Distribution of Skill Requirements for Information Technology Graduates in Indonesia

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ABSTRACT

The objective of this study was to get further insights into the significance of both hard skills and soft skills in securing employment within Indonesia's Information Technology (IT) industry till 2023. To enhance their abilities and effectively vie with their counterparts, IT graduates must possess a clear understanding of the specific talents that organisations require. Universities and other policymakers should utilise this knowledge to develop a plan that aligns the abilities required in the practical world with the skills necessary for graduation. Scraping techniques were employed to retrieve data from three Indonesian job board websites. Data for this study was managed using text processing and statistical techniques. Furthermore, the material underwent cleaning prior to analysis. According to the survey, Web Development, Programmer, and Help Desk Support are the predominant categories of online IT occupations. Out of the twenty highest-ranking occupations, fourteen were exclusively focused on developing software, applications, or programming for mobile or web platforms. Additionally, there was a Network Engineer, a Data Engineer, a Data Analyst, and a System Analyst as jobs that are also widely offered. SQL emerged as the leading computer language. Employers highly value applicants that possess proficiency in SQL as well as another programming language such as Java, C++, or PHP. Collaborative teamwork is consistently the most highly desired ability among employers. Motivated by a strong aptitude for acquiring knowledge and employing analytical thinking. All three of these factors are interconnected with IT projects, which often encompass a diverse array of employment roles.

Keywords: computer, hard skills, job opportunity, soft skill, text processing

INTRODUCTION

The Fourth Industrial Revolution offers opportunities for human resources to acquire advanced technological expertise. Given the importance of talent for a country's progress, it is essential to establish a program that enhances the skills of the workforce (up-skilling) or updates their skills (reskilling) to match the requirements of the contemporary industrial sector (Rohida, 2018). Considering the fifth industrial revolution and the expansion of the digital industry, particularly in the realm of artificial intelligence, it is imperative that we prepare for the future. Due to the automation of all job positions, those with limited skills will be compelled to either seek alternative employment or face unemployment (Badet, 2021).

Given the substantial influence of Information Technology (IT) on the advancement of Indonesia's economy, having proficiency in IT offers the possibility of new business and job opportunities, as well as enhanced productivity benefits. However, it also requires the acquisition of abilities that are always changing and developing. When imagining prosperous Indonesia in 2045, it is expected that there will be a surplus of people in the country (Umar, 2017). Indonesia faces the challenge of ensuring that the development of its industry is not impeded by a lack of skills in its workforce (Achmad Nur Sutikno, 2020). It is imperative for the Indonesian population to obtain essential IT skills required for this transition. Recent research has shown insights into the shortage of workforce in the information technology industry. A significant concern for policymakers and companies is the discrepancy between the skillsets of current and future IT professionals and the competencies that organisations are seeking. Both immediate and enduring measures can be employed to successfully address the rapidly changing skills requirements for IT positions (Gayatri et al., 2023).

Information Technology (IT) is the discipline that specifically concentrates on the use of computers to organise and analyse vast quantities of data, comprising both data and information stored on computing systems. Information Technology involves the analysis, creation, and implementation of computer systems that can process and present information. IT encompasses a broad spectrum of professional pursuits (Abdullah, 2015). During this period in Indonesia, there is a strong demand for job roles such as programmers, developers, administrators, IT systems analysts, and IT web designers/developers (Gayatri et al., 2023) Additional research is available that specifically concentrates on IT work, notably related to programmers conducted by Istiyowati et al. (2020). The researchers used statistical approaches to examine the viewpoints of lecturers and experts in the IT industry regarding the fundamental abilities that a programmer should possess. They accomplished it by disseminating surveys to people in both educational institutions and the business sector. The research findings suggest that there is little discrepancy in the skill level of programmers as perceived by industry users, experts, and educational lecturers. These findings indicate that the educational objectives of programming courses offered at universities are in line with the industry's requirements for graduating individuals in 2020.

In the ever-evolving field of information technology, there is a continuous demand for skilled IT professionals that possess a wide range of technical abilities. The list includes a range of hard skills, such as proficiency in programming languages

like SQL, PHP, Java, Python, and C++, expertise in database management and administration, knowledge of network security, familiarity with cloud computing, and proficiency in data analysis and visualisation (Mergel, 2012). However, depending exclusively on technical abilities is no longer sufficient; professionals must also possess distinct soft skills. Soft skills are crucial for successfully assimilating IT graduates into the labour market. To succeed in the fiercely competitive job market, it is imperative for IT graduates to possess fundamental soft skills such as effective communication, collaborative cooperation, analytical thinking, and proficient problem-solving abilities (Glazunova et al., 2022).

