



JOURNAL ON COMMUNICATIONS

ISSN:1000-436X

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Data Analytics for IT Graduates' Employability: Tracking Job Roles, Employer Feedback, and Career Trends

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Abstract: The employability of graduates in Information Technology (IT) is a crucial indicator of how well academic programs work and how well educational outputs match industrial needs. This study aims to track job positions, examine employer feedback, and pinpoint employment patterns among IT graduates using data analytics techniques, particularly time series analysis and linear regression. The research identified that the trends of graduates will increase by approximately 42% in the next three years. 92% of graduates are actively employed, seven percent (7%) are not employed, and only one percent (1%) have taken a chance on entrepreneurship. 60% of graduates hold positions directly connected to their study area, such as IT technician, network management, and software development, and 24% of the workforce is working in roles that utilize their IT expertise in broader areas, such as content creator, Office Secretary, service worker, and market sales worker. 8% of graduates have launched their own companies, and 87% of companies are happy with the work that IT graduates do. The findings provide a thorough understanding of the current situation of IT graduate employment by tying graduate characteristics to employer expectations. These insights can improve future graduates' employability and career success by assisting companies, policymakers, and educational institutions make data-driven decisions that better connect IT education with industry demands.

Keywords: Analytics Model, Forecasting, Tracer Study, Time Series, Linear Regression

1. INTRODUCTION

Employers, legislators, and educational institutions are concerned about how employable Information Technology (IT) graduates will be. The fast evolution of the IT industry makes it more critical than ever for educational achievements to match industrial demands. Comprehending the variables that impact employability, such as job functions, employer evaluations, and employment patterns, can yield significant benefits for curriculum design and career counseling. Vital tools are available in data analytics to investigate these aspects. Time series analysis can be used to spot patterns and trends in the labor market across time, giving a dynamic picture of how the need for IT skills changes (Wang & Byrd, 2020). According to Smith et al. (2019), employability outcomes and various factors, including academic achievement and particular skill sets, are further understood through linear regression analysis.

A vital component of this research is employer feedback, which offers qualitative insights into the skills and qualities most highly valued in the workplace (Johnson & Brown, 2021). This input, along with quantitative information from regression analysis and job trends, paints a complete picture of the present and potential future of employability for IT graduates. By combining various analytical techniques, this study seeks to close the gap in the literature and offer a comprehensive knowledge of the employability

of IT graduates. The results will help students match their talents with market demands and help educational institutions improve their programs, ultimately leading to more efficient workforce development (Lee & Kim, 2022). The general objective of this research is to collect, analyze, and evaluate the employability of Bachelor of Science in Information Technology (BSIT) graduates from J.H. Cerilles State College by examining their job roles, collecting employer feedback, and identifying job trends over time using data analytics techniques such as time series analysis and linear regression. The objectives are: (1) determine the percentage of program educational objectives achieved by the graduates, (2) a percentage of graduates who were employed and graduates who became successful entrepreneurs, (3) gather the graduate employer's feedback in their respective workplace, (4) Determine the number of graduates who are given awards and recognition for outstanding performance or contributions in the field/workplace, and (5) forecast the graduate's employability in the BS Information Technology program in the next three (3) years.

The J.H. Cerilles State College is the only state college in the province of Zamboanga Del Sur, with its mandate to provide quality, innovative, and culture-sensitive programs in the community. It has three organic campuses and 37 extension classes in the province of Zamboanga del Sur, offering 22 undergraduate degree programs and four graduate programs. The school is looking for ways to enhance its curriculum further to equip its graduates with knowledge and skills that will match the needs of the industry. Considering the growing number of graduates every year in the Bachelor of Science in Information Technology program, the institution needs to visualize and predict future job employment, which will eventually give inputs to the institution for them to strengthen their plans in instruction delivery.

