish
Participant 4	UX/UI Designer	Large	2014	Female	Japanese

The sample consisted of four participants, all of whom held a computer science degree from a Japanese university and had work experience in a Japanese company. The participants were diverse in terms of nationality, with two being international and two Japanese nationals, as well as gender, with two males and two females. This purposive sampling strategy ensured diversity in the sample and facilitated a comprehensive exploration of the research questions.

Data collection was conducted through in-depth, semi-structured interviews that lasted approximately 60 minutes, and document analysis of the Japanese educational policy guidelines. The interviews were audio and video recorded and subsequently transcribed for analysis. Alongside these interviews, I conducted a thorough analysis of Japanese educational policy guidelines. This

document analysis served a dual purpose: first, it provided a contextual understanding of the broader educational environment in Japan, and second, it aided in the creation of appropriate interview questions. The questions were thus informed and shaped by an understanding of the educational policies, ensuring a focused and relevant line of inquiry during the interviews. Data saturation was achieved by the fourth session, indicating that no new information or themes emerged from the data at that point.

The data collected provided rich and detailed insights into the challenges and opportunities within Japanese computer science education in relation to the job market transition from the perspective of graduates. In the following sections, the findings from the interviews and document analysis will be presented and discussed in detail, exploring the themes and subthemes that emerged from the data. This analysis will contribute to a deeper understanding of the complexities and nuances of the experiences of computer science graduates in Japan and help inform strategies for enhancing the quality and relevance of computer science education in the country.

6.2 Key Empirical Findings

This section presents critical themes identified in the study, focusing on the challenges and opportunities within higher computer science education in Japan. The key themes, Challenges, Opportunities, Soft Skills, Hard Skills are further subdivided into various sub-themes to better understand the underlying issues and prospects and answer the following research question: What do IT graduates identify as key challenges and opportunities during their educational journey and their transition to the job market?

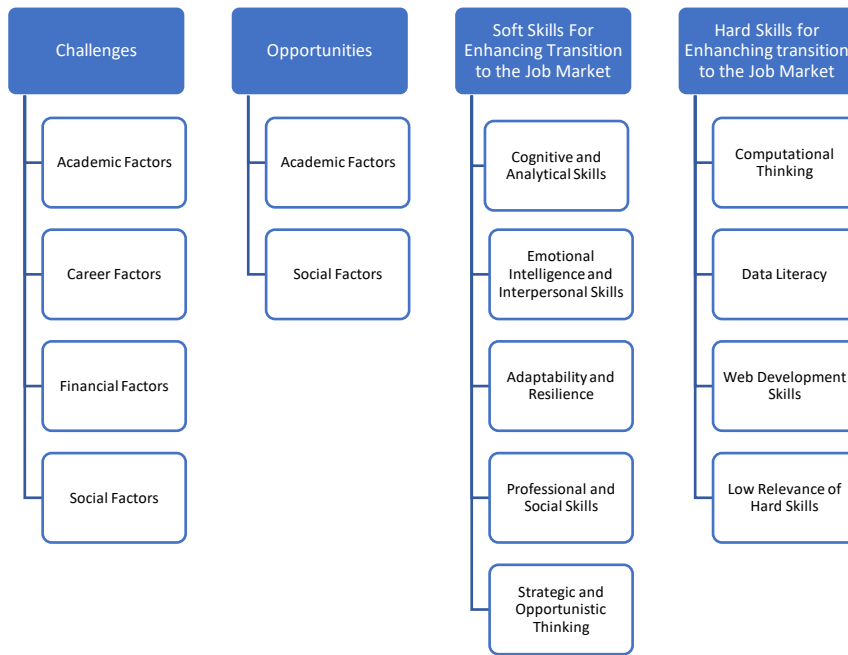


Figure 3: Key Empirical Findings Divided into Themes and Sub-Themes

6.3 Challenges

6.3.1 Academic Challenges

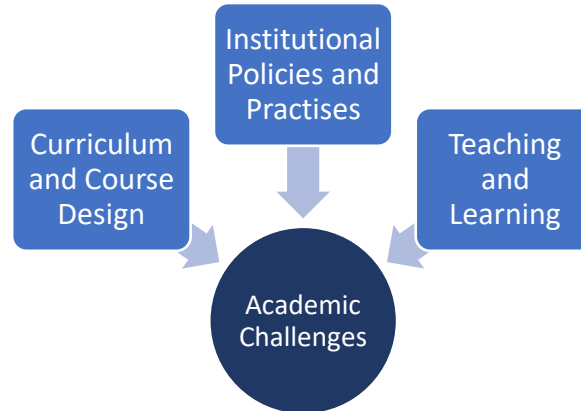


Figure 4. Academic Challenges Theme Divided into Sub-themes.

In interviews with Japanese computer science graduates, it was identified that academic factors within Japanese higher computer science education encompass issues related to curriculum and course design, institutional policies and practices, and teaching and learning. In terms of curriculum and course design, graduates highlighted unmet learning interests, lack of fundamental knowledge, difficulties in balancing specialization and generalization, low levels of education, problems in implementing fieldwork experience, and challenges in pursuing exchange studies. The respondents explained that these issues contributed to a incoherent educational experience and limit students'

ability to effectively learn and apply skills in real-world situations. Reflecting on their education experience, several interviewees noted:

“I’m very interested in design in general. Software design is one aspect of it, but I didn’t really have any opportunities to learn at university except for very abstract algorithmic design. And I really wish there would have been a bit more opportunity to broaden your perspective instead of focusing on one thing so much.” (Interview participant 1)

“I found out that the more general classes, like the ones I had during my Masters, the level was, compared to Germany, incredibly low. So, the content of some classes I had, it was like maybe a second or third-semester theoretical computer science class from my Bachelor’s. So, I was really surprised how low the level was in the general classes compared to Germany.” (Interview Participant 1)

“There is no time within the education program in Japan to go abroad. When you go abroad, you lose time and then you’re behind schedule. And if you’re behind schedule, you reduce your chances later in your life, then you ruin your career path.” (Interview Participant 4).

Reflecting on the Japanese educational policy regarding balancing curriculum, one participant noted:

“The curriculum policy proposes a balance between specialization and generalization to enable students to choose their own study that fits them most. However, this could be challenging for universities to achieve as they try to balance the needs of diverse students and the demands of the local community, international society, and industry.” (Interview participant 3)

The interviewees in this study shared their views and opinions regarding institutional policies and practices. They expressed concerns about conservatism, lack of effective assessment methods, overly difficult entrance exams, generational conflict, lack of individualism, challenges in balancing national and regional needs, heterogeneity in education quality, lack of clarity, absence of a broader perspective, and a lack of present moment awareness. The interviewees’ insights revealed that these issues result in an education system that is inflexible and struggles to adapt to the changing needs of the computer science field:

“Admitting a diverse range of students could be a challenge for universities, especially if their admission policies are focused on academic performance alone.” (Interview Participant 3)

“A lot of the high-level education is gated behind university entrance exams, which are painfully difficult to pass.” (Interview Participant 1)

“It's really hard to change something in Japan because if bureaucrats actually are the 70s or 80-year-old men or women and they clearly do not understand what younger generations need.” (Interview Participant 2)

“The Japanese higher education system serves both national and regional needs, and balancing these needs can be challenging, particularly when implementing policies that impact university autonomy and decision-making.” (Interview Participant 4).

Lastly, the interviewees expressed their visions and thoughts on the teaching and learning challenges within their computer science education path in Japan. They mentioned academic credentialism, a focus on memorization, and a lack of emphasis on cultivating curiosity. They felt that this environment restrains creativity and innovation, limiting students' ability to think critically and problem-solve in the future workplace:

“A lot of students, at least me, I was only thinking, if I had a higher grade and if I was really good student, then I would be more suitable for work and I would be more prepared for real-life situation.” (Interview Participant 3)

“Japanese policymakers should rather start with growing curiosity among students. And then that curiosity actually can be grown in some amazing ways as well.” (Interview Participant 2)

“One aspect of Japanese university education that could be improved is the heavy emphasis on memorization and rote learning, which I think is a barrier to creativity and critical thinking. I used to spend a significant amount of time memorizing sometimes useless information rather than understanding and applying it, which didn't prepare me properly for the demands of the modern workforce.” (Interview Participant 4).

6.3.2 Career Challenges

The interviews revealed that career-related challenges with Japanese higher computer science education hold two primary issues: the disconnection between education and work-life, and an information gap concerning career opportunities. A closer examination of these factors demonstrates their impact on graduates' ability to successfully transition into the workforce.



Figure 5. Career Challenges Theme Divided into Sub-themes.

The disconnection between education and work-life manifests in several ways. Firstly, the respondents mentioned that their curriculum did not adequately prepare them for the practical aspects of their chosen work field, focusing predominantly on theoretical knowledge. Consequently, the graduates did struggle to apply their academic learning to real-world situations, which hindered their job performance and career progression. Secondly, the lack of opportunities for internships or industry partnerships during their studies exacerbated this disconnect, as the respondents reported that they missed out on valuable hands-on experience that would have bridged the gap between academia and their professional life:

“I felt like in a bubble, and I just studied there, and it wasn't really connected to the real life about work and what to do with the skill after university. So I wish the university could provide more, invite more companies or, I don't know, some kind of more internship opportunities, work more efficiently.” (Interview Participant 3)

According to the interview respondents, the information gap regarding career opportunities presents another significant challenge for graduates. They attributed this gap to insufficient career guidance and support from educational institutions, as well as a lack of networking opportunities with industry professionals. As a result, they emphasized that students may be unaware of the full spectrum of career paths available to them, leading to confusion and potentially trivial choices in their job search. Furthermore, the interviewees said that the information gap could also limit graduates' ability to make informed decisions about further education, which might be crucial for career advancement:

“I struggled with the lack of practical experience because of the limited opportunities for practical experience and hands-on learning. I know that many Japanese universities, not only mine, focus on theoretical learning and do not provide sufficient opportunities for students to

gain practical experience in their chosen field, which can make it challenging for graduates to transition into the workforce.” (Interview Participant 4).