IT graduates that lack soft skills may face challenges when it comes to effectively collaborating with colleagues, expressing their ideas, and adapting to new technologies and job requirements. In addition, organisations acknowledge that IT professionals often work together in diverse and multicultural teams, requiring great interpersonal skills and the ability to effectively interact with individuals from different backgrounds and cultures. Therefore, it is crucial for graduates in the field of IT to have a wide-ranging set of skills that encompasses both technical expertise and interpersonal talents (Burbekova, 2021). This is necessary to succeed in the highly competitive job market and make significant contributions to the accomplishments of their organisations. In the context of IT student graduates, the term "soft kill" underscores the need of developing and honing soft skills in addition to technical expertise (Patacsil & Tablatin, 2017).

Other scholars analyse the aptitudes and proficiencies of women working in digital professions, specifically in the domain of IT. Murciano-Goroff (2022) found that female programmers with prior programming language experience are 11.07% less likely than male programmers to recognise their skill in that programming language on their resumes. Hong (2016) conducted a study that investigates the discrepancy between the abilities and requirements in the informatics area.

This research was conducted to enhance understanding of the importance of hard skills and soft skills in the IT area for employment in Indonesia till 2023. This article focuses on the specific skill requirements in the subject of informatics, as indicated by online job postings. The methodology employed in this investigation was text processing. This study aims to present a comprehensive analysis of the employment opportunities available to IT graduates in Indonesia. The talk also emphasises the most often occurred employment positions and the specific

qualifications sought by companies. This report also examines the sought-after hard skills, programming languages, and frameworks preferred by companies. Furthermore, apart from the technical aspects, the discussion also encompasses soft skills, offering a comprehensive understanding of the qualities sought by employers. Understanding the actual requirements of businesses will offer IT graduates a comprehensive understanding to enhance their skills and enable them to effectively compete with their peers. Relevant policy players, including universities, are expected to utilise this knowledge to design appropriate curriculum that aligns real-world competency requirements with graduation competencies.

METHODS

This research used text processing and statistical approaches for data collection and processing. Data was collected by scraping techniques on three job vacancy websites in Indonesia. Furthermore, data cleaning was carried out before analysis or better known as text preprocessing. The next stage was that the text processing so that descriptive analysis can be carried out. Each of these stages is described as follows:

1. Mining data/ Scraping,

   It is a technique of getting information from the website automatically without having to copy it manually. Web scraping focuses on obtaining data and information can be in the form of, text, links by retrieval and extraction to retrieve certain data from the page so that it can be reused by other systems or in further analysis (Fikri et al., 2022; Krishna et al., 2022; Speckmann, 2021)

   In this study, data was collected from three job vacancy websites in Indonesia. These websites are www.jobstreet.co.id, www.loker.id, and www.glints.com. Scraping was carried out using Python 3 programming language on Google Colab Application during November 01-29, 2023. The information extracted from the website is URL / vacancy address, position name, qualifications, responsibilities, location and salary. The libraries used in scraping are `bs4 (BeautifulSoup), requests requests_html(HTMLSession), csv, pandas,` and `numpy`.

   Technically the stages of scraping carried out are as follows: (1) import the required library, (2) send an HTTP request on the homepage to obtain a link detail of the vacancy, (3) send an htpp request on each link, (4) parse the web page, (5) find the required html elements, (6) extract data, (7) save the data in .csv format.

2. Text pre-processing,

The pre-processing stage is essential not only for preparing the corpus for modelling but also for directly influencing the results of natural language processing (NLP) applications. Tokenization improves the precision of part-of-speech tagging, while the retention of multiword expressions helps logical reasoning and machine translation (Chai, 2023). Before being used as input for the computer model, the text corpus must undergo appropriate pre-processing. The pre-processing requirements differ depending on the attributes of the corpus and the objectives of the NLP analysis (Kartika et al., 2023).