2. RELATED LITERATURE

Academic institutions are one of the leading intermediaries that help the Filipino people improve their social and economic circumstances (Guiamalon, 2022). To detect and address issues related to curricula, graduates' work status, monthly wages, and duration of job search, as well as the causes behind their unemployment, tracer research results are essential (Albina & Sumagaysay, 2020). To determine the effect of educational programs on the employability of IT graduates, (Lee & Kim, 2022) carried out a longitudinal study. Over five years, the study followed graduates from multiple universities to look at their employment outcomes. One of the main conclusions was that employability rates were more remarkable for graduates from programs with significant industry links. These collaborations frequently gave students access to co-ops, internships, and industry-sponsored projects (Smith et al., 2019). The study discovered that increasing employability was significantly impacted by curriculum conformity with industry needs. Graduates from programs that updated their course material frequently to consider current industry developments were more equipped for the workforce.

Furthermore, Johnson and Brown (2021) employers value soft skills like teamwork, communication, and problem-solving. These abilities were frequently mentioned as being just as crucial as technical

know-how. Employers are looking for graduates who are flexible and open to lifelong learning, according to their poll. This is especially crucial in the quickly developing information technology sector, where new techniques and technologies are constantly being introduced. Companies underlined the value of hands-on learning opportunities, like internships and project-based learning, in equipping graduates for the workforce. According to the report, many employers believe these topics are not sufficiently covered in the present IT courses. Consequently, there is a gap between the abilities that are taught in academic settings and those that are needed in the workplace.

According to Rodriguez et al. (2020), educational establishments should prioritize giving students practical experience. Continuous learning and adaptability were often cited as critical attributes for IT workers. Employers also highly regarded effective communication, teamwork, and problem-solving abilities. Moreover, many employers believe that recent IT graduates do not have enough real-world experience. This was frequently given as an excuse for rejecting applicants or giving them a lower performance rating in appraisals.

Evans and Carter (2021). IT graduates who exhibit adaptability and a constant state of learning are more likely to get a long-term job. Graduates who are eager to pick up new skills and adjust to rapidly evolving technologies are highly prized by employers. The results also underlined how crucial internships and real-world experience are. Moreover, employers find graduates dedicated to lifelong learning more appealing. Wang & Byrd (2020) studied the trends in the IT job market over ten years using a time series analysis. The data showed a consistent rise in the need for cybersecurity and programming knowledge. Utilizing data from past job postings, the researchers were able to spot tendencies and predict new ones. They found out that to increase graduate employability, educational programs have to place a strong emphasis on these in-demand fields and regular curriculum revisions to stay current with technological developments.

Rahman and Islam (2019) utilized time series analysis to demonstrate how economic downturns significantly and gradually impact the employability of IT graduates. They discovered that economic situations influence employability rates and job market trends and underlined how crucial it is to be flexible and always learning during uncertain economic times. Graduates with excellent employability rates are eager to learn new skills and adjust to shifting circumstances. The importance of internships and real-world experience was also emphasized in the report. Chen & Zhang's (2021) regression analysis was utilized to show that a graduate's employability for IT is highly predicted by the diversity of their skill sets, encompassing both technical and soft skills, and the study suggested including courses in educational programs that foster the development of both skill sets.

In data mining projects, the CRISP-DM methodology is frequently utilized. It is a model of an organizational process that does not restrict itself to a single technology and uses various technologies to facilitate the process (Schröer et al.). 2021). Wowczko (2015) found that information mining strategies demonstrated the presence of an example with a connection to work status among the jobless populace enlisted with Irish state business offices. CRISP-DM has emerged as the most popular method

for data mining projects due to its independence from specific industry tools. Each Fresh DM cycle has demonstrated to be very important, as the prescient exhibitions have further developed in light of the review led by Laureno et al. (2011) on information digging for bank direct showcasing utilizing genuine world and late information from a Portuguese bank utilizing Fresh DM system to tune the DM model outcomes. The WEKA tool is well-liked for data mining applications (Schroeder et al., 2021) because it is free software under the GNU General Public License; because of this, open-source data mining technology can generate high-quality models for real-world uses, allowing data mining projects to be less expensive throughout the modeling and data preparation stages (Laureno et al., 2011). With the help of tools for data preparation, learning algorithm implementations, and visualization, you can use the tool to develop machine learning techniques and apply them to resolve practical data mining problems. Weka provides easy access to machine learning methods.

