



Employer expectations of business analysts: Knowledge and insights from job offer analysis

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ABSTRACT

This study analyzed 1480 job advertisements for business analysts using natural language processing (NLP) and sentiment analysis. While confirming the demand for technical, analytical and communication skills, the study reveals important patterns that expand upon existing knowledge. Specifically, we observe how skill expectations evolve across career stages: junior positions emphasize language proficiency and communication, whereas senior roles require stronger project management, leadership, and advanced analytical capabilities. Sentiment analysis reveals that employers predominantly use neutral or positive language in job postings, reflecting conscious strategies to attract candidates. Furthermore, the study shows that an increasing number of employers are offering flexible working arrangements, such as hybrid and remote work, as well as non-wage benefits, including private healthcare and career development opportunities. This indicates an increase in competition for talent in the labor market. These findings offer valuable insights for curriculum design and recruitment strategies.

Introduction

In a rapidly evolving world, where the pace of technological and market changes significantly impacts businesses across all industries, the ability to quickly adapt and make well-informed decisions is crucial for achieving desired business outcomes (Min, 2016), especially in the era of Big Data. In this context, ongoing digitalization and continuous data growth provide access to an ever-increasing amount of information, which requires extensive analysis. After thorough exploration, the results are appropriately interpreted, potentially providing a significant competitive advantage for companies. Therefore, business analytics, which utilizes data to inform decisions and support decision-makers in making strategic, operational, and tactical choices, has become an essential aspect of every company's operations (Bayrak, 2015; Liu et al., 2023).

Business analytics can be viewed as an intersection of several disciplines, including quantitative data analysis, management science techniques and methods, computer science, and information and communication technology (ICT) tools (Schmitt, 2023). It is commonly defined as the transformation of data into actionable insights that support decision-making and problem-solving within organizational

processes (Evans, 2017). According to Gartner (2018), business analytics comprises data mining, predictive analytics, applied analytics, and statistics, and is delivered to business users in the form of applications. Moreover, it is closely associated with the development of Big Data. The growing importance of business analytics in organizations reflects the necessity of managing vast amounts of data to enable faster and more informed decisions (Chahal et al., 2019; Popoola et al., 2024).

At the center of this transformation are business analysts, professionals who act as a bridge between data, technology, and business objectives (Daraojimba et al., 2024; Farayola et al., 2023). Their role is not only to perform analytics, but also to translate data insights into actionable business strategies (Conboy et al., 2020; Fischer et al., 2020). Positioned at the intersection of business and IT, analysts must combine a deep understanding of both operational and strategic dimensions of companies with expertise in technological tools that enable the achievement of organizational goals. In addition, business analysts foster innovation and facilitate organizational change, allowing companies to remain competitive in today's dynamic environment (Barlette & Baillette, 2022; Kristoffersen et al., 2021). Their contribution to improving operational efficiency is equally important, as they assess processes, identify inefficiencies, and implement targeted improvements

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that enhance performance (Farayola et al., 2024; Uwaoma et al., 2024). This perspective is closely linked to the theory of human capital, which emphasizes that the skills, knowledge, and competencies of individuals are critical assets contributing to organizational performance and economic growth. Recent research has expanded this theory to include not only formal education and training but also the development of higher-order skills such as critical thinking, problem-solving, and adaptability, which are increasingly valued in the contemporary labor market. For example, a study conducted by the National Bureau of Economic Research highlights the growing importance of social and decision-making skills, emphasizing that investments in these areas generate significant returns at both individual and macroeconomic levels (Deming & Silliman, 2024). In the knowledge-intensive economy, human capital extends beyond formal education to encompass digital competencies, adaptability, and innovation capacity (Kryscynski et al., 2017; Kulikowski, 2024).

These developments explain why employers are increasingly investing in analytical teams within their organizations, resulting in the rising demand for business analysts. According to the U.S. Bureau of Labor Statistics, demand for these professionals is projected to grow by approximately 23 % by 2032, a rate much faster than in many other professions. In response, universities have begun to expand their educational offerings by introducing new courses related to data analysis. Nevertheless, employers' expectations regarding business analysts continue to evolve, making it necessary to align curricula with labor market requirements.

The main objective of this study is therefore to identify the key competencies and skills that business analysts should possess to meet employers' expectations. To address this objective, job postings for business analyst positions published on three major recruitment platforms—Pracuj.pl, LinkedIn, and JustJoin.it—were analyzed. Using natural language processing (NLP) techniques, including sentiment analysis and n-gram models, both the content and tone of employer expectations were examined. This approach made it possible to identify meaningful patterns and prioritize the most in-demand competencies. As the role of the business analyst continues to evolve, it is essential to regularly reassess labor market requirements to ensure that educational programs remain aligned with professional realities. The findings of this study provide valuable insights that can support universities in refining curricula to better reflect labor market needs.

Methodology

The analysis focused on three leading recruitment portals in Poland most frequently used by both candidates and recruiters. These comprised Pracuj.pl, the most popular Polish recruitment website that enjoys considerable user trust and is listed on the Stock Exchange; LinkedIn, a global platform offering a wide range of job opportunities and known for fostering professional networking; and JustJoin.it, a Polish startup focused on IT job offers designed to help IT specialists find

suitable employment. While LinkedIn operates on a global scale, both Pracuj.pl and JustJoin.it primarily target the Polish labor market. Nevertheless, it is important to note that many companies operating in Poland, especially in the IT and business services sectors, deliver services to foreign clients and international corporations. As a result, numerous job postings on these platforms reflect global expectations and requirements, particularly in terms of competencies, communication standards, and the use of English as a working language. This mitigates potential geographic or industry-related bias.

A total of 1480 job postings for business analyst positions published on the above-mentioned platforms in July 2024 were analyzed. The research procedure consisted of six steps, which are illustrated in Fig. 1. In the first step, job offers were collected from selected platforms using web scraping tools that facilitated the automated acquisition, analysis, and storage of data. Python was chosen for this task due to its extensive range of libraries, ease of integration with other tools, and capability to handle large data sets (vanden Broucke & Baesens, 2018). The data collection process was supported by the Selenium library, which automates the extraction of information from dynamic websites (Skribans & Kotlars, 2024). This tool enabled tasks such as text entry, page scrolling, and data element searches, including class, identifier, or tag names, without requiring human intervention. Once downloaded, the postings were cleaned and saved as a CSV file in Microsoft Excel.

In the next stage, the collected data were prepared for analysis. Text extraction was performed using the Natural Language Toolkit (NLTK) and spaCy, both of which provide advanced features for natural language processing (NLP). The first step in this process was tokenization, which divides the content into smaller elements known as tokens, including words, phrases, punctuation marks, or non-alphabetic characters. Tokenization enabled the separation of keywords and phrases required for sentiment analysis and helped eliminate elements such as compound words or punctuation that could skew the data. Lemmatization was then performed to identify the base form of words (lexemes), allowing different word forms (e.g., “analysts” → “analyst”) to be grouped. This significantly improved precision by treating variants of the same term as one, thereby increasing the accuracy of identifying expectations in job offers. Stopwords such as “with,” “and,” and “in” were also removed using the Polish stopwords library, a built-in Python module. Although this process could affect sentence context in complex constructions, it was essential for focusing on words directly related to competencies and expectations (Sarica & Luo, 2021).

Subsequently, the content of job postings was analyzed with respect to factors such as the number of offers available across platforms, contract types, and job levels. For this purpose, the Matplotlib and Seaborn libraries were applied to present the results through bar, line, and pie charts. This visualization provided a clear and concise overview of employment conditions offered to business analysts. The completion of all these steps resulted in structured and clean data, which were subsequently used for sentiment analysis (SA).