Text pre-processing in this study used Python 3 programming language, with `nltk`, `punkt`, `stop_words`, `unidecode`, and `re libraries` The pre-processing stage consists of several processes, namely:

a. insert scraped data (.csv) into the dataset,
b. make a list of jobs that are not included in the scope of the computer,
c. Use the `get_stop_words('en')` and `get_stop_words('id')` functions to find the basic word.
d. Replacing jobs that has same meaning so that there is no data redudancy, for example ‘mobile apps developer’ will mean the same as ‘mobile developer’, or ‘fullstack engineer’ equals ‘fullstack developer’, or ‘network technician’ equals ‘network engineer’ and so on.
e. omit numbers in the data, with `re.sub("\d+", "",text)`
f. remove special characters, with `re.sub(r"[-()\[\]\"/@;:<>{}'+=~|.?,&]"," ", text)`
g. Normalize data using the unidecode library
h. Remove jobs that are not included in computer field jobs from the dataset, and then bring up unique job data.

3. Text Processing

This study employs a dataset comprising textual information. Textual data refers to unstructured information containing job vacancies within the computer sector in Indonesia. Text preparation methods and language-specific reading tools can be utilised to convert this input into structured information. Text processing is a constituent of Natural Language Processing (NLP), a potent method for extracting structured information from unorganised data. Interdisciplinary study

has seen consistent expansion and today possesses a plethora of scientific discoveries. Natural Language Processing (NLP) is a discipline that falls under the domains of Artificial Intelligence and Linguistics (Chen et al., 2020). Its primary objective is to empower computers with the ability to understand written statements or phrases in human languages. The objective of this system is to streamline user tasks and satisfy the need to interact with the computer using natural language. The subject can be classified into two distinct categories: Natural Language Understanding, which entails the comprehension of linguistic elements, and Natural Language Generation, which centres around the production of text (Khurana et al., 2023).

Text processing in this study used Python 3 Programming Language with libary `nltk`, (`word_tokenize)`, `collections`, and `matplotlib.pyplot`, and `wordcloud` to present data. At this stage, various calculations of the frequency of data occurrence are carried out, including the distinct job name and frequency of its appearance, programming languages and frameworks needed by employers and their frequency, as well as soft skills from IT graduates needed by employers.

FINDINGS AND DISCUSSION

Data collection using scraping techniques on three job vacancy websites www.jobstreet.co.id, www.loker.id, and www.glints.com. using Python 3 programming language on the Google Colab Application during November 1-29, 2023 resulted in 682 data. The data contains a collection of information on 682 URLs for each vacancy, position/job, required qualifications, responsibilities of the position, skills needed, salary, and location of the employer. After pre-processing is done, the data that can proceed to the text processing stage is as many as 542 data. Based on these data, 123 types of jobs / positions offered by employers were obtained. Some of them are developers (analysts, designers, programmers, testers, and implementors, quality assurance, and support engineers, database engineers) both mobile and web, help desk and IT support, network engineers, sales, ERP engineers, IoT, project managers, even including strategists and business analysts.

The wordcloud in this study used N-gram tokenizer, namely trigrams and bigrams, to evaluate the frequency of letter pairs. N-grams are contiguous sequences of words, symbols, or tokens found within a document. Strictly speaking, they can be defined as the contiguous series of elements in a document. They are significant in the context of NLP (Natural Language Processing) tasks using textual data (Daniel & Martin, 2023). They have a wide range of uses, such as being employed as language models, semantic features, spell checkers, machine translators, and text analyzers. Figure 1 shows a wordcloud of diverse jobs for informatics graduates offered. While Figure 2 shows The top 20 online positions offered by employers.

Figure 1 Wordcloud Trigram 200 words word cloud depicting 123 distinct career categories available through company vacancy websites.

From Figure 1 and Figure 2 the most positions offered by employers are Web Developer, Programmer, then continued with Help Desk Support. 14 Jobs of the top 20 jobs are related to making software / applications / program codes either mobile or web. Those jobs are PHP Programmer, iOS Developer, Odoo Developer, Android Developer, Mobile Developer, Front-end Developer, Java Programmer, Net Developer, Back-end Developer, Fullstack Developer, Software Developer, Programmer, And Web Developer.

Another job related to software development is System Analyst, which plays a role in research activities, planning, coordinating, as well as selecting software and systems to accommodate institutional needs. While coding is not obligatory, it is highly advantageous for a System Analyst. A System Analyst's role necessitates proficiency in coding languages and frameworks to effectively execute solutions. This will assist them in examining, assessing, and adjusting activities.