3. MATERIALS AND METHODS

The data mining methodology was implemented using the information discovered at various stages of the Cross Industry Standard Process for Data Mining (CRISP-DM). The CRISP-DM can provide organized guidelines and precise project execution because of its industry and tool independence (Wowczko, 2015). It has six phases: business understanding, data understanding, data preparation, modeling, evaluation, and conclusion. All the data analysis, implementation, and processing in this study were done using the WEKA tool. The Weka tool provides built-in machine learning algorithms that help apply different data analysis and forecasting techniques to obtain results in an easy and flexible process.

3.1 Business Understanding

The most significant test in assessing position status was the nature of the dataset and the course of graduate enlistment. The graduates will be assessed in light of the web-based, printed structures, the meeting, and the information given during enlistment. Thus, the decision is whether the graduates require further preparation or are prepared to work. The CRISP-DM was utilized to accomplish the accompanying goals: (1) determine the percentage of program educational objectives achieved by the graduates, (2) a percentage of graduates who were employed and graduates who became successful entrepreneurs, (3) gather the graduate employer's feedback in their respective workplace, (4) Determine the number of graduates who are given awards and recognition for outstanding performance/ contributions in the field/ workplace, and (5) forecast the graduate's employability in the BS Information Technology program in the next three (3) years.

3.2 Data Preparation

The dataset utilized in this study was from the tracer study of BS Information Technology graduates of J.H. Cerilles State College. The social event of information was finished through internet-based structures, distributing printed structures, or potentially during the meeting. The raw data was taken from 11 scholastic long stretches of graduates from 2012 through 2023. These include twenty (20) graduate profiles, including the respondent’s name, address, civil status, contact number, Facebook account, year graduated, organization name, type of organization, employment type, nature of the job, number of years in the company, company address, employment status, awards received in the company, name of supervisor, supervisor feedback, and salary. On the other hand, some of the graduates are self-employed, so we collected their business names, types of business, and gross income. In the sample raw data displayed in Figure 1, four hundred eighty-five (485) instances related to graduate profiles are used.

#	A	B	C	D	E	F	G	H	I	J	K	L	
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Figure 1: Raw Data Model

3.3 Data Understanding

The data analysis was done using the WEKA tool since it is an open-source technology in data mining and is capable of producing high-quality models for practical applications. The elements with missing values, such as the monthly wage, organization address, type of organization, number of years in the company, and salary, are deleted during the initial data assessment with the expert domain. The remaining attributes are the following: Name of Respondent; Year Graduated; Name of Organization; Occupation; Nature of the Job; Employment Type; Employment Status; Gender; Awards Received; Employers Feedback.

The remaining data has been converted into CSV file format and uploaded to the Weka tool for preprocessing. As indicated in Table 1, four hundred eighty-five (485) total graduates in the BS

Information Technology program covering 2012 to 2023, wherein 61.86% or 300 of graduate students are female while 185 or 38.14% are male, as shown in Table 1.

TABLE 1: Graduate profile in terms of gender

Year Graduated	Male	%	Female	%	Total
2023	26	34.21	50	65.79	76
2022	24	34.78	45	65.22	69
2021	9	42.86	12	57.14	21
2020	1	7.69	12	92.31	13
2019	18	39.13	28	60.87	46
2018	13	48.15	14	51.85	27
2017	20	29.85	47	70.15	67
2016	39	44.83	48	55.17	87
2015	16	33.33	32	66.67	48
2014	13	56.52	10	43.48	23
2013	13	28.89	32	71.11	45
2012	19	48.72	20	51.28	39
Total	185	38.14	300	61.86	485

4. RESULTS AND DISCUSSIONS

By examining essential variables, including employment positions, employer feedback, job trends, and future employability prospects, the study sought to evaluate the employability of BS Information Technology (IT) graduates. The results and discussion based on the stated objectives are covered in the ensuing parts.