Sentiment analysis has become a vital tool for categorizing and

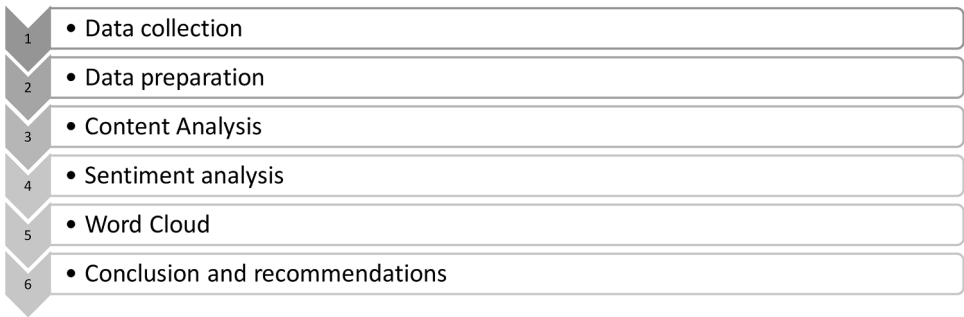


Fig. 1. Research procedure.
Source: Own research results.

interpreting textual data, thereby contributing to more informed decision-making (Hamilton et al., 2016). In this study, SA was conducted in Jupyter Notebook using Python’s VADER Sentiment Analyzer, which applies the VADER algorithm to assess sentiment by processing content and analyzing the emotional tone of text (Isnan et al., 2023). The results of the analysis were classified into three categories following Hutto and Gilbert (2014): positive sentiment, which indicates that the analyzed text generates favorable impressions; neutral sentiment, which suggests that the text does not evoke strong emotions; and negative sentiment, which implies that the text generates adverse impressions that could reduce attractiveness or raise concerns. Thresholds were set as follows: a score greater than 0.05 indicated positive sentiment, a score of between −0.05 and 0.05 indicated neutral sentiment, and a score of less than −0.05 indicated negative sentiment. Both requirements and responsibilities were analyzed, as these represent the two main components of business analyst job postings.

Although the VADER tool was originally optimized for social media and general English texts, it has proven effective in more formal contexts such as professional job postings. To ensure accuracy, a manual validation was conducted on a random sample of 100 job postings, covering both ‘requirements’ and ‘responsibilities’ sections. The comparison showed a high level of agreement between manual assessments and VADER classifications, confirming that with appropriate data pre-processing the tool can be reliably applied to formal language.

In the fifth step, the required skills and qualifications were visualized using a word cloud, a method that highlights the most frequently occurring words in an engaging format by varying color and font size according to frequency (Heimerl et al., 2014). For this purpose, the wordcloud library in Python was applied (Skeppstedt et al., 2024). Finally, conclusions were drawn to provide answers to the research problem, with recommendations directed to both candidates and universities seeking to align educational offerings with labor market needs.

Results and discussion

Conducting the study according to the previously described research procedure provided information on the current requirements of employers toward business analysts. The Python libraries and tools used in the analysis enabled an effective examination of job advertisements. The results were structured into three elements: content analysis of job postings for business analysts, sentiment analysis, and word cloud analysis.

Analysis of job postings for business analysts

The analysis of job postings on selected recruitment platforms focused on the number of available advertisements by experience level and other important criteria, such as work modes, contract types, employment dimensions, and benefits. In total, 1480 job offers were analyzed from Pracuj.pl, LinkedIn, and JustJoin.it. Table 1 presents the distribution of job offers across these platforms, with Pracuj.pl showing the largest number of advertisements (702). This website also reported the highest average number of new job offers per week and per day.

The next step examined the number of job offers by experience level: junior specialists, specialists, senior specialists, and an “other” category. The “other” category included roles such as trainee, intern, expert,

manager, and director. As shown in the Fig. 2, LinkedIn offered the highest number of opportunities for junior-level specialists (84 ads). In contrast, Pracuj.pl was the leading platform for mid-level specialists, with 404 job ads. For senior positions, LinkedIn and JustJoin.it had similar numbers of offers, reflecting balanced demand for experienced professionals. In the “other” category, Pracuj.pl again had the most listings (56 ads). Overall, Pracuj.pl proved to be the most diverse platform, offering positions at all levels of experience.

In the next stage of the analysis, the basic information from job advertisements on the three selected recruitment platforms was consolidated into a single data set. Out of all the job offers, 1436 were for full-time positions, 39 for part-time work, and only 5 for temporary or supplementary employment. The clear predominance of full-time roles suggests that employers prefer stable, long-term employment. This indicates that companies are seeking employees who can fully commit to their responsibilities, while at the same time signaling to job seekers that temporary positions for business analysts are rare.

To test whether differences in experience-level distribution across the three platforms were statistically significant, a chi-square (χ^2) test of independence was conducted. The contingency table included the number of job offers for junior, specialist, senior, and other positions on each platform, resulting in a 4×3 matrix. The results showed a statistically significant association between platform and experience level: $\chi^2 = 118.69$, $df = 6$, $p < 0.001$. This finding demonstrates that the distribution of postings by experience level is not random. For instance, LinkedIn featured a higher proportion of junior-level offers, while Pracuj.pl concentrated on mid-level specialists. JustJoin.it displayed a more balanced distribution, making it attractive to companies seeking candidates across different levels, especially in IT-related industries. These results suggest that recruitment platforms cater to distinct segments of the labor market.

The types of contracts offered were also analyzed (Fig. 3). The most common was the employment contract, accounting for 61.73 % of postings. This type of contract provides stability and significant social protections, such as health insurance, paid vacation, and pension security, fostering loyalty and long-term employer–employee relationships. The second most frequent arrangement was the B2B contract (33.10 %), which offers flexibility and favorable financial terms for both parties. Employers save on social contributions, while employees may receive higher compensation. A smaller share (3.97 %) consisted of other contract types, such as internships, contracts for specific tasks, replacement contracts, or temporary arrangements.

Work modes were another key criterion. Among analyzed postings, hybrid work was the most frequently offered arrangement (49.14 %), reflecting the growing importance of flexibility for both employers and employees. Remote work accounted for 34.46 % of offers, appealing to individuals seeking to reduce commuting costs and maintain mobility. On-site work was the least common (16.40 %), indicating a shift away from traditional office-based roles in the business analyst profession. The high proportion of remote and hybrid opportunities highlights employees’ expectations for flexibility and work–life balance, as well as employers’ willingness to adapt to these demands.

In addition to remuneration, employers increasingly attract candidates with supplementary benefits. As shown in Fig. 4, private health-care (16.70 %) and life insurance (16.00 %) were the most commonly offered. Other frequent benefits included subsidies for sports activities in the form of a MultiSport or Medcover Sport card (13.10 %), reimbursement for training or courses (10.40 %), flexible working hours (10.00 %), team-building trips (10.10 %), and support for foreign language learning. These additional benefits demonstrate growing competition for skilled professionals and suggest that non-wage perks are becoming a standard.

Sentiment analysis results

Job postings on recruitment platforms are constantly evolving and

Table 1
Number of offers divided into recruitment websites.

	Recruitment portal name		
	Pracuj.pl	LinkedIn	JustJoin.it
Total number of active job ads *	702	370	408
Average number of job ads added per week	585	130	142
Average number of job ads added per day	120	12	26

* Number of active job offers as of July 31, 2024.

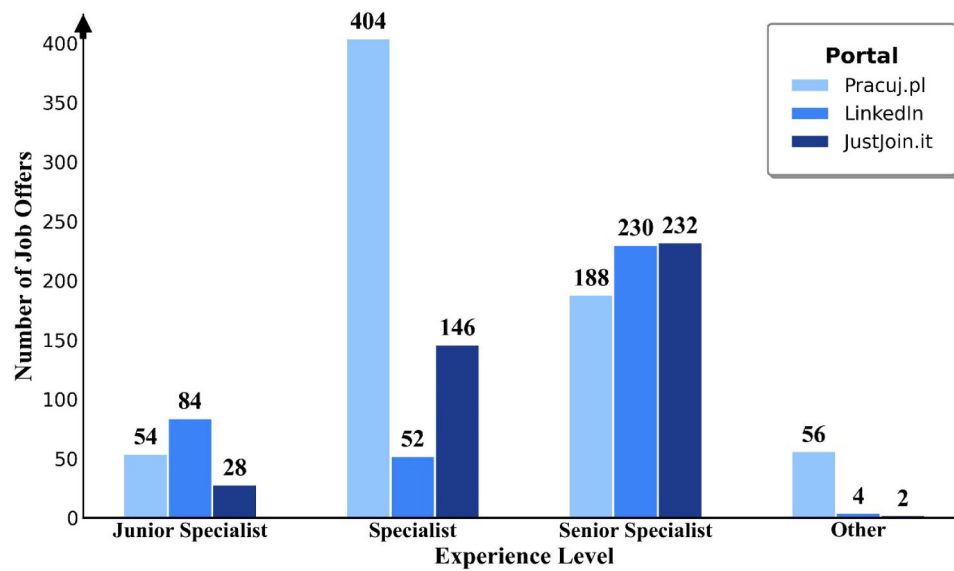


Fig. 2. Number of job advertisements for business analysts on selected recruitment websites, broken down by experience level.
Source: Own research results.