Within the top 20 occupations, there exist two positions that pertain to data: Data Analyst and Data Engineer. These two occupations are distinct. A Data Analyst is someone who conducts research and performs analysis of information utilising data analysis technologies. A Data Analyst's primary responsibility is to analyse numerical data and convert it into a comprehensive report that can be readily comprehended by the firm. Data engineers operate in many environments, constructing systems that gather, handle, and transform unprocessed data into meaningful insights for data

scientists and business analysts to analyse. Their primary objective is to ensure data accessibility for organisations to assess and enhance their performance. Data engineers are crucial in the creation and maintenance of databases in certain occupations.

Other jobs that are not closely related to creating program code or software development are System Administrator, Help Desk Support, and IT Support. These jobs are very instrumental in the smooth running of company activities or software development activities. Another job that is also included in the top 20 is Network Engineering which plays a role in handling computer networks.

Figure 2 The top 20 online positions offered by employers

Web developer is a job that plays a role in the development of web-based applications, as well as programmers can work both in Web Developers, Mobile Developers, Iot Developers, and other Software Developers. mentioned that there are several skills that must be mastered by a web developer, namely: Skills on Application Server, Database Server, Web Server, Operating System, Programming Languages, Client - Side Scripting, Server-Side Scripting, Java Script Libraries, Database Technologies, Application Server, Database Server, Web Server, Operating System, Programming Languages, and Client - Side Scripting(Raza et al., 2023). Meanwhile, programmers are generally required to really master certain programming languages

or even more than one programming language with the main task of coding. Unlike the Java Programmer job in Figure 2. A Java Programmer is asked to work on a project that most aspects are developed using the Java programming language.

The interesting thing about Web Developer job vacancies in Indonesia is that they must have a very variety of abilities. These abilities include soft skills and hard skills. One of the contents of the web programmer job offer in www.loker.id with a salary of Rp 13,000,000 – Rp 18,200,000 per month is as follows:

"JOB DESCRIPTION : REQUIREMENTS Developers to produce web based program and system for Workshop Formulate program specifications and basic prototypes. Transform software designs and specifications into high functioning code in the appropriate language Integrate individual software solutions to higher level systems. Use web-based tools to create advanced SaaS when applicable. Test code periodically to ensure it produces the desirable results and perform debugging when necessary. Perform upgrades to make software and systems more secure and efficient. Collaborate with technical writers to create documentation for user support. Coding and debugging. Designing and testing computer structures. Troubleshooting system errors. Writing computer instructions. Managing database systems. Maintaining operating systems. Editing source-code. Profiling and analyzing algorithms. Implementing build systems. Providing tech support. Proven experience as a programmer or relevant role. Experienced in Fullstack Developer / Building web Applications. Knowledge about UI/UX design Knowledge in designing and integrating RESTful API. Requires skills such as Front-end Languages and Frameworks (HTML, CSS, JavaScript, AJAX, PHP). Requires skills such as Back-end technologies and Frameworks (NodeJS, ExpressJS, Django, Flask, C++). Requires skills such as Database Management Systems (MySQL, SQL SERVER and PostgreSQL, MongoDB, and Oracle Database), Version Control, and Web Hosting Platforms. Detail-oriented and excellent concentration ability An analytical mindset and critical thinking. Demonstrable ability to discover and fix errors in code BSc/BA in computer science, software engineering or relevant discipline End user-oriented. Expert IT skills. Strong aptitude for math. Advanced knowledge of operating systems Analytical and problem-solving skills. Fluent in communicating in a foreign language, at least English, both Oral and Written and being able to speak Mandarin will be an advantage Willing to work at North Jakarta (Sunter) Willing to work Monday-Saturday."

The offer of a web developer position above shows that a Web Developer is expected to understand some of the work in the Software Development Life Cycle (SDLC). This includes Coding –Documenting –Implementing and maintaining web applications. IT graduates who apply to become web developers are required to be able to Convert software specs and designs into highly functional code written in the

relevant language then connect discrete software solutions to systems at a higher level. This means that web developers are expected to be able to understand design documents, both database design and application structure and logic design. It also includes Expertise in UI/UX design Integration along with the creation of RESTful APIs. In addition to the requirement of the ability to use several programming languages and frameworks such as HTML, CSS, JavaScript, AJAX, PHP, and SQL, applicants are also required to have the ability to code, debugging and troubleshooting system errors. These abilities are a basic skill of a programmer.