6.3.3 Financial Challenges

Financial obstacles present significant difficulties in higher education, primarily due to the large expenses associated with exchange programs and the scarcity of resources for executing new policy initiatives. These elements create barriers for students seeking global exposure and impede the progression of the educational infrastructure.



Figure 6. Financial Challenges Theme Divided into Sub-themes.

Based on the insights shared by all four of my interviewees, pursuing exchange studies can be financially challenging for many Japanese higher computer science education students. The costs involved, such as living expenses, travel costs, and potential lost income from part-time work, can accumulate and create an alarming financial burden. As a result, many students are unable to pursue international experiences, which could broaden their academic and cultural perspectives. The interviewees expressed concern that this limitation deprives students of valuable skills and insights that are increasingly essential in today's globalized job market.:

“But one thing that I actually can say that going for exchange is really expensive for parents and especially when everybody doesn't have the same financial background. For example, if you're not from a wealthy family, then how would it be possible to get that opportunity.” (Interview Participant 2).

Moreover, all four of my interviewees highlighted the damaging impact of insufficient funding on the Japanese higher education landscape. They expressed concerns that the shortage of funding for implementing new policies hinders the development and execution of innovative strategies and reforms aimed at enhancing the quality and relevance of higher education. The interviewees noted that this constraint prevents educational institutions from adapting to emerging trends and

addressing the evolving needs of both students and the job market. As a result, the potential for growth and improvement within the system is damaged:

“Implementing new policies may require significant financial resources, and securing funding can be challenging, particularly during periods of economic problems like Covid-19, lack of labour force and so on.” (Interview Participant 4).

6.3.4 Social Challenges

Based on the insights shared by the interviewees, including two non-Japanese nationals, social factors are critical dimensions that can negatively influence the experience of students within Japanese higher education institutions. They expressed concerns about a lack of inclusivity, language barriers, racism, and social pressure, which collectively contribute to an unwelcoming environment for students from diverse backgrounds. The non-Japanese interviewees specifically highlighted the matter of language barriers and a lack of inclusivity as significant issues that can hinder their academic success and overall well-being.



Figure 7. Social Challenges Theme Divided into Sub-themes.

The lack of inclusivity within educational institutions is experienced by two of the non-Japanese interviewees through insufficient representation and support for students from varying cultural, ethnic, and socio-economic backgrounds:

“My university could be a bit more inclusive in promoting foreigners to join club activities rather than trying to exclude them because integration would be possible if they got everyone to mix more.” (Interview Participant 1)

Based on the experiences shared by my interviewees, deficiencies in the inclusivity of Japanese higher education institutions can lead to feelings of isolation and marginalization. They expressed

that this constrained their ability to form meaningful connections and engage fully in the academic community.

For the non-Japanese respondents who did not have proficient Japanese skills when they started their studies, language barriers posed significant challenges in terms of academic performance and social integration. The interviewees expressed that students like them may struggle to comprehend complex concepts and effectively participate in class discussions, leading to potential disproportions in academic achievement. Additionally, language barriers worsened the isolation feelings of my respondents, as they and their friends encountered difficulties in forming relationships and navigating social situations within the educational context:

“I think the social barrier is huge just because no one speaks English and then they end up only meddling with other foreigners because they speak English. But that way they don't actually find access to the country that they're studying in. Which I think is a pity because Japan is a nice country.” (Interview participant 3)

One of my respondents mention their experience of racism within institutional policy of Japanese higher education. The experience involved a change in regulations that impacted the interviewee's ability to participate in club activities, specifically the jazz club. The interviewee noted that the change in regulations was targeted towards foreign students, and specifically affected those with a particular type of student ID card, which was given to international students. This example highlights the issue of discriminatory policies that specifically target international students and limit their ability to participate fully in university life:

“Just to give one example, when I was at Tohoku University for the first time, I was allowed to normally participate in club activities. So I joined the Jazz club and I could just take the key and go there and practice whenever I wanted. When I came back for my Masters, I suddenly found that the regulations changed and actually foreign students were not allowed to use prep equipment anymore. I wasn't allowed to rent the key. And that was specifically to anyone who had this specific type of student ID card. But that was the type of student card that international students would get. So it would only apply to foreigners.” (Interview Participant 1).

The consequences of racism can be harmful to students' mental health, academic performance, and overall sense of belonging within the academic community.

Social pressure also emerged as a significant issue for my interviewees. Particularly, my Japanese respondents mentioned that they felt pressured by the expectations of their peers, family, and

society at large, and claimed that it has a huge impact on students' well-being and academic success. These pressures appeared in various forms, such as conforming to cultural norms or making certain decisions:

“Even if you're super experienced, even if you know a better way of doing things, even if you know a more effective way of doing things, you will be pointed out that you did not do something according to the manual.” (Interview participant 2)

“Back then I really didn't like to study with somebody. I always wanted to be alone. But There is a 協調性 [kyōchōsei] 1 in Japan. Actually, you have to be the same kind of color like everyone else. That is what I really I didn't like.” (Interview participant 4).

6.4 Opportunities

6.4.1 Academic Opportunities

Opportunities within the academic factors of higher computer science education in Japan encompass two primary dimensions: institutional practices and the study environment. The graduates have highlighted several aspects within these dimensions that hold potential advantages for enhancing the overall educational experience.

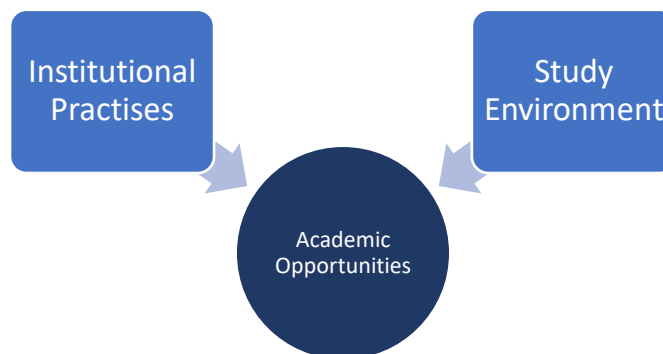


Figure 8. Academic Opportunities Divided into Sub-themes.

In terms of institutional practices, easy graduation requirements are noted as an opportunity that could facilitate a smoother transition from academia to the workforce. A less strict set of graduation requirements may enable students to focus on cultivating practical skills and gaining real-world experience, which can prove invaluable in their future careers:

1 Spirit of cooperation

“Actually to graduate from a Japanese university is really easy. I didn't have to write any thesis because all the grades I previously received were good.” (Interview participant 2).

During the interview process it emerged that the study environment also presents a wealth of opportunities for enhancing the educational experience for students. The respondents noted their experience of research-intensive environment which, in their opinion, fosters a culture of investigation and critical thinking, enabling students to develop essential problem-solving skills and engage in cutting-edge research within their respective fields:

“I think that the Japanese system of assigning every student into a lab and having them participate in an active research environment, I think it's great. And more universities should copy that.” (Interview participant 1).

Individualized instruction and self-directed learning, as noted by graduates, are crucial elements that cater to the diverse needs and learning preferences of students. These approaches empowered the respondents to take ownership of their education and progress at their own pace, thus optimizing learning outcomes:

“The laboratory work and the amount of detail and support it allows for research was just great. So this actually helped me a lot.” (Interview participant 1).

Additionally, satisfaction with their teachers played a significant role in shaping a positive study environment of my respondents. All my interviewees mentioned that they were very satisfied with their educators who demonstrated enthusiasm, dedication, and a genuine commitment to their students' success and contributed to their students' overall engaging and supportive educational experience:

“In Japan teachers are more passionate about their profession than in Europe. In Europe you have to do everything by yourself but in Japan you would be led to the correct way.” (Interview participant 2)

“I was incredibly fortunate with my professor. My professor was not only actually fluent in English, but he also was very welcoming and accommodating toward foreigners and was trying to promote an international atmosphere in his lab.” (Interview participant 1).

6.4.2 Social Opportunities

The interview process revealed that social factors present numerous opportunities in higher computer science education in Japan. The respondents covered aspects such as a collaborative campus climate, positive peer relationships, student engagement, and strong teacher-student relationships. Each of these elements contributed to a more enriching and supportive educational experience for the interviewees.