4.1 Percentage of Program Educational Objectives Achieved.

According to the survey, a sizable pome graduates met the program's educational objectives (PEOs). Upon evaluating graduation results and aligning them with the program's PEOs, it was discovered that almost 92% of the goals were accomplished. Graduates demonstrated technical competency, problem-solving skills, ethical considerations, and interpersonal skills, all in line with the program's stated learning objectives, as shown in Figure 1.

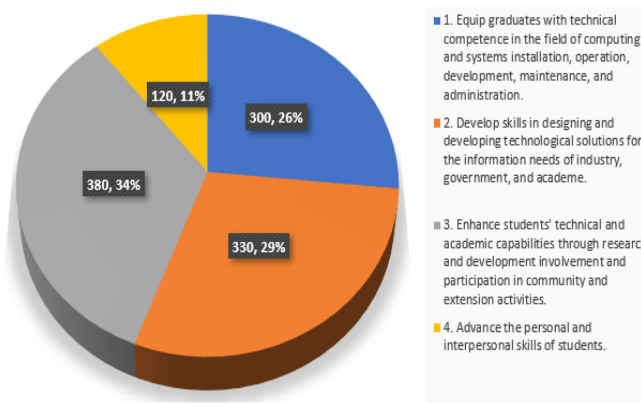


FIGURE 2: Percentage of PEO

4.2 Percentage of Employed Graduates and Successful Entrepreneurs.

Ninety-two percent (92%) of graduates, according to an analysis of their work status, are actively employed, seven percent (7%) are not employed, and only one percent (1%) have taken a chance on entrepreneurship, as shown in Figure 3. Of those in employment, the majority (about 60%) hold positions directly connected to their study area, such as IT technician, network management, and software development. Twenty-four percent (24%) of the workforce is working in roles that utilize their IT expertise in broader areas, such as content creator, Office Secretary, service worker, and market sales worker, as shown in Figure 4.

