

ANALYSIS OF THE EMPLOYEE SENTIMENT AS THE TOOL TO BUILD POSITIVE WORKING ENVIRONMENT

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Purpose: The purpose of this paper is to identify the possibilities to use Employment Sentiment Analysis (ESA) to build positive working environment.

Design/methodology/approach: The paper is an attempt to identify the awareness of managers and specialists in big companies about the possibility to use ESA and Employee Sentiment Analysis Tools (ESAT). The answers to the research questions were helpful to meet the paper objectives. The data from own empirical research conducted with the use of CAWI (Computer-Assisted Web Interview) were used in the research. The analysis of available source materials – scientific papers, Internet platforms with the inbuilt AI tools to ESA was performed in the paper.

Findings: The analyses presented in the paper show that the awareness level of managers and specialists in big companies about the existence of ESAT is rather low. The younger the generation the more they notice the positive influence of using ESAT by employers on their engagement as well as they declare the readiness to take up work in an organization which uses such tools. Nevertheless, the condition is that the employers inform workers about using ESAT. Fears referring to the data privacy and security arising from using ESAT depend on the respondents' belonging to the specific generation. The younger the generation, the lower the fears are.

Research limitations/implications: Examining the level of awareness of managers and specialists in big companies about the existence of ESAT is the introduction to research connected with building positive working environment. The authors claim that further research should be focused on using other modern information technologies – among others Internet platforms with built-in AI tools shaping employees' well-being.

Practical implications: In the business culture oriented on the employee's well-being ESA makes it possible to track employees' emotions, moods and reviews about a given subject. Thanks to ESA, the employers may identify positive, negative or neutral employees' attitude, which makes it possible to react to the potential problems quickly and to improve working conditions.

Originality/value: The results of the conducted survey research should be regarded as an attempt to present a new opinion in the scientific discussion about the possibility to use ESA and ESAT. As this issue is widely recognized in the subject literature, the issue of identification

the awareness of managers and specialists in big companies about the possibility to use ESAT is recognized weakly.

Keywords: Employee sentiment analysis (ESA), employee sentiment analysis tools (ESAT), working environment.

Category of the paper: research paper.

1. Introduction

In the era of widely-spread digitalization and access to the Internet the number of data generated and shared in a digital form is increasing exponentially. The number of generated data was about 19% higher for the last three consecutive years (2020-2023) than all the data from before 2020 (Raghunathan, Kandasamy, 2023). The phenomenon of expressing and sharing opinions, comments to the entries in the Internet blogs and posts in social media is common. The effective use of social data in the context of competition causes the dynamic development of multidisciplinary approach such as sentiment analysis. This approach covers psychology, sociology, management and economics as well as natural language processing and machine learning (Ligthart et al., 2021).

This paper is an attempt to analyse the awareness of managers and specialists in big companies concerning the possibilities to use employee sentiment analysis and information tools supporting the performance of such an analysis¹. It was planned to conduct the survey research the purpose of which is to identify the opinions of managers and specialists in big companies concerning their attitude to possible use of employee sentiment analysis tools (ESAT) by their employers. The trial to answer the following research questions may be helpful to meet the paper objective:

- RQ1. In which rate are managers and specialists in big companies aware of the existence of employee sentiment analysis tools and how does this awareness affect their approach to the potential use of these tools by their employers?
- RQ2. How does the perception of managers and specialists in big companies concerning the impact of employee sentiment analysis tools on the working environment influence their readiness to take up work in the organization which uses such tools?
- RQ3. In which rate do the fears regarding the data privacy and security affect the acceptance of managers and specialists in big companies to use employee sentiment analysis tools by employers?

The exploration of the above research questions will enable to identify the possibilities to use sentiment analysing to build the positive working environment.

¹ The dynamic development of this research area has started since 2004, presented in a significant increase in scientific papers in the field of sentiment analysis and opinion exploration (Birjali et al., 2021).