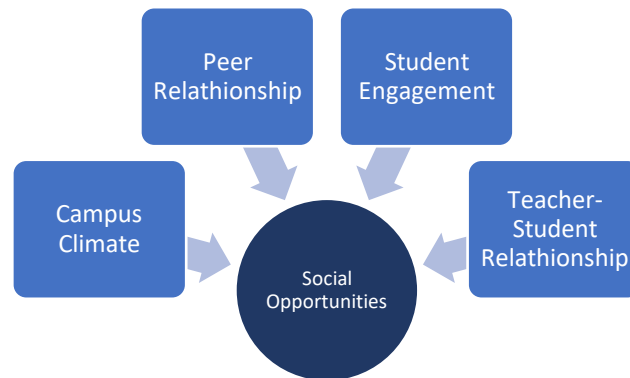


Figure 9. Social Opportunities Theme Divided into Sub-themes

The interviewees emphasized that a collaborative learning environment encourages students to work together, fostering teamwork, communication skills, and critical thinking abilities:

“Throughout my degree, I had the opportunity to work on several team projects, which helped me to develop my collaboration, communication, and problem-solving skills, which I believe on of the most important skills in the job market.” (Interview participant 4).

Cross-cultural communication promoted understanding and appreciation for diverse perspectives for the respondents, which is essential in an increasingly globalized world. Mentorship experiences my interviewees had provided them with guidance, support, and networking opportunities, helping them navigate academic and career challenges more effectively:

“I think being in Japan and being in an international environment helped me socially to interact and work with all kinds of people. So, it was a lot of international colleagues and having experience dealing with different cultures and being in a different environment I think helped a lot me to this day.” (Interview participant 1)

“During my university times I got to know a person who worked for Japan Airlines back then, and he told me a lot of interesting stories about his career which inspired me a lot back then.” (Interview participant 2).

Student engagement, which included a wide range of extracurricular activities, allowed the interviewees to pursue their personal interests, and establish meaningful connections with peers. These experiences contributed to their overall well-being, personal growth, and sense of belonging within the academic community:

“I don't know about the West, but there are so many activities that you can join in Japanese universities. You can create your own activity. For example, if you like to read a manga or watch anime, you can create that activity stuff as well.” (Interview participant 2).

Strong teacher-student relationships were vital for facilitating positive interactions between faculty and the respondents. A nurturing mentor-mentee relationship had enabled four of my interviewees to access personalized guidance, academic support, and encouragement, ultimately promoting their academic success:

“The first one certainly I would say is while I mentioned that my professor helped me a lot, he didn't do the work for me. Instead, he encouraged me to find out how I can work efficiently myself. And I think this is something that helped me a lot organize my own work processes and my own thinking.” (Interview participant 1)

“I got recommended to this job I have now by my teacher because as he said he saw a lot of potential in me.” (Interview participant 3)

Interestingly, one interview participant identified academic favouritism as a positive experience, despite its general perception as a negative practice. This perspective highlights the complexity and subjectivity of individual experiences within the educational context:

“If you become friendly to your professors or be good to them personally, I would say then you will get the better grades for sure. Not only grades for tests or exams or quizzes, but usually, for me, I got to know professors and I talked to them personally and they got to know about me. And then, they got to know me that I am a very nice person and told me that I don't have to write a thesis.” (Interview participant 2).

To summarize, these empirical findings bring to light the significant hurdles and possibilities that are present in higher computer science education in Japan, especially when looking at it through the eyes of a graduate. It's crucial to spot and tackle these matters if Japan wants to improve the quality and significance of computer science education in the nation. By seizing the opportunities and overcoming the obstacles, Japan has the potential to develop a more welcoming, flexible, and

impactful educational system that equips computer science graduates with the skills they need to thrive in this constantly changing field. However, it is important to note that these findings are specific to the experiences and perspectives of the interviewees and may not necessarily reflect the broader situation of Japanese higher education as a whole.

6.5 Essential Soft skills to Navigate the Job Market after Graduation

In this section, I will present the soft skills theme, focusing on four key themes and their respective sub-themes. From the respondents' point of view, these soft skills are essential for computer science graduates from Japanese universities to navigate the challenges and opportunities in the job market. Looking at this is very important as it may help to eliminate challenges and enhance opportunities within Japanese higher computer science education.

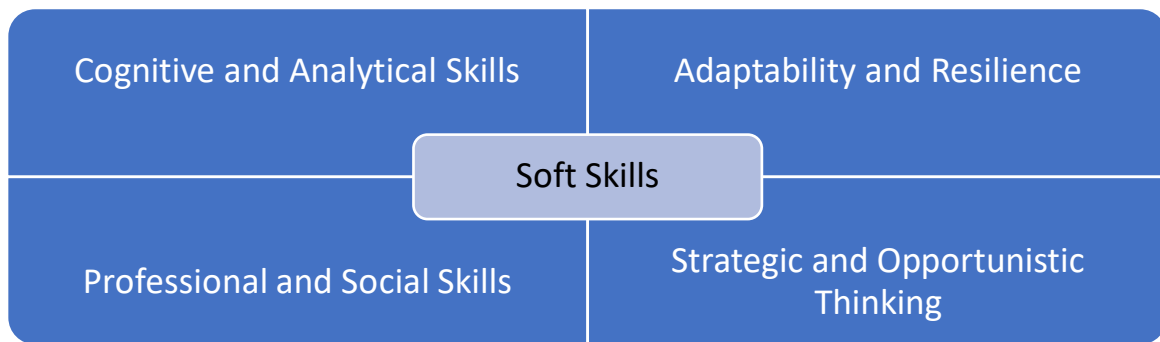


Figure 10. Soft Skills Theme Divided into Sub-themes.

6.5.1 Cognitive and Analytical Skills

Based on the responses from my respondents, it has become evident that cognitive and analytical abilities were essential for them to thrive in both academic and professional settings. The participants highlighted problem-solving, critical thinking, and making informed decisions.

Analytical thinking, as highlighted by several interviewees, refers to the ability to dissect complex problems, deconstruct them into smaller, more manageable components, and subsequently identify potential solutions. One interviewee stated:

“I think this sort of thinking helped me a lot during my career because it allows me to analyze problems in a very abstract way and take a step back, look at the problem, decide on the solution, and then tackle it.” (Interview participant 1).

Information literacy is another essential cognitive skill that emerged from the interviews. This skill involves the capacity to locate, evaluate, and effectively utilize relevant information from a diverse range of sources during the decision-making process. As one participant emphasized:

“How to navigate and find information and what's reliable information and what is not and all this kind of things that my university actually helped me to be prepared for work.” (Interview Participant 3).

Lastly, creativity emerged as a key theme in the discussions, with interviewees underscoring its importance for fostering innovation and generating novel ideas. Creativity enables computer science graduates to approach problems from various perspectives and devise unique solutions. One interviewee shared their perspective on creativity, stating:

“My artistic skills helped me to solve problems creatively. I really believe that creativity and the ability to think out of the box are one of the important skills in data science.” (Interview participant 3).

6.5.2 Emotional Intelligence and Interpersonal Skills

Emotional intelligence and interpersonal skills emerged as significant sub-themes from the interviews, with participants highlighting their importance in fostering strong relationships, understanding others' emotions, and effectively collaborating in diverse teams. The respondents highlighted that these skills are essential for computer science graduates to navigate the complexities of both academic and professional settings.

Compassion, as emphasized by three interviewees, involves the ability to empathize with others and exhibit care and understanding. Friendliness also emerged as a key interpersonal skill, which enables students to establish rapport and maintain positive relationships with their peers, teachers, and colleagues. An interviewee remarked:

“For example, I heard that top guys like CEOs in Japan sometimes like to sneak in and listen to the conversations of their employees. So you never know who you encounter at your company. So that's why you never know. You can't be unfriendly. Then, you know, if you're a good, friendly person, maybe that CEO will catch you, and get your job.” (Interview participant 4).

Lastly, interviewees underscored the importance of strong interpersonal skills, which encompass effective communication, active listening, and the ability to work collaboratively with others. One participant stated:

“I think communication and cooperation skills are the most important. Because cooperation is very important in Japan. Even if you don't have enough hard skills you will always succeed if you have good communication skills.” (Interview participant 4).

6.5.3 Adaptability and Resilience

Adaptability and resilience emerged as a key sub-theme during the interviews, with participants emphasizing their significance in helping computer science graduates thrive in dynamic environments, overcome obstacles, and recover from setbacks. These skills were essential for the respondents to succeed in the ever-evolving landscape of higher education and the job market.

Flexibility, as highlighted by all four interviewees, refers to the ability to adapt one's approach, thinking, and behaviour in response to various situations and challenges. One interviewee shared their perspective on flexibility, stating:

“Japanese companies often operate in a fast-paced and dynamic environment, and the ability to adapt to changing circumstances and work effectively under pressure is considered a valuable skill.” (Interview Participant 2).

Resilience was also identified as a crucial skill by the interviewees. This skill gave the capacity to one of the participants to persevere and bounce back from hardship, failure, or stress. They emphasized the importance of resilience, saying:

Patience and endurance are very important. So one thing that actually was difficult for me is coping with the fact that not everyone you are working with knows what they are doing. That works with every field, not only computer science. But I don't think it can be overstated how important it is. When I was researching in Zurich, I had this very naive, overly optimistic view of academic life and everyone is professional, and everyone is super good in their field. (Interview participant 1).

6.5.4 Professional and Social Skills

Professional and social skills were identified as critical themes in the interviews, with participants emphasizing their importance in managing one's professional image, building networks, and

effectively organizing time and resources. These skills are essential for the participants to excel in both academic and professional settings.