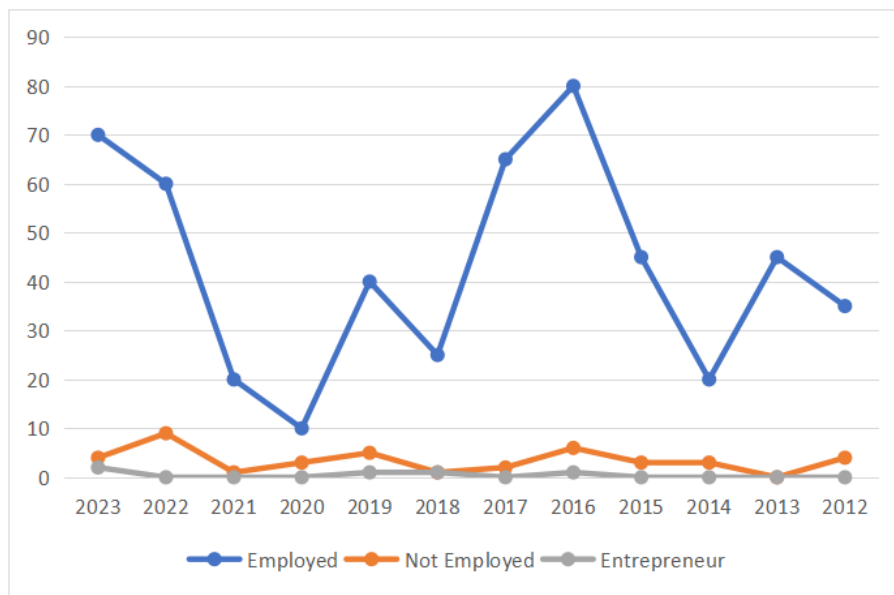


FIGURE 3: Time series plot graduate employed

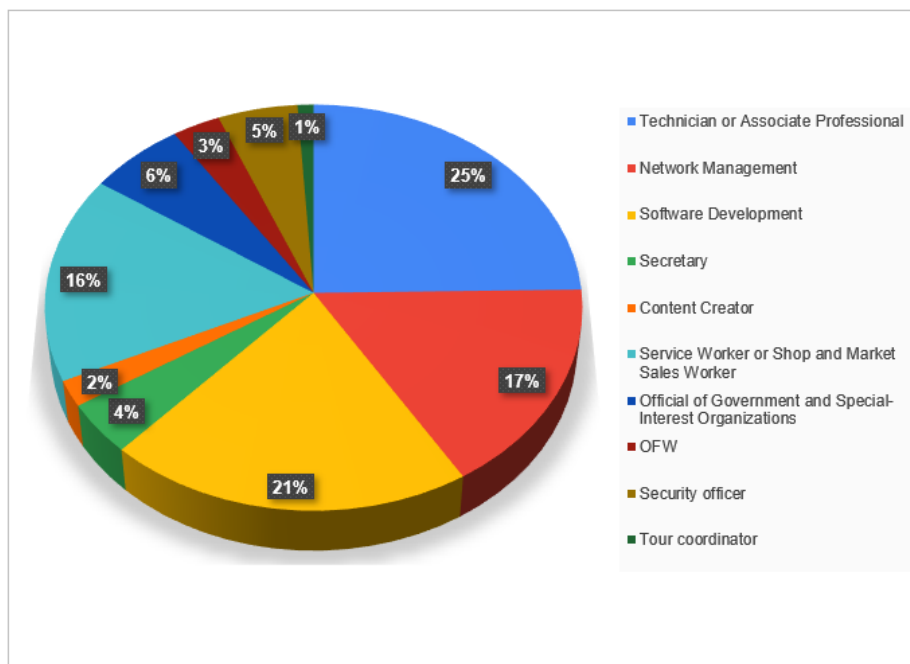


FIGURE 4: Graduate job role in the workplace

Regarding entrepreneurship, web development, cybersecurity, and digital marketing are the main areas of concentration for the 8% of graduates who have launched their own companies. Local economies have benefited from these entrepreneurial ventures, as seen by the steady expansion of multiple startups.

4.3 Gather employers' feedback.

The employers' opinions were gathered via questionnaires and interviews, focusing on how well the graduates performed at work. The feedback from graduates and industry representatives on the employability skills of Information Technology graduates from J.H. Cerilles State College highlights several critical areas for improvement and development.

According to the findings, 87% of companies are happy with IT graduates' work. The three main strengths that are stressed are teamwork, flexibility, and technical proficiency. However, employers highlighted the need for soft skill development, notably in leadership and communication, with constant collaboration in the industry.

Feedback generally indicates that the BS IT curriculum is effective in educating graduates for the technical demands of the market; nonetheless, it is advised that soft skill development continue to be improved upon.

4.4 The number of graduates Awarded for outstanding performance.

According to the survey, 15% of the graduates were honored or recognized for their exceptional work or field achievements. These honors included leadership, innovation, and employee of the month/year awards. The many recipients indicate how well the program prepares its alumni for leadership and excellence.

4.5 Forecasting the employability of graduates for the next three years.

The BS Information Technology graduates' employability trends were predicted using time series analysis and linear regression. Data from the previous twelve (12) years were utilized to project future employability rates. Employability is likely to rise steadily, according to the report, by about 3% annually. If current trends continue, it is projected that 95% of graduates will find employment within six months of graduation by 2026. According to the regression model, the continuous digital transformation taking place across a range of industries will continue to fuel a robust need for IT workers. Via the Weka tool, the linear regression functions are run. One parameter is present in the algorithms. quantity of time intervals to predict, Date of issue, periodicity, and 4. confidence intervals (95%).