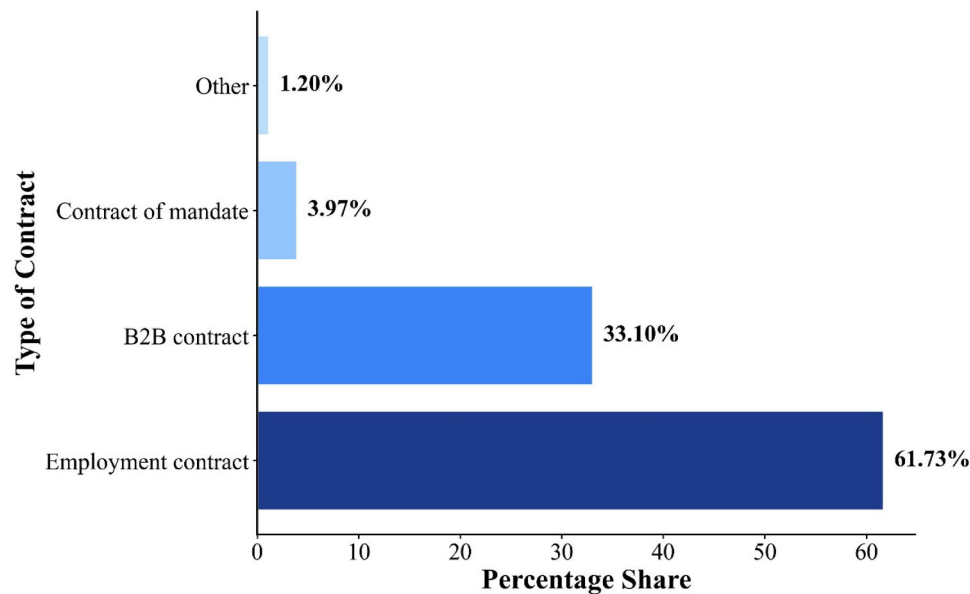


Fig. 3. Types of contracts in job advertisements for business analysts and their percentage share.
Source: Own research results.

typically feature a variety of requirements and responsibilities established by employers in line with organizational preferences and current business needs. Information such as job location, full-time or part-time status, and available benefits has become crucial in attracting initial interest from candidates. Only after reviewing these details do potential applicants carefully analyze the required skills and job responsibilities. The way employers present these expectations can strongly influence how advertisements are perceived by prospective business analysts, ultimately affecting their decision to apply. To examine the overall tone and emotional charge of job advertisements, sentiment analysis was conducted. This approach enabled the identification of dominant trends in the tone of advertisements and provided insights into potential consequences for job seekers.

The sentiment analysis was carried out in the Jupyter Notebook environment, which offers a wide range of Python libraries that facilitate precise implementation of this type of research. The analysis

primarily employed the VADER library, specifically its VADER Sentiment Analyzer, which applies the VADER algorithm to assess sentiment by processing textual content and evaluating the emotional tone of statements (Hutto & Gilbert, 2014). The results were categorized into three sentiment classes: positive sentiment, which indicates that the analyzed text generates favorable impressions and makes the advertisement appear attractive; neutral sentiment, which suggests that the text does not evoke strong emotions and reflects a balanced formulation; and negative sentiment, which implies the presence of discouraging language that could reduce the attractiveness of the advertisement.

The analyzed postings consisted of two main elements: requirements and duties. Therefore, the sentiment analysis was performed separately for these parts of the advertisements. Fig. 5 presents basic statistics from the sentiment analysis in the form of box plots for both requirements and duties. As shown in Fig. 5, the sentiment scores for requirements and duties are similar. The median, approximately 0.1, lies close to the first

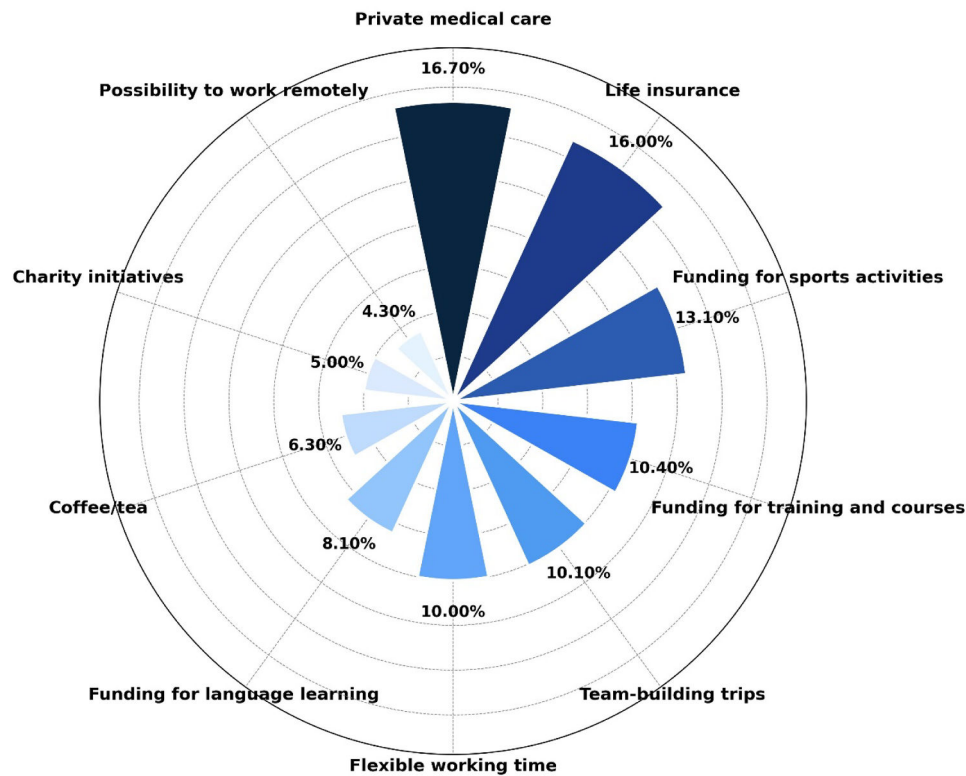


Fig. 4. The most popular additional benefits offered in job advertisements for business analysts. Source: Own research results.