Impression management emerged as a key professional skill, as highlighted by two interviewees. This skill involved the ability to present oneself positively and professionally in various contexts, such as interviews, networking events, and social media. One interviewee shared their experience, stating:

“I thought it was kind of interesting to just apply for the jobs. And I managed to talk my interviewers into hiring me even though I had no previous experience and the position was quite serious at the airlines company.” (Interview participant 2).

Networking skills were also emphasized by participants as essential for building and maintaining professional relationships and connections in the field. An interviewee remarked:

“If I say what the university has offered me is mostly I would say network. Thanks to networking, thanks to teachers, and knowing people, I got this job, what I have today.” (Interview participant 3).

Organizational skills, as underscored by the interviewees, involve the ability to plan, prioritize, and manage tasks efficiently. One participant noted:

“Attention to detail is highly valued in many Japanese industries, and job candidates are often expected to have a high degree of accuracy and precision in their work.” (Interview Participant 4).

Finally, time management and work ethic, were also mentioned as essential professional skills, refer to the ability to allocate and utilize time effectively to meet deadlines and achieve goals.

Interviewees also identified work ethic as an important attribute for computer science graduates. This skill encompasses maintaining a strong sense of responsibility, integrity, and dedication to one's work. One participant emphasized:

“Japanese companies place a strong emphasis on professionalism and work ethic, and I think its quite known that employees are expected to demonstrate a high level of dedication, commitment, and reliability. And of course, understanding and adhering to Japanese business etiquette, such as bowing, exchanging business cards is also considered important for success in the Japanese workplace.” (Interview participant 2).

6.5.5 Strategic and Opportunistic Thinking

Strategic and opportunistic thinking skills emerged as important sub-themes during the interviews, with participants emphasizing their significance in identifying and seizing opportunities, as well as persuading and influencing others. These skills were essential for the respondents to excel in both academic and professional settings and to navigate the competitive landscape of the job market.

An opportunistic mindset, as highlighted by two interviewees, refers to the ability to recognize and capitalize on opportunities that arise in various situations. One interviewee shared their experience, stating:

“A lot of the academic environment is much more opportunistic than idealistic, let's put it like that. Maybe that's a neutral way to phrase it and this is something that I certainly was struggling with at the beginning because I came from a much more idealistic point of view trying to make research that furthers the state of the art rather than making research that makes sure that my company can file a patent.” (Interview participant 1).

Persuasive skills were also identified as crucial by the participants. These skills involved the capacity to communicate effectively, present compelling arguments, and influence others' opinions or decisions. An interviewee remarked:

“And I think being able to interact with the client in a way that you can convince them, even if the client thinks they know what's best, but they have no clue.” (Interview participant 2).

By developing these essential soft skills, computer science graduates from Japanese universities will be better equipped to address the challenges and opportunities in higher education and successfully transition to the job market.

6.6 Essential Hard Skills to Enhance Japanese Computer Science Education

Based on the coding process, the Hard Skills key theme can be divided into the following sub-themes:



Figure 11. Hard Skills Theme Divided into Sub-themes.

6.6.1 Computational Thinking

This sub-theme focuses on the ability to solve complex problems using computer-based techniques and algorithms. The following emerged during the interviews: understanding programming languages, logical reasoning, and algorithmic thinking. Understanding the challenges and opportunities within this sub-theme could provide insights into how Japanese computer science education prepares students for the job market in terms of problem-solving and critical thinking skills:

“My university provided me with a strong foundation in programming, algorithms, and computer systems, which has been invaluable in my previous job as a software engineer.”
(Interview participant 2).

6.6.2 Data Literacy

This sub-theme revolves around the ability to understand, analyze, and utilize data effectively. All four respondents mentioned data management, data visualization, and statistical analysis. Examining this sub-theme could help identify gaps and strengths in Japanese computer science education with respect to preparing students for data-driven roles in the job market.

6.6.3 Web Development Skills

This sub-theme covers the technical skills required for designing, building, and maintaining websites and web applications as one of the participants works as a software developer. It includes proficiency in HTML, CSS, JavaScript, and other relevant programming languages and frameworks. One of the respondents provides insights into the extent to which Japanese computer science education prepares students for careers in web development and related fields:

“When I graduated even though I was not exposed to difficult task right from the beginning, I heavily relied on my web development skills so it really helped me to grasp all the information during the training faster.” (Interview participant 2).

6.6.4 Low Relevance of Hard Skills

Interestingly, two interviewees mentioned that hard skills were not necessary for a smooth transition to the job market after graduation. This sub-theme highlights the importance of soft skills and adaptability in the ever-changing landscape of the tech industry. One of the respondents shared how Japanese companies might prioritize soft skills over hard skills when graduates transition to the job market:

“In my opinion, judging from a Japanese company perspective you basically don't need any hard skills. All hard skills are taught by the company.” (Interview participant 4).

The limited mention of hard skills by interviewees might be due to several reasons. First, hard skills are often assumed to be a fundamental part of computer science education, making them less remarkable when discussing the transition to the job market. Second, soft skills have become increasingly important in the tech industry as collaboration, communication, and adaptability are critical to success. Finally, the rapidly evolving nature of the tech industry may make some hard skills obsolete by the time students graduate, whereas soft skills remain relevant across various roles and industries.

Additionally, it is important to note that during the interviews, participants mentioned only those hard skills that they personally used in their work experience. This could result in a narrower scope of hard skills being discussed, as participants might not have covered the full range of skills relevant to computer science graduates. Furthermore, interviewees may have focused on mentioning common hard skills for computer science graduates, which might have already been widely recognized and acknowledged, leading to a reduced emphasis on discussing these skills in detail. This could explain why the range of hard skills mentioned during the interviews was limited compared to the soft skills discussed.

6.7 Summary of the Findings

The respondents of this study faced academic, career, financial, and social challenges in Japanese higher education. These challenges stemmed from concerns about curriculum design, institutional policies, teaching methods, the gap between education and work-life, financial constraints, and

social issues. Addressing these challenges is crucial for improving students' learning experience and their transition to the job market.

The interviewees have also uncovered that Japanese higher computer science education presents opportunities for academic and social growth. Factors such as easy graduation requirements, research-intensive environments, individualized instruction, teacher satisfaction, and a collaborative campus climate contributed to positive learning experiences of the respondents. Capitalizing on these opportunities can help improve the quality and impact of computer science education in Japan.

During interviews it has also emerged that soft skills play a vital role in the success of computer science graduates in the job market and higher education. These skills include cognitive and analytical abilities, emotional intelligence, adaptability, professional and social skills, and strategic thinking. The respondents emphasized that developing these soft skills equips graduates to address challenges and opportunities in the job market.

The interviewees have also mentioned that essential hard skills, such as computational thinking, data literacy, and web development, are necessary for enhancing Japanese computer science education. However, the limited mention of hard skills in the interviews suggests that soft skills and adaptability might be more critical in the ever-evolving tech industry.

To better prepare computer science graduates for the job market, Japanese higher education should keep a balance between developing hard and soft skills. While hard skills provide a strong technical foundation, soft skills allow graduates to adapt and excel in various roles and industries.

The narrower range of hard skills discussed compared to soft skills might be due to participants' personal experiences or the widely recognized nature of common hard skills. This suggests that there could be other relevant hard skills not emphasized in the interviews, warranting further exploration.

Nonetheless, it is crucial to recognize that the conclusions drawn from these interviews pertain only to the participants' individual experiences and viewpoints and may not accurately represent the overall state of higher education in Japan.

7 Discussion

7.1 Overview of the Research

This master's thesis serves as a pilot study designed to explore the challenges and opportunities within Japanese computer science education. As a preliminary investigation, the primary goal of this research is to gather initial insights, uncover new perspectives, and test the feasibility of more extensive research in the future. Therefore, this study could contribute to the existing literature and provides a foundation for future investigations.

This discussion chapter aims to address the primary research question: “*What do IT-graduates identify as key challenges and opportunities during their educational journey and transition to the job market?*”. By exploring this research question, this chapter seeks to provide insights into the experiences of computer science graduates in Japan and offer recommendations for improving the quality of higher education in this field. By examining the interplay between academic, career, financial, and social challenges, as well as the role of hard and soft skills in higher education and the job market, this chapter aims to offer insights that can inform educational policy and practice in Japan.

7.2 Graduates' Perceptions of their Educational Experience regarding their Transition to the Workforce

7.2.1 Academic Challenges

The analysis of the interviews highlights the perception of curriculum design as a major challenge in Japanese higher computer science education. The interviewees' perspectives on curriculum and course design can be presented as areas that need improvement to enhance the overall educational experience in Japanese higher computer science education. The graduates in this study expressed several concerns that impact their educational experience. One key issue is the unmet learning interests, where the current curriculum may not adequately address the diverse range of interests and needs of students within the computer science field, such as UI/UX design in case of one participant. Rosen (2010) and Schlechty (2011) adds up that educators must strive for adapting teaching strategies to accommodate students' diverse interests. This limitation may lead to a lack of fundamental knowledge in essential areas, as the curriculum fails to provide a strong foundation upon which students can build their expertise (Rosen, 2010). In regard to the lack of fundamental knowledge, reported by the respondents, the research emphasizes the significance of fundamental

knowledge required for novice programmers and highlights the importance of developing these skills in computer science education (Lister et al., 2004)

The respondents also discussed the difficulties in balancing specialization and generalization in the curriculum, with two respondents receiving too narrow education. This imbalance may result in graduates who are either underprepared for the demands of the job market or struggle to identify their specific areas of interest within the field. Barnett (1994) critiques the growing emphasis on competency-based approaches in higher education, arguing that the focus on measurable skills and performance indicators can lead to a narrow view of education. He highlights the importance of considering the broader aims of higher education, such as fostering critical thinking, creativity, and a deeper understanding of the disciplines. He also discusses the tensions between general and specialized education, examining the potential drawbacks of an overly specialized curriculum that may neglect the development of transferable skills and interdisciplinary perspectives. While Barnett's study is rather old, the issues he discussed are still valid and topical, and correlate with opinions of the respondents.