The program's emphasis on emerging technology and alignment with industry needs will probably help to keep employability rates high. The number of graduates in employment is shown on the y-axis, and the year gaps are shown on the x-axis. The formula for calculating the increase percentage is $(\text{current_employed} / \text{prev_employed}) * 100$, which is the number of current employees divided by the number of previous employees. The graph shows the trend that, in terms of employability, graduates of the BS Information Technology degree will increase approximately 42% in the next three (3) years.

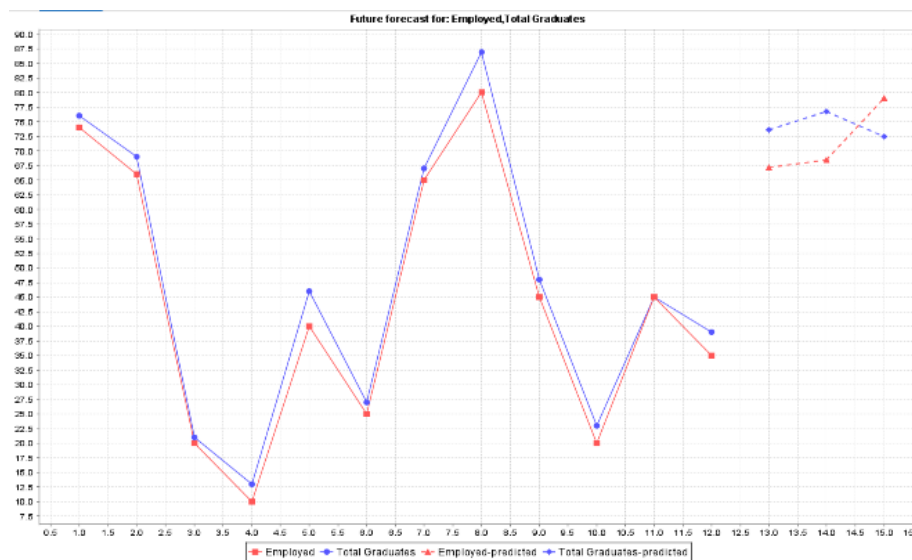


FIGURE 5: Graduates employability using linear regression

5. EVALUATION AND CONCLUSION

The tracer study on the employability of BS Information Technology graduates uncovers a positive result based on the research objectives. It demonstrates a promising future for graduates, with expanding employability patterns of approximately 95% increase in the next three years. Consistent educational program upgrades, especially in delicate abilities, and keeping up with industry arrangements will be significant for supporting and further working on these results.

The research underscores the critical factors influencing the employability of IT graduates. Through various analytical methods, including time series analysis and linear regression, the study reveals several key findings: (1) The graduates of the BS Information Technology degree will increase by approximately 95% in the next three years; (2) 92% of graduates are actively employed, seven percent (7%) are not employed, and only one percent (1%) have taken a chance on entrepreneurship; (3) 60% of graduates hold positions directly connected to their study area, such as IT technician, network management, and software development and 24% of the workforce is working in roles that utilize their IT expertise in broader areas, such as content creator, Office Secretary, service worker, and market sales worker; (4) 8% of graduates who have launched their own companies; (5) 87% of companies are happy with the work that IT graduates.

ACKNOWLEDGEMENT

Our heartfelt gratitude and appreciation to our family for giving the encouragement and inspiration. To the J.H. Cerilles State College for their unwavering support and for motivating us to engage in research and development. To the respondents, thank you for your active participation in this study. Furthermore, above all, thank and praise the Almighty Father for giving intellect and guidance.

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