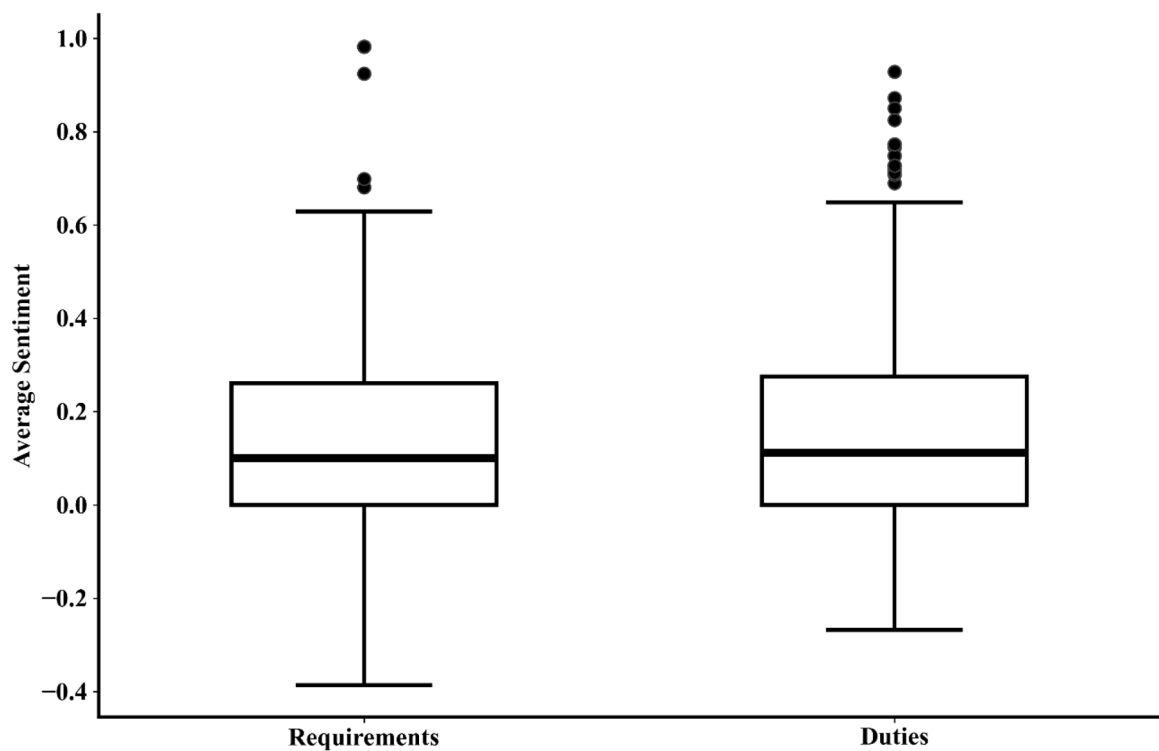


Fig. 5. Box plot for sentiment analysis for requirements and duties in job advertisements. Source: Own research results.

quartile (Q1), indicating that many requirements and duties oscillate around neutral sentiment. In addition, the values of Q1 and Q3 demonstrate that most postings are formulated in a neutral or positive tone. Outliers deviate significantly from the bulk of postings and reflect

highly positive sentiment, creating a right-sided asymmetry in the distribution. Overall, Fig. 5 illustrates that job postings are predominantly neutral or slightly positive in tone, suggesting that employers frequently use emotionally neutral or encouraging language when describing

requirements and duties. The observed skewness toward positive values implies a deliberate strategy to attract candidates by framing roles as supportive and development oriented. Outliers with particularly positive sentiment likely reflect promotional language aimed at differentiating job postings in a competitive labor market.

The percentage share of each type of sentiment for the requirements and obligations formulated by employers was also presented (Table 2).

The percentage distribution of sentiment categories for requirements and duties is presented in Table 2. A majority of advertisements were written in a positive tone (58.78 % for requirements and 54.39 % for duties). This suggests that employers aim not only to clearly present expectations but also to motivate potential candidates by portraying positions as attractive and conducive to professional growth. A substantial share of postings also adopted a neutral tone (40.27 % for requirements and 43.11 % for duties). Neutral formulations tend to focus on factual, professional descriptions without emotional coloring, which may appeal to candidates who value clarity and precision in the recruitment process. Only a small minority of postings conveyed a negative tone (0.95 % for requirements and 2.5 % for duties), suggesting that language emphasizing challenges or difficulties is rare.

In summary, Table 2 complements the box plot by quantifying sentiment distribution. The predominance of positive and neutral tones, combined with the marginal presence of negative sentiment, indicates a deliberate communication strategy aimed at attracting potential candidates. These findings suggest that employers attempt to build a positive employer brand and avoid discouraging language that might dissuade qualified applicants.

Word cloud analysis

The collected job advertisements were subjected to a series of pre-processing operations to prepare the data for analysis. First, the descriptions of requirements and duties were tokenized into single words. Characters and symbols such as periods, commas, and dashes, as well as words irrelevant to the study, were removed to minimize the risk of distorted results caused by common terms overshadowing key phrases. The words were then reduced to their base forms, and all letters were standardized to lowercase. Next, the words were assigned to grammatical categories such as nouns, verbs, and adjectives. Because single words do not provide sufficient context to identify requirements or duties, it was necessary to analyze the relationships among words to understand how they interact. To this end, dependency analysis was applied to detect semantic and structural relationships in language, enabling the identification of frequently repeated word sequences, which is essential when studying employer expectations (Goldberg, 2017).

One of the most common tools in dependency analysis within natural language processing (NLP) is the use of n-grams. These are sequences of n consecutive elements in a text that help identify frequently occurring phrases in large data sets. The basic types of n-grams include unigrams, bigrams, and trigrams. Unigrams ($n = 1$) represent single words; bigrams ($n = 2$) represent pairs of consecutive words; and trigrams ($n = 3$) represent three-word sequences (Jurafsky & Martin, 2024). In this study, bigrams were used to capture important pairs that frequently co-occur in job postings. The results were visually represented through a word cloud, which highlighted the most frequently mentioned competencies and employer expectations for business analysts. Fig. 6 presents a word

cloud illustrating the key requirements identified in job offers.

The word cloud in Fig. 6 serves as a visual summary of the most frequently mentioned keywords in job postings. The relative size of each phrase reflects its frequency, allowing for quick identification of competencies most often expected by employers. The figure shows that employers often require candidates to have higher education and professional experience, at least at a basic level. Knowledge of English is one of the most common requirements. This is unsurprising, as most tools, technical documentation, software, and programming libraries are created in English, and many analysts work in international teams or serve foreign clients. Analytical skills are also central to the role of a business analyst, as indicated by phrases such as analytical skill, analytical ability, problem-solving, data analysis, analytical thinking, and business analysis. These skills enable effective data processing, risk identification, informed decision-making, process optimization, and forecasting based on historical data.

Technical competencies are equally important, as evidenced by phrases such as *power bi*, *ms office*, *SQL knowledge*, and *bpmn uml*. Proficiency in Microsoft Power BI allows analysts to create interactive dashboards and integrate data from diverse sources, including Microsoft SQL Server and Excel, ensuring consistency and comprehensiveness in analyses. Knowledge of UML and BPMN diagrams is also highly valued. UML diagrams are useful for designing and modeling IT systems, while BPMN diagrams visualize process flows. Both tools bridge business process understanding with technical system design, highlighting the hybrid analytical and technical skills required of business analysts. Employers also emphasize communication, which supports teamwork and ensures the accurate transfer of knowledge and analytical results. This emphasis is reflected in phrases such as *communication skill*, *communication ability*, *fluent communication*, and *solving skill*. In addition, project management competencies are frequently highlighted, with phrases such as *manage project*, *teamwork*, and *problem skill* indicating expectations that analysts not only run projects but also collaborate effectively with teams and monitor risks.

To further explore these results, skill requirements were analyzed by experience level. Fig. 7 presents the ten most frequently mentioned skills for junior specialists. As shown in the figure, *English language* occupies the top position, confirming the central role of language proficiency in this group. The next essential competencies are *project management* and *communication skills*, which, although ranked slightly lower, highlight employers' expectations that junior analysts contribute to basic coordination and effective communication. More advanced abilities, such as *strong skills* or *analytical skills*, appear only in the lower part of the ranking, suggesting that organizations anticipate these skills will be developed progressively as careers advance. The figure therefore demonstrates that for junior business analysts the most important areas are language, project management, and communication, while analytical expertise is expected to mature over time. Interestingly, employers also list *prior experience* at this stage, which may not necessarily refer to industry-specific practice but rather to any form of professional engagement, underscoring the importance of internships and early training opportunities.

Fig. 8 presents the ten most frequently mentioned skills for specialist analysts. As shown in the figure, *english language* remains the most important competence, confirming that language proficiency is essential across career stages. The next key skills are *project management* and *work experience*, which emphasize that specialists are expected to take greater responsibility for coordinating projects and applying their professional background in practice. *Higher education* is also frequently listed, reflecting the importance of formal qualifications at this level. In addition, employers highlight *problem solving* and *analytical skills*, together with technical knowledge such as *database knowledge* and *tools knowledge*. These requirements suggest that specialists must demonstrate strong communication abilities, increasing independence in their work, the capacity to solve complex problems, and proficiency in technical tools. The presence of *two years* among the most frequent

Table 2

Percentage distribution of sentiment for requirements and duties found in job advertisements for business analysts.