Additionally, the interviewees mentioned the low levels of education in some courses, which could contribute to a fragmented learning experience and undermine students' ability to effectively learn and apply skills in real-world situations. Biggs (2003) argues that a well-aligned curriculum leads to better quality learning as students are guided to construct meaning and develop understanding in a coherent and structured way. In the context of fragmented learning, Biggs' work is relevant because it addresses the challenges that arise from poorly designed curricula and disconnected learning experiences. He emphasizes the importance of creating a cohesive learning environment where the various elements of a course are carefully aligned and integrated to promote deep learning, as opposed to surface or fragmented learning.

Another challenge identified by the participants is the implementation of fieldwork experience, which may not be effectively integrated into the curriculum, leaving students with limited opportunities to apply their theoretical knowledge in practical settings. Billet (2009) also emphasizes the importance of providing students with practical experiences that allow them to apply theoretical knowledge in real-world settings, fostering the development of professional skills and competencies necessary for their future careers. He discusses the challenges of incorporating work experiences into higher education curricula and highlights the need for effective partnerships between educational institutions and workplaces to ensure that students gain valuable learning experiences. He also underlines the importance of carefully designed curricula and pedagogical

practices to facilitate meaningful learning from work experiences. Similarly, the interviewees noted that the curriculum does not support pursuing exchange studies, and they expressed that many Japanese students avoid participating in exchange programs because it could negatively impact their career prospects. Interestingly, Aspinall (2012, p.169) support this evidence in his study and highlights that *“Japanese students in their third and fourth years are often engaged in job-hunting activities (shūshoku katsudō). Most are unwilling to be out of Japan during this period because of possible interruptions to these very important activities.”* This situation underscores the need for a more flexible and supportive curriculum that allows students to pursue international exchange opportunities without jeopardizing their career prospects.

These issues, as described by the respondents, contribute to an incoherent educational experience that may limit students' ability to effectively learn and apply skills in real-world situations. To address these concerns and enhance the quality of computer science education in Japan and make the transition of the graduates to the job market smoother, it is crucial to revise the curriculum and course design, ensuring a balance between specialization and generalization, incorporating practical experiences, and facilitating exchange programs.

The interviewees in this study also provided valuable insights into the challenges they perceive within the institutional policies and practices of Japanese higher computer science education. One major concern expressed by the participants is the conservatism in a form of reluctance to change the education system due to various cultural reasons. Moreover, students reported the lack of individualism and the absence of a broader perspective in their education. Analysing the 2004 education reforms in Japan, Goodman (2005) argues that while the reforms were designed to address some of the challenges facing Japanese higher education, they also revealed the extent to which conservatism remains a powerful force within the system. Additionally, the increased emphasis on competition and market-oriented approaches to higher education may have reinforced existing power dynamics and further established conservatism.

Additionally, the interviewees identified generational conflict as a challenge, where older educators may adhere to traditional teaching methods while younger students desire more innovative approaches. This issue is closely related to another issue, identified by the respondents, the importance of present moment awareness in education. Respondents highlighted that the current education system may struggle to keep up with the latest industry trends and technologies, resulting in graduates who are not adequately prepared for the job market. Maryellen Weimer's article (2003) emphasizes adapting teaching practices to prioritize student learning. This approach can improve

educational outcomes and help educators connect with students, regardless of age or experience. Though the article does not specifically address the phenomena of older educators not understanding what young students need in university education, it does touch upon the broader topic of updating teaching practices to meet the changing demands of higher education. By focusing on learning and being open to new teaching methods, educators can better connect with and understand the needs of their students, regardless of age or experience. Levine and Dean (2012) in their book explore the challenges and opportunities for modern college students. The authors (Levine & Dean, 2012) also emphasizes the need for educators to adapt their teaching practices in response to factors like technology, economic pressures, and shifting social norms, creating a more supportive educational environment for today's students.

According to the respondents, the higher education sector faces challenges in assessment and admissions, particularly with respect to the effectiveness of assessment methods and the difficulty of entrance exams. The respondents mentioned that the existing assessment methods may not accurately measure students' true abilities and potential. The Japanese university entrance examination system has been a topic of much discussion and debate, with conflicting opinions on its merits and drawbacks. This research (Zeng, 1995) demonstrates the impact of the entrance exams on social mobility in Japan. It suggests that the system has allowed for a reasonably broad socioeconomic base among college students, with students from the lowest-income families earning their socio-academic success through this examination, particularly in national and public universities. However, the system has also been criticized for hindering the development of critical thinking and creative skills, and for creating intense pressure and competition among students. The reasons behind the continued use of the entrance exam system in Japan are complex and multifaceted, with differing explanations depending on one's perspective. Some view it as a way to ensure meritocratic selection and maintain competitiveness, while others see it as a means to balance societal harmony and renew efficiency (Eckstein & Noah, 1992). Still, others argue that the objective test is necessary to guarantee access to upward mobility in the fairest possible way (Schoppa, 1993). Despite being over 30 years old, the articles on university entrance examinations in Japan still hold relevance and are consistent with the opinions of the respondents in this study. Moreover, the recent research suggests that the situation has not changed. Allen (2016) states that the practice of "shiken jigoku" or "examination hell," which is prevalent among high school leavers in Japan, is a reflection of the deep-seated cultural emphasis on education and diligence, as rooted in Confucian beliefs. This intense preparation period for entrance exams to higher education institutions is regarded as a significant turning point in an individual's life trajectory (Allen, 2016).

However, the acceptance of such practices does not exclude their potential drawbacks. Critics argue that this high-stakes testing system may promote short-term learning strategies, such as rote memorization, at the expense of fostering a deeper comprehension of fundamental principles (Allen, 2016). This indicates the significance of reassessing and modifying university admissions processes to create a more equitable and accurate system for evaluating prospective students. It is crucial for universities to consider the challenges and criticisms of the current system and work towards creating a more inclusive and fair approach to admissions. The findings of this research, along with the existing literature, emphasize the need for continued research and critical analysis of university admissions processes to promote social mobility and equal opportunities for all students.

The respondents also reported that they experienced the lack of clarity in the curriculum and the absence of a broader perspective during their education. In regard to this, Rowe and Zegwaard's article (2017) emphasizes the need for a broader perspective in a curriculum to improve students' employability and particularly advocates for the development of graduate employability skills and attributes through curriculum enhancement, particularly via work-integrated learning.

These issues, as identified by the participants, suggest that the current education system is inflexible and struggles to adapt to the rapidly changing needs of the computer science field. In order to enhance the quality of computer science education and better prepare graduates for the job market, it is essential to address these challenges and strive for a more adaptive and flexible approach to education that responds to the evolving demands of the industry.

In this study, interviewees also shared their visions and thoughts on the teaching and learning challenges within their computer science education path in Japan. Their views shed light on some of the issues that exist in higher education that can restrain creativity and innovation among students. The interviewees mentioned academic credentialism, which suggests that the emphasis is placed more on acquiring credentials than on the learning process itself. The article by Tomlinson and Watermeyer (2022) explores the ways in which universities and colleges have increasingly adopted market-oriented approaches to education, with a focus on producing graduates who are attractive to employers. This trend has led to a rise in credentialism, where the emphasis is placed more on the acquisition of credentials than on the learning process itself. The authors (Tomlinson & Watermeyer, 2022) argue that this shift towards a market-oriented approach has commodified higher education, transforming it into a product to be bought and sold. This has led to concerns about the quality and value of education, particularly in terms of preparing students for the demands of the modern workforce. As a result, they suggest that higher education institutions must strike a

balance between meeting the demands of the market and upholding the values and mission of education. This requires a shift in focus towards cultivating critical thinking and problem-solving skills, rather than simply acquiring credentials.

The respondents also highlighted a focus on memorization and a lack of emphasis on cultivating curiosity. This learning environment, according to the interviewees, may not be conducive to critical thinking and problem-solving skills that are necessary for success in the workplace. Sternberg (2010) argues that there is too much emphasis on memorization and regurgitation of information in higher education, and that this approach does not adequately prepare students for the challenges of the real world. He suggests that instead of simply memorizing information, students should be taught to think creatively and solve problems in innovative ways. This requires a shift in the way that educators approach teaching, emphasizing critical thinking and encouraging students to take risks and embrace failure as part of the learning process. As such, it is vital for higher education institutions to address these concerns and re-examine their approaches to teaching and learning in order to better prepare students for the demands of the modern workforce.

7.2.2 Career Challenges

The analysis of the interviews uncovered two main career-related challenges faced by graduates of Japanese higher computer science education: the gap between education and work-life, and the information gap concerning career opportunities. A deeper understanding of these challenges can help identify ways to better support students during their transition to the workforce.