In terms of softkill requirements, IT graduates are required to have several abilities, such as foreign language skills, analytical and problem-solving skills, concentration, and so on. Although there are no grandiose requirements, it can be mentioned that the skills required in the vacancies above are quite complex and may only be fulfilled by IT graduates who already have more than one year of experience in related fields. Overall, this may be quite understandable, because with a salary range of Rp 13,000,000 – Rp 18,200,000 per month is higher than the average salary of web programmer positions in Indonesia which is 4-7 million per month according to www.jobstreet.com (*Web Developer Salary in Indonesia (December, 2023) – JobStreet*, 2023)

Other jobs that are also quite popular on offer are Helpdesk and IT Support. Most of this work does not involve software development. So, for IT graduates who do not have an interest in programming or software / application development can choose this career. Helpdesk and IT Support in general are responsible for technical related to computer systems, hardware, and software that are directly related to the process of answering and handling system problems or user complaints quickly and efficiently. Many researchers have developed intelligent and automated systems to replace humans in this work, such as those done by (Al-Hawari & Barham, 2021; Muhtadibillah, 2019; Ogawa et al., 2022; Zellefrow et al., 2023). The rapid role of intelligent systems that replace humans as helpdesks, so people who work in this field must survive by having advantages in terms of soft skills. IT graduates in helpdesk and IT support positions are expected to have strong problem-solving and prioritization skills, have strong presentation skills, and have excellent interpersonal and communication skills and are adept at teamwork.

The requirement for IT student graduate skills is diverse and constantly evolving to meet the demands of the industry. Employers now expect IT graduates to

have a wide range of technical skills, including programming languages, database management, cybersecurity, and cloud computing. Programming language development plays a significant role in the advancement of computer applications and technology. It enables programmers to write code that can be understood by computers and perform specific tasks. In recent years, there have been significant advances in programming languages that have extended their capabilities from basic functionality to powerful language-based environments. These language-based environments take advantage of the knowledge of the programming language to provide users with more robust mechanisms for developing their programs. This has resulted in more efficient and effective software development, as developers can utilize features like syntax highlighting, code completion, and debugging tools offered by modern programming languages and their environments. Furthermore, the increasing demand for professionals in computer-related jobs necessitates that individuals possess programming skills.

Figure 3 shows the programming languages (left) and frameworks (right) most needed by employers in Indonesia. On the side of programming languages, the top position is occupied by SQL. As also stated by in IEEE Spectrum, employers greatly appreciate the amalgamation of SQL proficiency with an additional programming language such as Java or C++ (Cass, 2023). Within contemporary distributed systems, a substantial quantity of crucial business data is maintained within SQL databases.

The next order is occupied by the Java programming languages. It is a flexible, concurrent, strongly typed, class-based object-oriented language. Usually, it is transformed into the bytecode instruction set and binary format as defined in the Java Virtual Machine Specification. Based on data collected, the salary to workers in the Java Programmer position is offered between 17 million-30 million Rupiah per month.

In line with website development vacancies that are at the top of the list, the programming languages JavaScript, HTML, CSS and PHP are also included in the top programming languages needed in Indonesia. According to W3Techs' research in March 2023, a significant 77.5% of all websites continue to depend on PHP, showing a modest decrease from the 78.9% that utilized it in 2022 (Web Technology Surveys, 2023). JavaScript is an excellent programming language for front-end developers to learn. W3 Techs reports that JavaScript is used as a front-end programming language for nearly 98 percent of all websites (W3Techs, 2023). Consequently, acquiring proficiency in PHP and other languages for web development will prove advantageous

if IT graduates or students aspire to pursue a career in web development within the upcoming years in Indonesia.

Like the utilisation of JavaScript in web development, the React framework also follows suit. Among the frameworks that IT graduates working in Indonesia should prioritise mastering, the React framework holds the top position. Framework React is a JavaScript framework. Frameworks can streamline and expedite the application development process, hence enhancing the efficiency of application developers. Application developers can leverage existing components and capabilities within the framework, hence obviating the necessity to write code from the beginning for each aspect of the application.