Sentiment	Requirements	Duties
Positive	58.78 %	54.39 %
Neutral	40.27 %	43.11 %
Negative	0.95 %	2.5 %



Fig. 6. Word cloud for key employer requirements towards business analysts. Author's illustration. Source: Own research results.

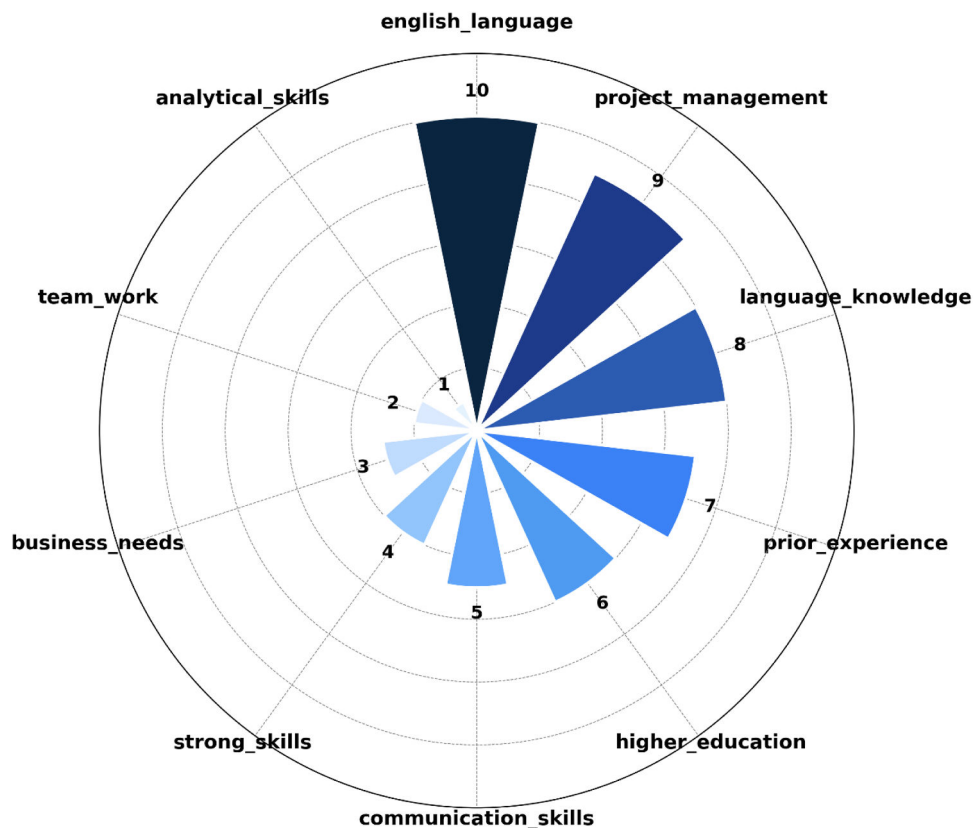


Fig. 7. Top 10 most frequent skills for junior analysts, with 10 representing the highest frequency. Source: Own research results.

phrases further indicates that employers often set prior professional experience, typically at least two years, as a baseline for entry into specialist roles.

The most important skills expected from a senior analyst are shown in Fig. 9. As illustrated, *english_language* once again holds the top position, confirming the continuing significance of language proficiency

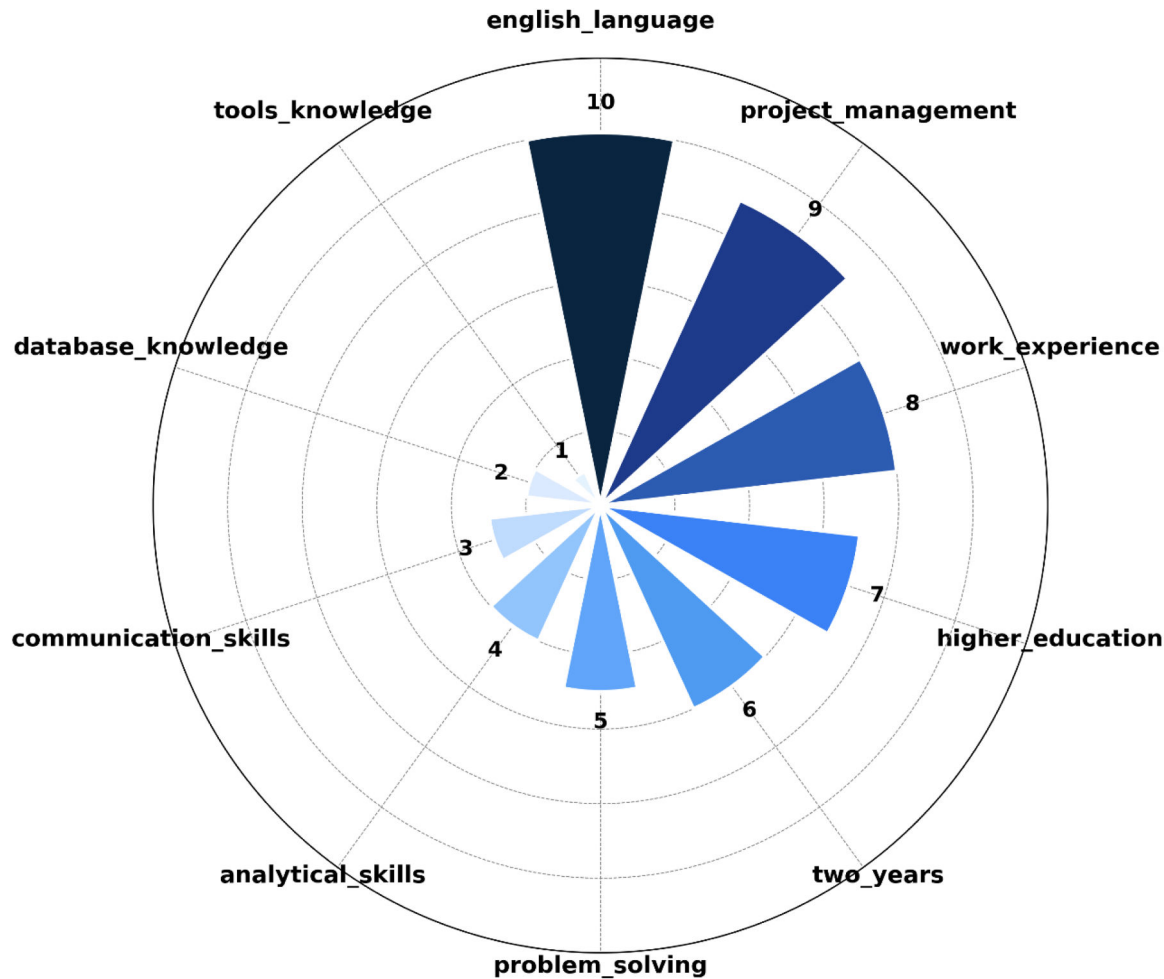


Fig. 8. Fig. 8. Top 10 most frequent skills for specialist analysts, with 10 representing the highest frequency.
Source: Own research results.

across all career stages. The next most emphasized competencies are *problem_solving* and *excellent_skills*, indicating that senior analysts are expected to address complex challenges with a high level of expertise. Employers also frequently list *analytical_ability* and *management_experience*, which reflect the need for advanced analytical reasoning as well as the ability to coordinate projects and lead teams. Other relevant skills include *communication_ability*, *business_requirements*, and *data_management*, all of which highlight the broader strategic responsibilities of senior analysts. The appearance of *attention_detail* among the most frequent skills underscores the importance of precision in handling large volumes of information and ensuring accuracy in decision-making.

In summary, the analysis shows that junior analysts are expected to demonstrate proficiency in English, effective communication, and basic project management. Specialists are additionally required to possess problem-solving abilities and knowledge of analytical tools. Senior analysts must combine advanced analytical expertise with management skills and the ability to define and oversee business requirements. Across all levels, professional experience is consistently valued, though the definition of experience differs: for junior candidates, general work experience may suffice, while for senior analysts, years of specialized practice are essential. This has implications for universities, which should provide students with practical opportunities, such as internships and certifications, to enhance employability.