The gap between education and work-life is demonstrated through the curriculum's focus on theoretical knowledge, often at the expense of practical experience. Graduates reported that their education did not adequately prepare them for the practical aspects of their chosen field, which led to difficulties in applying their academic learning to real-world situations. In regard to this, several authors (Labanda-Jaramillo et al., 2022) argue that the digital transformation of industry and society requires a corresponding transformation of higher education, with a focus on developing digital literacy and preparing students for the changing demands of the workforce. The article explores the role of academic management in facilitating this transformation, highlighting the importance of strategic planning, innovation, and collaboration. The article draws on case studies and examples to demonstrate effective approaches to academic management in the context of Industry 4.0²,

² Industry 4.0, or the Fourth Industrial Revolution, represents the current era of technological change. It's marked by the integration of digital, physical, and biological systems, transforming industries worldwide. This shift is driven by

including the development of interdisciplinary programs and the integration of digital technologies into the curriculum. Therefore, the importance of engaging with industry partners and staying up-to-date with the latest trends and developments in the field becomes evident. Moreover, Carbone et al. (2007) reveal a range of different perspectives on what constitutes successful teaching. These perspectives include the use of real-world examples and experiences to enhance learning outcomes. The article also highlights some of the challenges and barriers to successful teaching in the context of computer science and IT education, such as the rapid pace of technological change and the need for ongoing professional development to keep up with new developments in the field.

The information gap regarding career opportunities is another significant challenge faced by graduates. The interviews revealed that insufficient career guidance and support from educational institutions, as well as limited networking opportunities with industry professionals, have contributed to this information gap. As a result, students may not be fully aware of the wide range of career paths available to them, which can lead to confusion in their job search. Watts' book (2006) is highly relevant to the question of how to make students aware of their career opportunities. By emphasizing the importance of career development as an integral part of higher education, the author highlights the need for educators to take an active role in helping students explore and prepare for their future career paths. The book also emphasizes the importance of experiential learning, such as internships, co-op programs, and other work-integrated learning opportunities, in helping students gain real-world experience and explore potential career paths. By providing these opportunities, educators can help students to develop a clearer understanding of their interests, skills, and values, and make informed decisions about their future career paths (Sides & Mrvica, 2017; Holzer, 2015). Therefore, to address the challenge of information gap, higher education institutions should consider enhancing their career services by offering comprehensive guidance, workshops, and networking events to help students navigate the job market and make well-informed decisions about their career paths.

7.2.3 Financial Challenges

The analysis of the interviews highlights two critical financial challenges that impact both students and the Japanese higher education system: financial constraints faced by students and the lack of financial resources for implementing new policies within Japanese higher education.

advancements in technologies like the Internet of Things (IoT), artificial intelligence (AI), and cloud computing, which are reshaping how businesses operate and how people work.

Financial constraints faced by students, particularly those associated with exchange programs, create barriers for students seeking global exposure. The interviewees acknowledged that the high costs involved in pursuing exchange studies, such as living expenses, travel costs, and potential lost income from part-time work, make it difficult for students from diverse financial backgrounds to participate. This limitation prevents students from gaining valuable skills and insights that are increasingly essential in today's globalized job market. Aspinall (2012) supports this finding and asserts that for Japanese students, studying abroad can be a costly experience. However, the Japanese government is currently trying to ease the financial burden for student. According to Ota (2018, p. 100), the Japanese government aimed to increase the number of students studying abroad to 120,000 by 2020 through the Japan Revitalization Strategy. This includes expanding budgets for study abroad programs and scholarships, such as the Inter-University Exchange Project and student support. MEXT's study abroad scholarship budget increased from 600 million yen in 2009 to 8.1 billion yen in 2017. Consequently, short-term study abroad participation has risen rapidly, more than doubling from 36,000 in 2009 to over 96,000 in 2016. By offering such support, educational institutions can enable a more diverse group of students to access international experiences, which can broaden their academic and cultural perspectives, ultimately contributing to their success in the global workforce.

Reflecting on the Japanese educational policy, the interviewees emphasized the damaging effects of inadequate funding on the Japanese higher education system. They voiced concerns that the lack of resources for implementing new policies hinders the creation and implementation of innovative approaches and reforms designed to improve the quality and relevance of higher education. The interviewees observed that this limitation hinders educational institutions' ability to adjust to emerging trends and cater to the changing demands of both students and the employment sector. Yonezawa (2023) supports this view and concludes that the insufficient funding of higher education in Japan has led to an unequal distribution of resources among national universities. While top universities have managed to maintain or even slightly increase their income through diversified sources, less competitive institutions face considerable budget constraints. This disparity has hindered the research performance and overall development of these less competitive universities, indicating a pressing need for policy reform and resource allocation improvements in Japan's higher education sector. Moreover, Huang (2018) adds up to this by highlighting the significant and growing disparity between national, local public, and private Japanese higher education institutions. He claims that it is crucial for both the central government and individual institutions to develop and maintain robust and efficient financing mechanisms. These mechanisms should aim to reduce

this gap while being mindful of the unique Japanese context and aligning with global trends. This will ensure a more equitable distribution of resources and foster a balanced development across all sectors of the higher education landscape.

7.2.4 Social Challenges

The interviewees provided valuable insights into the social factors that may negatively impact students' experiences in Japanese higher education institutions. These factors make room for further discussion and analysis, particularly in the context of fostering a more inclusive environment for students of diverse backgrounds.

One concern raised was the lack of inclusivity within the institutions. This issue was critical especially for the non-Japanese respondents, as creating a welcoming and inclusive environment is essential for promoting a sense of belonging and supporting students' academic success. To address this issue, research suggests that it is essential for the Japanese government to promote intercultural awareness and acceptance both within and beyond university campuses. While Japan's internationalization policies rely heavily on practical activities and initiatives, there is limited effort directed towards challenging attitudes and addressing prevalent prejudices within the broader social context, particularly concerning the concept of Japaneseness. Acknowledging and addressing the weaknesses within the unsustainable "us-them" conceptualization of difference is crucial for making Japanese higher education more inclusive. Without this acknowledgement, efforts to internationalize Japanese higher education institutions may only achieve superficial results, rather than fostering genuine, deep-rooted internationalization (Rivers, 2010).

Another challenge identified by the non-Japanese interviewees was the language barrier when receiving their education in English. According to the respondents, this barrier can impede effective communication, and, particularly, social integration into the Japanese society. This finding can be supported by Bradford (2013) who suggest that in order to effectively implement English-medium instruction (EMI) degree programs in Japan, it is crucial to address linguistic, cultural, and structural challenges. Providing support to both students and faculty involved in EMI programs is essential for overcoming these challenges. This support could include language and academic skills classes for students, as well as intercultural teaching skills classes for faculty. Furthermore, faculty members should maintain active engagement with the international academic community through conference participation and international collaborations. Addressing structural challenges requires universities to adapt administrative practices, including staff and faculty employment policies, in

order to foster positive outcomes for EMI programs. It is important for institutions to offer language support and encourage cross-cultural interactions to overcome this obstacle.

Racism was also mentioned by one of the non-Japanese interviewees as a concern within Japanese higher education institutions. An instance of racism occurred when the respondent, due to their foreign nationality, was denied access to the club room. In regard to this, Crimmins (2020) suggests that fostering a supportive campus climate and building a positive and inclusive campus environment that encourages students from diverse backgrounds to feel welcome, safe, and respected are crucial for solving the issue of racism. Moreover, the author adds that it is important to implement policies and practices that ensure equal access to the opportunities within higher education and provide support for students from different backgrounds. Moreover, international educators must recognize the urgency of fostering a deeper understanding of different cultures and customs. It is vital for educators to familiarize themselves with diverse parts of the world, religions, and customs and encourage their students and scholars to study these areas. Addressing discrimination faced by international students requires promoting cross-cultural communication and fostering tolerance among individuals with different customs and values (Hanassab, 2006). Sato et al. (2022) states that it is important to support international students through participation in extracurricular activities on and off campus in Japan. This approach can enhance learning across cultures, build respect among diverse groups, and contribute to the formation of a global community. For Japan to maintain its global presence, it is crucial for its higher education institutions to focus on the unique needs and experiences of international students. By doing so, Japan can create an inclusive and supportive educational environment that prepares students for success in the globalized world and strengthens the country's position as an attractive destination for international education.

Lastly, the interviewees pointed out the social pressure experienced by students in these institutions. Specifically, the Japanese interviewees pointed out that they experienced pressure from their peers, and society, which significantly affected their well-being. These pressures manifested in different ways, including adhering to cultural norms or making specific choices. This finding is supported by numerous research studies: Japanese students live in a social environment where adherence to norms is anticipated (Bossy, 2000). Efforts should be made to mitigate this pressure and provide students with the necessary support and resources to cope with these challenges.

In conclusion, addressing the social challenges within Japanese higher education institutions is crucial to ensure a supportive and inclusive environment for students from diverse backgrounds. By

fostering a culture of inclusivity, providing language support, and combating discriminatory policies and social pressures, educational institutions can create an environment that promotes the well-being and academic success of all students.

7.2.5 Opportunities

Opportunities within the academic aspects of higher computer science education in Japan can be divided into two main dimensions: institutional practices and the study environment. Graduates have identified several factors within these dimensions that have the potential to improve the overall educational experience.

Contrasting with the extremely challenging entrance examinations mentioned by the respondents earlier, flexible graduation requirements were regarded as an opportunity within institutional practices that can help facilitate a smoother transition from academia to the workforce. Although the direct link between easy graduation requirements and smooth transition to the job market was not identified in the existing research, some studies suggest that graduation requirements, which are part of an institution's policies and practices, can significantly influence student retention. Strict or inflexible graduation requirements may contribute to student dropout rates if students feel overwhelmed or incapable of meeting these requirements (Braxton et al., 2013).