Saks (2019) conducted a study comparing the Vue, React, and Angular frameworks, yielding several findings. Vue demonstrated superior performance as a framework. Ultimately, it was determined that React is the optimal framework to acquire proficiency in when seeking employment, while Vue is the preferred framework for small-scale apps that necessitate swift performance. Angular is particularly well-suited for larger and more intricate applications. However, it is crucial for IT graduates to master at least one framework to streamline the application development process, making it more efficient, expedient, and organised.

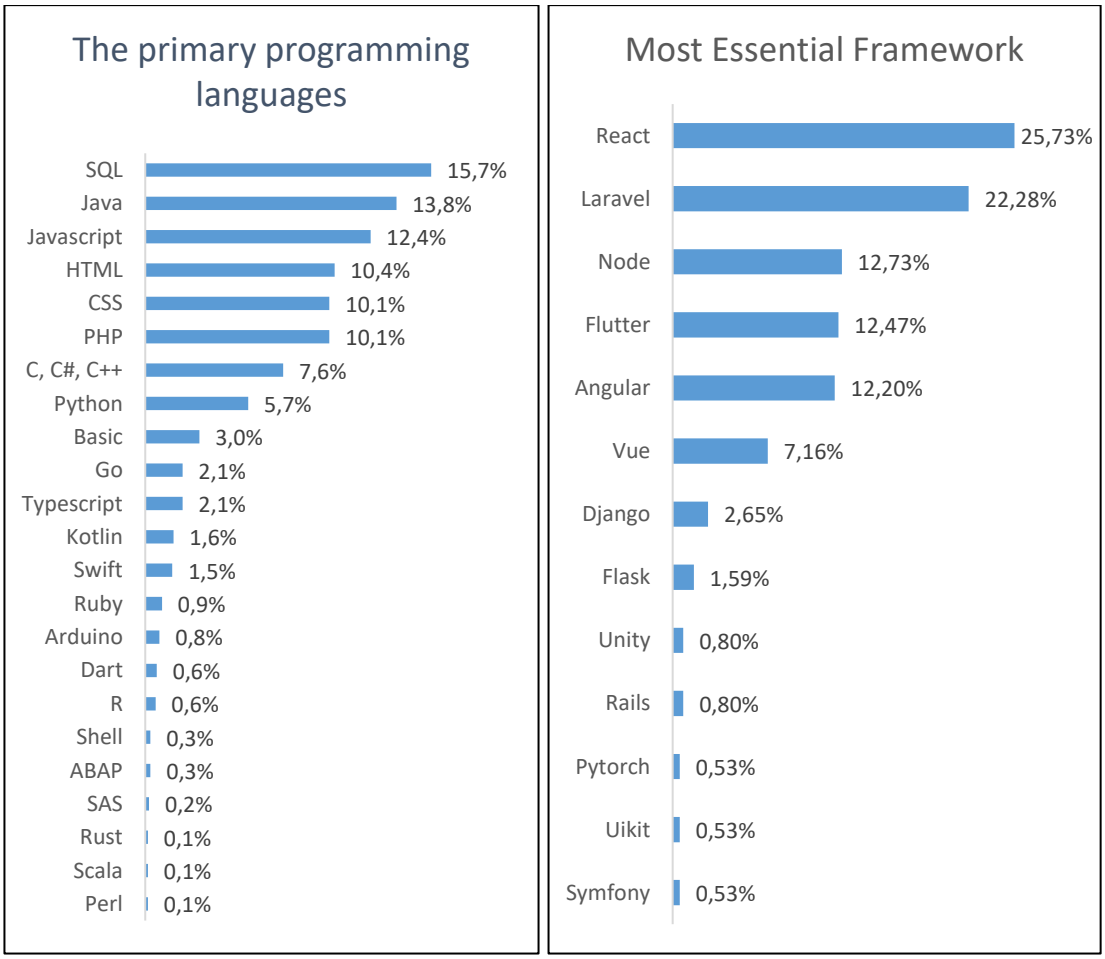

Figure 3 Programming languages dan framework required by employers

On the other hand, the need for Python language experts in Indonesia may not be in line with the IEEE spectrum. According to (Cass, 2023), Python is the second most popular programming language in the global job market. In Indonesia, Python languages ranks eighth and occupy 5.7% of programming languages required by employers. This programming language appears a lot in Web Developer and Full stack Developer vacancies.