Finally, [Table 3](#) summarizes the most frequently required programming languages and analytical tools. The ranking is based on their popularity in job postings, with level 1 representing the most frequently mentioned and level 10 the least. At the top of the list is Microsoft SQL

Server, which is highly valued for managing large data sets and storing sensitive business information related to customers, products, and finances. In second place is Microsoft Excel, a tool that continues to play a central role in everyday business analysis by enabling statistical calculations, pivot tables, and advanced visualizations. Python appears in third position, reflecting its growing importance as a versatile programming language for data analysis, statistical modeling, and machine learning applications.

In addition to these core tools, employers often seek familiarity with Microsoft Power BI, a business intelligence platform used to build interactive dashboards and integrate data from multiple sources. Collaboration and project management are supported by tools such as Jira and Confluence, which facilitate progress monitoring, documentation, and teamwork in analytical projects. Job postings also include requirements for R and SAS, both of which are powerful environments for advanced statistical analysis and data processing. Some advertisements highlight knowledge of Enterprise Architect, a system modeling tool based on UML notation that connects business requirements with IT solutions. Finally, Tableau appears as a leading tool for interactive data visualization, though it is mentioned less frequently than Power BI, suggesting employers' preference for Microsoft solutions in the Polish labor market.

Taken together, the results presented in [Table 3](#) show that employers expect business analysts to combine proficiency in traditional office software with knowledge of modern programming languages and advanced visualization platforms. The strong emphasis on SQL, Excel, and Python demonstrates the importance of technical versatility, while

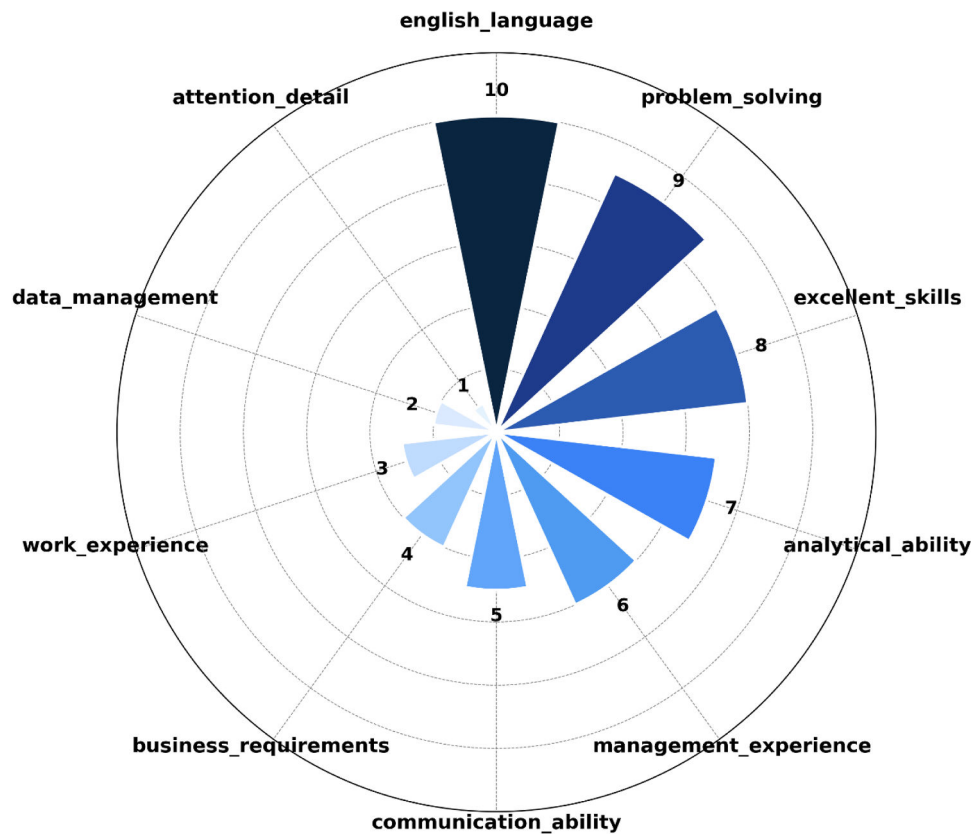


Fig. 9. op 10 most frequent skills for senior analysts, with 10 representing the highest frequency.
Source: Own research results.

Table 3

Percentage distribution of sentiment for requirements and duties found in job advertisements for business analysts.

Tools and programming languages	Popularity lever
Microsoft SQL Server	1
Microsoft Excel	2
Python	3
Microsoft Power BI	4
Jira	5
Confluence	6
R	7
SAS	8
Enterprise Architect	9
Tableau	10

the presence of project management and system modeling tools highlights the need for analysts to work effectively at the interface of business, data, and technology.

Discussion

This section synthesizes the results to highlight not only the competencies most frequently demanded by employers but also their significance in the contemporary business environment. Particular attention is devoted to how universities and other educational institutions can adapt their curricula to prepare graduates more effectively for market expectations, especially given the increasing importance of hybrid skillsets that combine technical, analytical, and interpersonal abilities. The discussion also compares the findings of this study with international literature to validate the consistency of employer expectations across markets and frameworks such as the Business Analysis Body of Knowledge (BABOK). Finally, it reflects on how job

advertisement practices, including tone and clarity in describing skill requirements, influence candidate perceptions and contribute to more effective recruitment strategies.

To structure the analysis of competencies, this study draws upon the BABOK Guide developed by the International Institute of Business Analysis (IIBA, 2015). This widely recognized framework outlines core areas of competence for business analysts, including business analysis planning, elicitation and collaboration, requirements analysis, and solution evaluation. Accordingly, we propose categorizing employer expectations into four main skill groups: technical, analytical, communication, and project management. This categorization is consistent with the competency model outlined in BABOK and aligns with the findings of Meredith et al. (2019), who emphasized that employers most frequently demand technical and analytical skills, followed by communication and project management competencies.

The results of the present study confirm that technical competencies play a crucial role in the business analyst profession. Employers place particular emphasis on proficiency in programming languages such as Python, R, and SQL, as well as data visualization and business intelligence tools such as Tableau and Power BI. Increasingly, familiarity with cloud-based solutions and big data platforms is also considered essential (Albright & Winston, 2016; Meredith et al., 2019). Analytical skills remain central, encompassing the ability to interpret complex data sets, construct predictive models, and apply statistical methods. Employers consistently expect strong problem-solving capabilities, and knowledge of machine learning models is becoming a highly desirable, if not indispensable, qualification (The PMI Guide to Business Analysis, 2017; Meredith et al., 2019). Communication skills are equally important, particularly the ability to present insights clearly to non-technical stakeholders. Business analysts are expected to demonstrate strong written and verbal communication, including the ability to prepare presentations and visual reports that effectively convey data-driven

conclusions (The PMI Guide to Business Analysis, 2017; Meredith et al., 2019). Finally, project management skills are increasingly valued, as business analysts are frequently responsible for leading or coordinating analytics projects, from identifying business needs to implementing data-driven solutions. Knowledge of project management methodologies such as Agile and Scrum is regarded as a valuable asset (Ndlela & Tanner, 2022).

These findings are consistent with international research. Meredith et al. (2019), who analyzed 240 job advertisements in Australia and New Zealand, identified problem-solving, communication, stakeholder collaboration, project management, implementation, and technical competencies (e.g., SQL and BI tools) as the most sought-after skills. Notably, some competencies valued by employers, such as project management, implementation, and technical skills, were not explicitly included in the BABOK framework. Similar conclusions were reported by De Mauro et al. (2018), who analyzed postings in the USA and Europe and found that project management, databases, BI tools, analytics, and business impact skills were most frequently requested. Fox et al. (2021), using the O*NET framework, further divided analyst competencies into knowledge, skills, abilities, and work styles, highlighting both hard and soft skills, including SQL proficiency, critical thinking, communication, and initiative, as essential for success in the business analytics profession. Taken together, these studies demonstrate a high level of consistency in the competencies required of business analysts across regions, with recurring emphasis on problem-solving, communication, data analysis, and technical skills. Our results similarly indicate that employer expectations consistently cluster into four main domains: technical, analytical, communication, and project management.