During the interviews, it became clear that, despite facing various academic challenges such as teaching methods and academic credentialism, the study environment still offers numerous opportunities for enhancing students' educational experiences. The participants particularly highlighted the research-intensive environment they were exposed. Research suggests that such environment fosters a culture of inquiry and critical thinking (Garde-Hansen & Calvert, 2007). Moreover, by cultivating a research culture in the undergraduate curriculum, students can hone essential problem-solving skills and engage in cutting-edge research within their respective fields (Garde-Hansen & Calvert, 2007).

Personalized instruction and self-directed learning, as reported by the graduates, are vital components that address the diverse needs and learning preferences of students. These approaches allowed the interviewees to take control of their education and progress at their own pace. Reigeluth et al. (2017) supports this finding and states that the learner-centered paradigm of education is essential for both personal and societal reasons. At the individual level, it addresses the diverse learning rates of students, ensuring that each learner can progress at their own pace without accumulating gaps in their knowledge or being held back by slower learners. This approach

empowers all students to reach their full potential. From a societal perspective, the shift from the industrial age to the information age demands a workforce that is more educated and skilled in knowledge work than ever before. Learner-centred education is the key to meeting this demand, ultimately benefiting economic competitiveness, political systems, and citizens' ability to thrive in a complex digital world. By adopting a learner-centred approach, we can create an educational system that caters to the needs of every individual and fosters a more knowledgeable and capable society.

Interestingly, despite the dissatisfaction with teaching methods, the satisfaction with educators played a significant role in shaping a positive study environment for the interviewees. The difference between dissatisfaction with teaching methods and satisfaction with teachers can be explained by differentiating between the methods used and the personal qualities of educators. Dissatisfaction might come from ineffective or unengaging methods, while satisfaction with teachers may come from their dedication, enthusiasm, and supportiveness. This finding highlights the need for educators to refine their teaching methods and maintain strong teacher-student relationships. Graham Gibbs and Martin Coffey (2004) in their empirical study investigated the impact of training university teachers on their teaching skills, their approach to teaching, and the approach to learning of their students. The authors emphasize the importance of professional development for educators to improve teaching quality and to create a more effective and engaging learning environment for students. Through training, university teachers can refine their teaching methods, adapt to diverse student needs, and foster a more learner-centred approach in their classrooms. As a result, the students' learning experiences are enhanced, leading to improved academic outcomes and overall satisfaction with their education. Teachers who demonstrate enthusiasm, dedication, and a genuine commitment to their students' success contribute to an engaging and supportive educational experience.

The interview process uncovered that social factors also include numerous opportunities in higher computer science education in Japan. Respondents touched upon aspects such as a collaborative campus climate, positive peer relationships, student engagement, and strong teacher-student relationships. Each of these elements contributed to a more enriching and supportive educational experience for the participants.

The interviewees stressed the importance of a collaborative campus atmosphere, where they were encouraged to engage in teamwork and cooperation. In this environment, the respondents formed meaningful relationships with their peers. These connections played a crucial role in inspiring and

motivating one of the respondents to embark on their career journey. This view is supported by Young & Schartner (2014) who explore the effects of cross-cultural communication education on international students' adjustment and adaptation to their new academic and cultural environment. The authors argue that cross-cultural communication education can play a crucial role in improving international students' academic performance and social integration. The mentorship experiences shared by the interviewees provided guidance, support, and networking opportunities, enabling them to navigate academic and career challenges more effectively. This finding correlates with the studies by Johnson and Ridley (2018) and Hamilton et al., (2019) which reveal that the mentorship program bring several advantages for the mentees such as improvement in their job search self-efficacy over time as a direct consequence of their participation in the program. The practical support provided by the program, such as networking opportunities, resume development and job interviewing skills, was highly appreciated by the mentees. They also gained a more realistic understanding of the workplace and their career prospects, and received crucial emotional and psychological support from their mentors (Hamilton et al., 2019).

Although the non-Japanese respondent encountered racism while participating in extracurricular activities, the Japanese interviewees emphasized the value of student engagement through a variety of extracurricular activities. These experiences enabled them to pursue personal interests and build meaningful connections with their peers. This finding again aligns with the research by Sato et al. (2022), which highlights the importance of supporting international students by promoting their participation in extracurricular activities both on and off-campus in Japan. By employing this approach, learning across cultures can be enhanced, mutual respect among diverse groups can be fostered, and the development of a global community can be facilitated. Moreover, Guilmette et al. (2019) add that ongoing involvement in extracurricular activities leads to increased perseverance in achieving goals and a more optimistic reassessment of those goals. This persistence and optimistic re-evaluation are positively correlated with emotional well-being and scholastic achievement. As a result, engaging in extracurricular activities can support overall well-being and success by fostering determination and a positive outlook on goals.

Strong teacher-student relationships played a crucial role in fostering positive interactions between faculty and respondents. Despite their dissatisfaction with teaching methods, this finding aligns with their reported satisfaction with educators, suggesting that respondents appreciated their educators' dedication and support, which contributed to their overall positive experience. A nurturing mentor-mentee relationship enabled four of the interviewees to access personalized guidance, academic support, and encouragement, ultimately promoting their academic success.

Moreover, one of the non-Japanese respondents was able to get their first job due to teacher's recommendation. Gerda Hagenauer and Simone E. Volet (2014) highlights the significance of teacher-student relationships in higher education. The authors emphasize that the quality of these relationships greatly influences students' motivation, learning, and overall academic success. They propose that additional research is necessary to better understand and improve teacher-student interactions in university settings, which in turn would contribute to the enhancement of teaching and learning experiences in higher education.

Interestingly, one interviewee perceived academic favouritism as a positive aspect, even though it is generally considered a negative phenomenon. This viewpoint underscores the complexity and subjectivity of personal experiences in an educational journey. Regarding this finding, research that views academic favouritism positively was not identified. On contrary, the existing scholar articles emphasize that higher education institutions should get rid of academic favouritism. For example, the study (Ali et al., 2018) explores the causes and effects of teacher favouritism in university, using quantitative research methods. The findings reveal that teachers may show favouritism based on factors such as gender, race, geographical area, political ideology, and family relationships. The results also indicate that teacher favouritism negatively impacts student confidence, mutual trust, and respect between students and teachers, leading to students focusing more on gaining favour than on academic achievement. In some cases, students may even choose to leave institutions where favouritism is prevalent. The study concludes that emphasizing students' skills, potential, and academic accomplishments should be the primary criteria for assessing academic performance, as this would encourage students to concentrate on their studies rather than seeking teachers' favour.

To conclude, the empirical findings reveal a wealth of opportunities within the academic and social factors of higher computer science education in Japan. By seizing these opportunities, Japanese higher education institutions have the potential to create a more welcoming, flexible, and impactful educational system that equips computer science graduates with the skills they need to thrive in an ever-evolving field. However, it is essential to recognize that these findings are based on the experiences and perspectives of the interviewees and may not necessarily reflect the broader situation of Japanese higher education.

7.2.6 Hard and Soft Skills

Together with the challenges and opportunities, the respondents identified a diverse array of both soft and hard skills that they considered crucial during their transition from university to the workplace. These insights may hold significant value for policymakers who are working to address

challenges and maximize opportunities within Japanese higher education. By integrating the development of these essential skills into the curriculum, policymakers can enhance the employability of future graduates and better prepare them for success in their professional lives.

Based on the insights gained from the respondents, cognitive and analytical skills played a crucial role in their success in both academic and professional environments. The participants emphasized the importance of problem-solving, critical thinking, informed decision-making, and creativity. These findings correspond to the study by Van Dyne and Braun (2014), that highlights the effectiveness of a computational thinking course in enhancing student analytical skills, which are crucial for computer scientists. The findings of this research underscore the importance of developing and nurturing analytical skills in computer science students, as these abilities can significantly contribute to their success in both academic and professional environments. The conclusions drawn from this study (Van Dyne & Braun, 2014) emphasize the need for computer science curricula to incorporate computational thinking and analytical skill development as core components. By doing so, educational institutions can better prepare their students for the challenges they will face in their future careers, as well as equip them with the necessary tools to solve complex problems and make informed decisions. Furthermore, the study's findings suggest that investing in the development of analytical skills can lead to improved academic performance, increased student engagement, and greater overall satisfaction with the learning experience. In turn, this can enhance the quality of computer science education and produce graduates who are better prepared to contribute effectively to the rapidly evolving field of technology. Additionally, Belousova et al. (2020) suggest that open discussions, digital simulations of real-world scenarios, and collaboration environments enable students to experiment, communicate, and analyse patterns. These approaches, in turn, help to enhance their analytical skills, better preparing them for the challenges they may face in their academic and professional lives. This study again underpins the need to pay attention to the challenges identified by the respondents earlier, such as the lack of real-world experience and information gap.