Python has evolved into a versatile programming language. Python is extensively utilised in the creation of artificial intelligence (AI), alongside the web. Its utilisation is bolstered by its robust and comprehensive libraries, which contribute to its power. Indonesia has formulated the National Strategy for Artificial Intelligence of the Republic of Indonesia for the period of 2020-2045. This is a national policy document that outlines the key areas of focus and priority for artificial intelligence technology in Indonesia. It serves as a reference for ministries, institutions, local governments, and other stakeholders involved in activities related to artificial intelligence technology (National Strategy on Artificial Intelligence 2020-2045, n.d.).

The document emphasizes the "AI for Indonesia Vision 2045". To align with the national policy, it is crucial to possess a high level of proficiency in Python, which is a highly influential programming language for artificial intelligence.

The requirement for IT student graduate skills is diverse and constantly evolving to meet the demands of the industry. Employers now expect IT graduates to have a wide range of technical skills. Additionally, soft skills such as communication, critical thinking, problem-solving, and teamwork are highly valued in the IT field. This multidimensional skill set is crucial for IT graduates to succeed in their careers and adapt to the ever-changing technological landscape. The soft skills enable graduates to effectively collaborate with colleagues, adapt to new technologies, and handle complex projects (Glazunova et al., 2022). Furthermore, soft skills are not only important for individual success, but they also contribute to the overall productivity and efficiency of an organization. Without strong soft skills, IT student graduates may struggle to communicate their ideas, collaborate effectively, and adapt to the fast-paced and constantly changing nature of the IT industry.

In this study, soft skills were collected into several groups, namely Table 1. The frequency of each soft skill group was calculated from the appearance of one of the keywords in the dataset. Vacancies consist of Indonesian and English, so keywords also consist of both languages.

Figure 4 shows the soft skills of IT graduates expected by employers. From the picture, teamwork is the most requested ability by employers. Followed by the ability to learn and analytical skills. This is in line with the results of research by Burbekova (2021) and Glazunova et al. (2022). All three of these things are related to IT projects, generally involving various types of work. For example, in software development, a Front-End programmer is expected to work with UI/UX designers so that the resulting application can be in accordance with customer needs and at least revisions. The programmer will also work with the tester so that all important parts of the software are tested in various cases. Critical thinking and problem-solving skills are needed when problems arise, such as if the end user flatform is not compatible with the product produced, then the entire team involved will try to solve the problem so that the project is completed on time with satisfactory quality.

Table 1. Soft skill Group and its keywords

Soft skill	Keywords	Significance
Communication skill	communication, komunikasi, *berkomunikasi*, discussion, communicate	Ability to communicate well
Teamwork	team, *bekerjasama*, *kolaborasi*, collaboration, closely, *koordinasi*, *bekerja*	Ability to work together in teams
Leadership	*kepemimpinan*, *memimpin*, lead, leader,	The ability to lead, generally appears in the position of project manager
Coding skills	clean, clear, readable, reusable, well, documented, *efisien*, efficient, *dibaca*, *terorganisasi*, organised, organized, stable, tested	The ability to produce program code that is clean, easy to read, easy to reuse, documentable, efficient and does not waste memory, easy to read, stable, easy to test, and well organized.
Analytical skills	*kritis*, *analistis*, logic, problem, solving, analytical, critical, thinking	Ability to solve problems with analysis and christianity
English ability	english, written, fluent, *inggris*, pasif, passive, speaking, excellent, verbally, verbal, writing	Good English language skills that are fluent, only able to write, or just speak passively
SDLC knowledge	scrum, agile, sdlc	SDLC is a Software Development Life Cycle, or the process of software development, starting from requirements analysis to the maintenance stage. There are many types of SDLC, one of which is Scrum and Agile.
Learning ability	fast, learner, strong, passion, fast, inisiatif, *cepat*, *memahami*, learn, desire	The ability to learn quickly. Technology is developing rapidly and mastering the latest technology is expected by employers
Resillence	*tekanan*, *bersamaan*, adapt, paced, pace, time	Ability to withstand pressure both in terms of deadlines and working on several projects at the same time
Work ethic	responsible, motivated, independent, oriented, *mandiri*, *bertanggungjawab*, detail	The ability to be responsible and maintain motivation and able to learn independently without much teaching by supervisors.

Innovative	*inovatif*, *kreatif*, inovasi, creative, innovation, creativeness	The ability to innovate and create.