On this basis, we propose that higher education institutions consider incorporating certification-oriented modules and experiential learning components that align with these areas. Although this study does not directly assess the impact of certifications, the frequent references to tools such as SQL, Power BI, Python, and Jira suggest that integrating vendor-neutral or tool-specific certifications (e.g., Microsoft Power BI, Google Data Analytics, or Agile/Scrum fundamentals) into curricula could substantially improve graduate employability. The findings also highlight that even junior-level positions frequently require some form of prior experience. This underscores the need for structured experiential learning opportunities, such as internships, case-based courses, simulations, or collaborative projects with industry partners, which can serve as substitutes for traditional professional experience in the eyes of employers.

Beyond confirming the established importance of technical, analytical, communication, and project management skills, this study provides additional insights into how expectations shift across career levels. For junior analysts, language proficiency and basic communication skills dominate, whereas senior analysts are expected to demonstrate complex problem-solving, leadership, and project management competencies. This progression underscores the importance of aligning educational program design and career development planning with evolving skill requirements. Second, the application of sentiment analysis offers novel insights into how employers strategically frame job advertisements. The predominance of positive and neutral tones suggests that organizations deliberately aim to project an attractive employer brand, minimize candidate discouragement, and appeal to a broader talent pool. This aspect of employer communication has rarely been addressed in prior studies of business analyst competencies, and therefore represents a unique contribution of the present study. Moreover, many postings include non-wage benefits and flexible work arrangements, such as hybrid or remote models, private healthcare, training opportunities, and career development support. These practices indicate growing competition for talent and demonstrate that employers are increasingly attentive to the overall attractiveness of their value proposition.

Finally, differences across recruitment platforms reveal segmentation within the labor market. LinkedIn appears to emphasize junior positions, while Pracuj.pl serves as a major channel for mid-level

professionals. Recognizing these patterns can help both job seekers and recruiters tailor their search and outreach strategies. Based on these findings, we propose several recommendations for recruiters preparing job postings for business analysts. Job advertisements should clearly distinguish between required and optional skills, enabling candidates to assess their suitability more accurately. Descriptions should balance technical competencies, such as SQL or Power BI, with soft skills, including communication and problem-solving, which employers consistently emphasize. The language used should be concise and free from unnecessary jargon, ensuring clarity and accessibility for a wide pool of applicants. Including concrete examples of responsibilities, tools (e.g., Power BI, SQL), and methodologies (e.g., BPMN, Agile) enhances relevance and transparency. Finally, the tone of the job description should reflect the organizational culture, particularly given that sentiment analysis revealed a strong tendency toward neutral or positive framing, which is likely to resonate with candidates who value professional development and collaborative environments. Implementing these practices may improve both the quality and diversity of applications, particularly in a competitive and digitally evolving labor market.

Conclusions

The analysis of job postings for business analysts conducted in this study provides several key insights that can inform the design and refinement of educational programs for future professionals. The complexity of modern business environments, combined with rapid technological advancements, has elevated the importance of the business analyst role (Mashhood & Senapathi, 2020; Popoola et al., 2024). Consequently, higher education institutions must adapt their curricula to meet evolving employer expectations and prepare graduates for the challenges of the contemporary labor market.

The results indicate a growing demand for a combination of technical and analytical skills. Employers emphasize proficiency in data analysis tools such as Power BI, knowledge of databases, and the ability to interpret complex data sets. Universities should therefore integrate data science and technical courses into their curricula, while also ensuring that students understand business processes and can apply technical knowledge to problem-solving and decision-making contexts. Communication and project management skills are equally prominent in job postings, highlighting the expectation that business analysts bridge the gap between technical teams and business stakeholders. Accordingly, curricula should incorporate training in teamwork, presentation, and report writing, as well as project management principles, particularly within agile frameworks, to prepare students for leading and executing analytical projects.

The findings also reflect broader labor market trends. The increasing prevalence of hybrid and remote work models, along with non-wage benefits such as healthcare and flexible working hours, demonstrates a shift toward more employee-centered workplaces. Universities can respond to these changes by offering virtual internships and remote collaboration opportunities, helping students prepare for varied employment contexts. Equally important, the sentiment analysis revealed that job postings are most often formulated in positive or neutral tones. This suggests that employers strategically frame advertisements to project an attractive employer brand, minimize candidate discouragement, and appeal to a broad pool of applicants. This insight, which has rarely been addressed in previous studies on business analyst competencies, represents an important and original contribution of the present research.

In addition to identifying core competencies, this study underscores the dynamic nature of employer expectations across career stages and recruitment platforms. Junior analysts are primarily expected to demonstrate language proficiency and basic communication abilities, while senior analysts are increasingly required to show advanced problem-solving, leadership, and project management competencies. These findings emphasize the need for higher education institutions to

design curricula that support the progressive development of competencies across different career levels. The segmentation observed across recruitment platforms is also noteworthy. LinkedIn is used more frequently for junior-level recruitment, while Pracuj.pl plays a dominant role in mid-level recruitment. Recognizing these patterns can help job seekers and recruiters tailor their strategies more effectively.

Although this study provides valuable insights into employer expectations, it also has limitations. The analysis is descriptive and exploratory, based on cross-sectional data from online job postings. This approach makes it possible to identify associations between employer expectations and the skills most frequently mentioned but does not allow for causal inference. The reliance on job postings also means that results reflect demand-side perspectives only, without a systematic assessment of academic supply. A preliminary answer to this issue is offered by Kowalska-Styczeń & Juszczyk (2024), who analyzed bachelor's and engineering programs in Poland. Their study revealed a divergence in focus: bachelor's programs tend to offer broader curricula, including interpersonal and communication skills that are critical for cross-functional collaboration, while engineering programs emphasize technical and analytical skills and often neglect communication and project management. Additionally, the study highlighted that while engineering students are well-prepared for technically demanding roles, they may lack essential soft skills needed in client-facing or team-driven environments. Only a few programs included project management courses, and none offered structured training in communication skills. In comparison, programs such as the Business Analytics major at the Silesian University of Technology provided the most diverse and balanced skill development. These findings suggest that although students gain valuable preparation in technical areas, a gap remains between educational outcomes and the broader skill set expected by employers in the evolving digital economy.

Future research should address these gaps by using longitudinal data to analyze how employer requirements and educational responses evolve. Examining the impact of curriculum changes on graduate employability would provide insights into the alignment between academic offerings and labor market needs. Integrating analyses of both demand-side data from employers and supply-side data from universities would allow for a more comprehensive assessment of alignment. Surveys and interviews with graduates and employers could further validate findings and offer practical perspectives on skill adequacy. Finally, cross-country comparative studies could determine whether the trends observed in Poland are context-specific or reflect broader international patterns.

CRedit authorship contribution statement

Agnieszka Kowalska-Styczeń: Writing – review & editing, Writing – original draft, Validation, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Kinga Juszczyk:** Visualization, Software, Resources, Investigation, Data curation.