Emotional intelligence and interpersonal skills were a prominent sub-theme that appeared during the interviews, as participants emphasized their significance in building solid relationships, comprehending the emotions of others, and efficiently working within diverse teams. The respondents pointed out that these skills such as compassion and friendliness are crucial for computer science graduates to successfully move through the difficulties of both academic and professional environments. The research (DeKay, 2012) supports this finding and highlights the importance of interpersonal skills in professional settings. Effective communication is essential for

achieving workplace goals, fostering collaboration, and maintaining positive relationships among colleagues. The study (DeKay, 2012) concludes that interpersonal skills are critical for career success and should be prioritized in training and development initiatives. This is especially relevant for computer science graduates, as they often work in diverse teams and need to effectively communicate with various stakeholders to successfully implement projects and resolve challenges. Developing strong interpersonal skills can lead to improved teamwork, greater job satisfaction, and ultimately, enhanced workplace productivity. Moreover, Rubin et al. (2002) claims that extracurricular activities play a significant role in the development of interpersonal skills. Participating in such activities provides students with opportunities to interact with diverse individuals, work collaboratively, and develop effective communication skills, all of which are critical components of interpersonal skills. Therefore, it must be stressed again that both Japanese and non-Japanese students have equal opportunities to engage in extracurricular activities, furthering their personal and professional development.

Flexibility and resilience stood out as an important sub-theme during the interviews, as participants stressed the importance of these skills in enabling them to excel in changing environments, overcome challenges, and recover from difficulties. The skills became crucial for the respondents in navigating the constantly shifting landscape of higher education and the employment market. The book by Costa and Kallick (2000) discusses ways to identify and develop students' habits of mind, including adaptability and resilience. It provides practical strategies for promoting these skills, which are essential for success in dynamic environments and overcoming obstacles. Their strategies for developing habits of mind include encouraging students to ask questions, make connections, identify patterns, analyze data, and apply knowledge to new situations (Costa & Kallick, 2000). Therefore, this study highlights the importance of addressing challenges such as teaching methods and enhancing opportunities such as collaborative learning environments, as identified by the respondents, to promote the development of essential skills such as adaptability and resilience in students.

In the interviews, professional and social skills were perceived a significant theme, with the respondents stressing their importance in managing one's professional image, building networks, and organizing time and resources effectively. The study by Deming (2017) reveals a significant growth in jobs requiring social skills, with such workers having better job prospects and higher wages. Deming (2017) emphasizes the need for education systems to prioritize social skill development and calls for collaboration among educators, policymakers, and employers to create opportunities for individuals to enhance their social skills throughout their education and careers.

During the interviews, participants highlighted the importance of strategic and opportunistic thinking skills in recognizing and capitalizing on opportunities and persuading and influencing others. Research suggests that developing an opportunistic mindset in students involves a combination of entrepreneurial education, hands-on experiences, and supportive environments. Key aspects include fostering creativity, innovation, adaptability, networking, and continuous self-reflection. These strategies equip students with the skills to recognize and capitalize on opportunities, contributing to their long-term success in academia, the job market, and beyond (Lindberg et al., 2017).

The limited mention of hard skills by interviewees could be attributed to several factors. Firstly, hard skills are often considered a fundamental component of computer science education, making them less noteworthy during discussions about job market transitions. Secondly, soft skills have gained prominence in the tech industry, as collaboration, communication, and adaptability are crucial for success. The research by Stevens and Norman (2016) has demonstrated the priorities of IT employers when recruiting candidates. By analysing job advertisements and conducting interviews and focus groups, the study (Stevens & Norman, 2016) has revealed that industry representatives place greater emphasis on soft skills rather than specific technical skills. This suggests that companies value the ability of employees to work effectively in team-based, customer-focused, and business-oriented environments. Lastly, the rapidly evolving tech landscape may make some hard skills obsolete by the time students graduate, whereas soft skills remain relevant across various roles and industries. For example, Gussek et al. (2021) claim that the rapidly evolving nature of information technology leads to frequent obsolescence of technologies and competencies. As the environment changes, the demand for older competencies decreases, causing them to depreciate and reducing the performance of individuals who possess outdated skills compared to those with current competencies. Obsolescence is particularly significant for IT professionals, as the technologies and required skills in their field change at a rapid pace. This dynamic raises questions about the education and development of IT professionals and the nature of IT work.

It is crucial to acknowledge that during the interviews, participants mentioned only those hard skills that they personally utilized in their work experience. This could lead to a narrower scope of hard skills being discussed, as participants might not have covered the full range of skills relevant to computer science graduates. Additionally, the interviewees may have focused on mentioning common hard skills for computer science graduates, which might have already been widely recognized and acknowledged, leading to a reduced emphasis on discussing these skills in detail.

This could explain why the range of hard skills mentioned during the interviews was limited compared to the soft skills discussed.

An additional factor that may have contributed to the limited mention of hard skills during the interviews is the interviewees' awareness of the researcher's non-technical background. The respondents might have refrained from going too deep into the details of specific hard skills, fearing that the researcher would not understand the details. Consequently, this could have led to a less comprehensive discussion of hard skills, as participants may have opted to focus on more general and easily understood concepts, resulting in an emphasis on soft skills instead.

8 Conclusions

In conclusion, the successful transition of computer science graduates from university to the workplace is depending on a balanced development of both hard and soft skills. The findings from this study emphasize the growing importance of soft skills, including cognitive and analytical skills, emotional intelligence and interpersonal skills, flexibility and resilience, professional and social skills, and strategic and opportunistic thinking skills. These skills are vital in enabling graduates to navigate the dynamic and fast-paced professional landscape, work effectively in diverse teams, and adapt to the ever-changing technological environment.

While hard skills remain essential components of computer science education, their rapidly evolving nature requires a greater focus on the development of soft skills that are more universally applicable and resistant to obsolescence. To achieve this, it is essential for higher education institutions to reassess and refine their curricula, incorporating more real-world scenarios, collaborative learning environments, and extracurricular activities that foster the growth of these essential soft skills.

Furthermore, collaboration among educators, policymakers, and employers is crucial in ensuring a seamless transition from academia to the workplace for computer science graduates. This partnership can help create more opportunities for students to develop their personal and professional skills, enhance the quality of computer science education, assure the equal opportunities for all students, regardless of their nationality, and ultimately produce graduates who are better equipped to contribute effectively to the rapidly evolving field of technology.

By prioritizing the development of soft skills alongside hard skills and fostering a collaborative approach among key stakeholders, the challenges faced by computer science graduates during their transition to the professional world can be mitigated, allowing them to maximize their potential and secure long-term success in their careers.

9 Limitations and Suggestions for Further Research

This study is regarded as pilot study, which focused on the experiences of computer science graduates in Japan during their transition from university to the workplace. Therefore, it has certain limitations that warrant further research. Due to the self-reported nature of the data and the selected group of participants, the experiences and perceptions presented may not fully represent those of all computer science graduates in Japan. Furthermore, the respondents' experiences might be influenced by their unique circumstances, such as their specific course of study, university, or employment sector.

In this study, the focus on soft skills in the findings might be due to the respondents' perception of the researcher's non-technical background or the fundamental nature of hard skills, which could have limited the depth of discussion on hard skills. The limited scope of the study, focusing primarily on the transition from university to the workplace, might have overlooked other significant factors such as ongoing professional development or the impact of societal trends on the required skill set.

Considering these limitations, several ways for further research are suggested. Conducting a comparative analysis between different countries or regions could provide valuable insights into how the transition from university to the workplace varies across different cultural and educational contexts. A more detailed exploration of the relevance and evolution of hard skills in the tech industry could offer a better understanding of their role in successful workplace transitions. Longitudinal studies following graduates over a period of time could provide deeper insights into the ongoing development of necessary skills and the evolution of challenges and opportunities in the professional realm.

Additionally, future research could explore other significant factors such as the impact of societal trends, industry dynamics, or ongoing professional development on the skills needed for computer science graduates in Japan. Incorporating the perspective of employers could provide a more balanced view of the skills deemed most important in the workplace. Lastly, research focused on innovative approaches to curriculum design could offer practical strategies for higher education institutions seeking to better prepare their students for professional success, further building upon the insights gained from this pilot study.

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Appendix: Interview Questions

Japanese Version:

- 1) 自己紹介と学歴を聞かせてください。
- 2) 大学の教育はあなたのキャリアに対して、どのように準備されましたか？
- 3) 卒業した大学の教育はあなたのキャリアを成功させた点を3つ以上述べてください。
- 4) 大学の教育はより改善すれば良いと思う点を3つ以上述べてください。
- 5) 新卒してから就職する立場から、どのようなハードスキルが必要だと思いますか？
- 6) 新卒の場合、ジョブマーケットの観点から、どのようなソフトスキルが必要だと思いますか？
- 7) 理論か実践かどちらが重要だと思いますか。その理由は何でしょうか。
- 8) IT業界における社内研修の役割は何でしたか？
- 9) IT業界における労働市場の流動性についてどう思いますか？
- 10) 日本の高等教育の改善を目的とした政府の政策について、どのように思いますか？

English Version:

- 1) Please introduce yourself and your educational background.
- 2) How has your university/higher education prepared you for your career?
- 3) Could you name three or more aspects of your university education that helped you to succeed in your career?
- 4) Could you name three or more aspects of your university education that you wish were improved?
- 5) What kind of hard skills would a fresh graduate need from the job market perspective?
- 6) What kind of soft skills would a fresh graduate need from the job market perspective?
- 7) What is more important: more theory or practice? Why?

- 8) What was the role of in-house training in IT?
- 9) What do you think of labour market liquidity in IT?
- 10) What is your opinion on the government policy aimed at improving Japanese higher education?