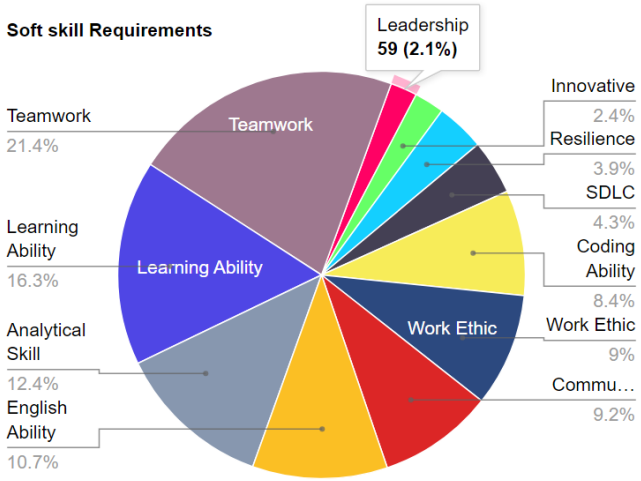

Figure 4 Soft skill requirement for IT Graduates

The interesting thing from the data collected is the need to master English both writing, speaking, and listening, which is 10.7% of the total soft skills requested. This will increase in the future because clients can come from abroad. It is very important for IT students to strengthen their English skills so that they can compete with workers from outside who work in Indonesia.

CONCLUSION

The results of the analysis show that there are several conclusions that can be drawn, namely:

At first, companies are most interested in hiring people for Web Development, then Programmer, and finally Help Desk Support. Fourteen of the top twenty jobs are all about making software, apps, or code for mobile or web platforms. System Analysts are another type of worker who works with software development. This job entails doing research, making plans, coordinating work, and picking the right software and systems to meet an organization's needs. There are two jobs in the top 20 that have to do with data: Data Analyst and Data Engineer. These two jobs are not the same. A Data Analyst is someone who uses technology for data analysis to do study and analysis on information. A Data Analyst's main job is to look at numerical data and turn it into a detailed report that the company can easily understand. On the other hand,

data engineers work in a variety of places and make systems that gather, process, and turn raw data into useful information that business analysts and data scientists can look at. Their main goal is to make sure that businesses can get the data they need to analyse and improve their operations. In some fields, data engineers are very important when it comes to setting up and maintaining systems. System Administrator, Help Desk Support, and IT Support are some other jobs that aren't directly related to programming or software creation. These jobs are very important for making sure that business activities or software development activities run smoothly. Network engineering is another job in the top 20. This job involves running and managing computer networks.

Furthermore, SQL now holds the highest rank among programming languages. Employers greatly appreciate the combination of SQL ability along with expertise in an additional programming language such as Java, PHP, or C++. SQL are commonly used in contemporary distributed systems to store a substantial volume of critical business data. The Java programming language fills the following position. Based on the acquired data, the wage range for individuals in the Java Programmer role is between 17 million and 30 million Rupiah per month. Website development jobs give priority to programming languages such as JavaScript, HTML, CSS, and PHP, as these are much in demand in Indonesia. Like the use of JavaScript in web development, the React framework follows the same approach. The React framework holds the highest rank on the list of frameworks that IT graduates working in Indonesia should prioritise mastering. Nevertheless, the need for Python language experts in Indonesia may not correspond with the IEEE spectrum. Python holds the seventh position in terms of popularity in Indonesia and is demanded by organisations for approximately 5.7% of their programming language needs. This programming language is commonly referenced in job advertisements for roles such as Web Developer and Full stack Developer. To comply with the national policy, it is crucial to possess a proficient mastery of Python, a highly consequential programming language in the realm of artificial intelligence. Third, employers constantly indicate that the most sought-after skill is teamwork. Driven by the ability to learn and the ability to think critically. All three of these things are linked to IT projects, which usually include a lot of different types of jobs. As part of software development, a Front-End Programmer works with UI/UX designers to make sure that the final app meets customer needs and demands as little as possible. The writer and tester will work together to make sure that all the important parts of the product are tested in all possible situations. When problems

happen, like when the end-user platform and the product being made don't work together, you need to be able to think critically and solve them. When this happens, the whole team works together to solve the problem and make sure the job is finished on time and to the right level of quality. One interesting thing that the data showed is that being able to speak, write, and understand English well makes up 10.7% of all the soft skills that are needed. Will keep going in the future because clients could come from other countries. IT students need to get better at English if they want to compete with foreign workers working in Indonesia.

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