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References

- Albright, S., & Winston, W. (2016). *Business analytics: Data analysis and decision making* (6th ed.). Cengage Learning Next.
- Barlette, Y., & Baille, P. (2022). Big data analytics in turbulent contexts: Towards organizational change for enhanced agility. *Production Planning & Control*, 33, 105–122. <https://doi.org/10.1080/09537287.2020.1810755>
- Bayrak, T. A. (2015). Review of business analytics: A business enabler or another passing fad. *Procedia - Social and Behavioral Sciences*, 195, 230–239. <https://doi.org/10.1016/j.sbspro.2015.06.354>.
- Chahal, H., Jyoti, J., & Wirtz, J. (2019). Business analytics: Concept and applications. In H. Chahal, J. Jyoti, & J. Wirtz (Eds.), *Understanding the role of business analytics* (1st ed., pp. 1–8). Some Applications. Softcover reprint of the original.
- Conboy, K., Mikalef, P., Dennehy, D., & Krogstie, J. (2020). Using business analytics to enhance dynamic capabilities in operations research: A case analysis and research agenda. *European Journal of Operational Research*, 281(3), 656–672. <https://doi.org/10.1016/j.ejor.2019.06.051>
- Darajimba, E. C., Nwasike, C. N., Adegbite, A. O., Ezeigweneme, C. A., & Gidiagba, J. O. (2024). Comprehensive review of agile methodologies in project management. *Computer Science & IT Research Journal*, 5(1), 190–218. <https://doi.org/10.51594/csitjr.v5i1.717>
- Deming, D. J., & Silliman, M. I. (2024). *Skills and human capital in the labor market* (NBER working paper no. 32908). National Bureau of Economic Research. <https://doi.org/10.3386/w32908>
- De Mauro, A., Greco, M., Grimaldi, M., & Ritala, P. (2018). Human resources for big data professions: A systematic classification of job roles and required skill sets. *Information Processing & Management*, 54(5), 807–817. <https://doi.org/10.1016/j.ipm.2017.05.004>
- Evans, R. J. (2017). *Business analytics - Methods, models and decisions* (2nd ed.). London, England: Pearson Education Limited.
- Farayola, O. A., Abdul, A. A., Irabor, B. O., & Okeleke, E. C. (2023). Innovative business models driven by AI technologies: A review. *Computer Science & IT Research Journal*, 4(2), 85–110. <https://doi.org/10.51594/csitjr.v4i2.608>
- Farayola, O. A., Adaga, E. M., Egieya, Z. E., Ewuga, S. K., Abdul, A. A., & Abrahams, T. O. (2024). Advancements in predictive analytics: A philosophical and practical overview. *World Journal of Advanced Research and Reviews*, 21(03), 240–252. <https://doi.org/10.30574/wjarr.2024.21.3.2706>
- Fischer, M., Imgrund, F., Janiesch, C., & Winkelmann, A. (2020). Strategy archetypes for digital transformation: Defining meta objectives using business process management. *Information & Management*, 57(5), Article 103262. <https://doi.org/10.1016/j.im.2019.103262>
- Fox, M., Brees, J. L., & Vaidyanathan, G. (2021). Competency evaluation for careers in business intelligence analysis. *Issues in Information Systems*, 22(4), 157–167. https://doi.org/10.48009/4_iis_2021_168-179
- Gartner. (2018). IT glossary. Retrieved from <https://www.gartner.com/it-glossary> Accessed September 6, 2024.
- Goldberg, Y. (2017). *Neural network methods for natural language processing. Synthesis lectures on human language technologies*. San Rafael, CA: Morgan & Claypool. <https://doi.org/10.2200/S00762ED1V01Y201703HLT037>
- Hamilton, W., Clark, K., Leskovec, J., & Jurafsky, D. (2016). Inducing domain-specific sentiment lexicons from unlabeled corpora. In *Proceedings of the 2016 Conference on Empirical Methods in Natural Language Processing* (pp. 595–605). Austin, Texas: Association for Computational Linguistics.
- Heimerl, F., Lohmann, S., Lange, S., & Ertl, T. (2014). Word Cloud Explorer: Text analytics based on Word clouds. In *Proceedings of the 47th Hawaii International Conference on System Sciences* (pp. 1833–1842). Waikoloa, HI, USA: IEEE. <https://doi.org/10.1109/HICSS.2014.231>
- Hutto, C., & Gilbert, E. (2014). VADER: A parsimonious rule-based model for sentiment analysis of social media text. In *Proceedings of the International AAAI Conference on Web and Social Media* (pp. 216–225). Palo Alto, CA: AAAI Press. <https://doi.org/10.1609/icwsm.v8i1.14550>, 8(1).
- IIBA. (2015). *A guide to the business analysis body of knowledge (Version 3.0)*. Toronto, Ontario, Canada: International Institute of Business Analysis.
- Isnan, M., Elwirehardja, G., & Pardamean, B. (2023). Sentiment analysis for TikTok review using VADER Sentiment and SVM model. *Procedia Computer Science*, 227, 168–175. <https://doi.org/10.1016/j.procs.2023.10.514>
- Jurafsky, D., & Martin, J. (2024). *Speech and language processing: An introduction to natural language processing, computational linguistics, and speech recognition with language models* (3rd ed.). Boulder, CO: University of Colorado.
- Kristoffersen, E., Mikalef, P., Blomsma, F., & Li, J. (2021). The effects of business analytics capability on circular economy implementation, resource orchestration capability, and firm performance. *International Journal of Production Economics*, 239, Article 108205. <https://doi.org/10.1016/j.ijpe.2021.108205>
- Krystcynski, D., Reeves, C. A., Stice-Lusvardi, R., Ulrich, M. D., & Russell, G. (2017). Analytical abilities and the performance of HR professionals. *Human Resource Management*, 57(3), 715–738. <https://doi.org/10.1002/hrm.21854>
- Kulikowski, K. (2024). Defining analytical skills for human resources analytics: A call for standardization. *Journal of Entrepreneurship, Management and Innovation*, 20(4), 88–103. <https://doi.org/10.7341/20242045>
- Liu, S., Liu, O., & Chen, J. (2023). A review on Business analytics: Definitions, techniques, applications and challenges. *Mathematics*, 11(4), 899. <https://doi.org/10.3390/math11040899>
- Mashhood, A., & Senapathi, M. (2020). Understanding the role of business analysts in digital transformation: A multivocal literature review. In *Proceedings of the Australasian Conferences on Information Systems (ACIS 2020)*. Wellington, New Zealand: AIS (Association for Information Systems). Paper 34 <https://aisel.aisnet.org/acis2020/34>.
- Meredith, P., Summons, P. F., Park, M., & Cheek, B. (2019). What do employers expect from business analysts and is it captured by the "Business Analysis Body of Knowledge" (BABOK)? In *Proceedings of the Australasian Conference on Information Systems (ACIS 2019)*. Perth, Australia: AIS (Association for Information Systems). Paper 175 <https://aisel.aisnet.org/acis2019/93>.
- Min, H. (2016). *Global business analytics models: Concepts and applications in predictive, healthcare, supply chain, and finance analytics* (1st ed.). FT Press Analytics.

- Ndlela, M., & Tanner, M. (2022). Business analysts' contributions to the dynamic capabilities of agile software development teams. *Information Technology & People*, 36(8). <https://doi.org/10.1108/ITP-08-2021-0656>
- Popoola, O. A., Adama, H. E., Okeke, C. D., & Akinoso, A. E. (2024). The strategic value of business analysts in enhancing organizational efficiency and operations. *International Journal of Management & Entrepreneurship Research*, 6(4), 2664–3596. <https://doi.org/10.51594/ijmer.v6i4.1059>
- Sarica, S., & Luo, J. (2021). Stopwords in technical language processing. *PLoS ONE*, 16(8). <https://doi.org/10.1371/journal.pone.0254937>
- Schmitt, M. (2023). Deep learning in business analytics: A clash of expectations and reality. *International Journal of Information Management Data Insights*, 3(1), Article 100146. <https://doi.org/10.1016/j.jjimei.2022.100146>
- Skeppstedt, M., Ahlert, M., Kucher, K., & Lindström, M. (2024). From word clouds to word Rain: Revisiting the classic word cloud to visualize climate change texts. *Information Visualization*, 23(3), 217–238. <https://doi.org/10.1177/14738716241236188>
- Skríbans, V., & Kotlars, A. (2024). European cargo vehicle market dataset for 2023. *Data in Brief*, 55, Article 110648. <https://doi.org/10.1016/j.dib.2024.110648>
- The PMI Guide to Business Analysis. (2017). Project management institute, Inc, Pennsylvania.
- Uwaoma, P. U., Eleogu, T. F., Okonkwo, F., Farayola, O. A., Kaggwa, S., & Akinoso, A. (2024). AI's role in sustainable business practices and environmental management. *International Journal of Research and Scientific Innovation*, 10(12), 359–379. <https://doi.org/10.51244/IJRSL.2023.1012029>
- Vanden Boucke, S., & Baesens, B. (2018). *Practical web scraping for data science: Best practices and examples with python* (1st ed.). Berkeley, CA: Apress. <https://doi.org/10.1007/978-1-4842-3582-9>
- Kowalska-Styczeń, A., & Juszczak, K. (2024). Preparing business analysts for the modern job market: A comparative analysis of skills and education. *Scientific Papers of Silesian University of Technology. Organization and Management Series*, (208), 215–231. <https://doi.org/10.29119/1641-3466.2024.208.13>