2. Sentiment analysis and employee sentiment analysis tools

Sentiment analysis² is the set of activities consisting in detecting the review polarity qualified as phrases which present positive, negative or neutral emotions (Baj-Rogowska, 2019). As for sentiment analysis³ and monitoring employees' moods, HR departments use various Internet platforms with built-in AI tools which analyse internal communication (e.g. e-mails or messages on the communication platforms) concerning their sentiment to identify the changes in employees' moods and early signals of potential problems connected with well-being. The sentiment analysis in the assessment of employees' well-being allows to recognize and classify emotions expressed in the communications connected with the workplace automatically, which facilitates the comprehension of the general mood among employees. Thanks to such solutions, the employers may identify positive, negative or neutral employees' attitude, which enables to react on potential problems quickly and to improve working conditions⁴. The examples of such Internet platforms with AI tools are presented in Table 1.

Table 1.

Examples of Internet platforms with the built-in AI tools for employee sentiment analysis

	Name of the Internet platform with built-in AI tools	Characteristics
1.	Culture Amp ⁵	<ul style="list-style-type: none"> – Enables the performance of employees' surveys with the advanced sentiment analysis, allowing the organisations to understand what their employees really feel. – Uses AI algorithms to analyse open responses in surveys, identifying employees' moods.
2.	Microsoft Viva Glint ⁶	<ul style="list-style-type: none"> – Uses the advanced analytics and AI to analyse the feedback from employees helping the organisations to improve employees' wellbeing. – Analyses employee sentiment in the real time, enabling to identify and solve problems quickly.

² In the literature the terms sentiment analysis or opinion mining appeared in the beginning of 21st century in the works of Nasukawa, Yi (2003); Pang, Lee, Vaithyanathan (2002) in the context of identifying the subjective polarity together with determining the strength of such polarity (strong, weak) of a given text which was the opinion of its author. Sentiment analysis is based on the methods and tools of Natural Language Processing (NLP), computational linguistics, big data and text mining and is part of business analyses and machine learning (Chaturvedi et al., 2018).

³ Sentiment analysis may be performed on three consecutive levels and namely: document, sentence, aspect (Dhanalakshmi, Sri Devi, 2020; Ligthart et al., 2021). Whereas the classification of sentiment is done with the use of such approaches as: machine learning (supervised learning methods and unsupervised learning methods); word methods, hybrid methods (Yusof et al., 2015, Al-Qablan et al., 2023).

⁴ The efficient analysis of reviews, moods, attitudes, notifications concerning selected area of company operating (products, services, processes) requires to include the existence of sarcasm, spelling mistakes, idiomatic expressions, abbreviations, which constitutes a big challenge in the area of affective computing and emotion recognitions (emotion recognition) (Valdivia et al., 2018).

⁵ <https://www.cultureamp.com/>

⁶ <https://www.microsoft.com/en-us/microsoft-viva/glint?ocid=cmmort1cgin>

Cont. table 1.

3.	Lattice ⁷	<ul style="list-style-type: none"> – Enables to conduct surveys referring to employees' engagement and efficiency which cover sentiment analysis. – Allows the HR managers to monitor changes in the employees' moods and fast reaction to possible problems. AI is used to analyse the survey data.
4.	Officevibe ⁸	<ul style="list-style-type: none"> – Specialises in gathering feedback from employees with the use of short, weekly surveys. – Uses sentiment analysis based on AI to help managers understand how the employees feel at work, showing potential problems with wellbeing.
5.	TINYpulse ⁹	<ul style="list-style-type: none"> – Enables the organisations to conduct anonymous work surveys and gather feedback. – Uses AI to analyse data, identify trends in employees' moods and to give insight into potential areas of dissatisfaction.

Source: own study.

The requirements, which sustainable human resources management faces concerning effective use of big data, social data, contribute to the increased interest in practical use of sentiment analysis to understand the emotional state which business employee experience in a better way (Raghunathan, Kandasamy, 2023).

3. Research method

The research was conducted with the use of CAWI method (Computer-Assisted Web Interview) in the period January 2024 – April 2024. The survey questionnaire was sent to big Polish companies situated in the Lodz and Silesia Provinces. The return from 117 companies was received in response. The research was voluntary and it is assumed to be a pilot observation. The respondents representing managers and specialists of big companies from two main sectors of economy: industry and services (with the exclusion of financial companies) participated in the research.

The suggested survey questionnaire consisted of 6 questions – 2 single-choice questions and 4 questions to which the even 4-grade Likert scale (without neutral option) was used. The even scale was chosen to encourage the respondents to take a more decisive approach, eliminating the possibility to select the “safe” middle response which does not present a clear opinion. The questions in the survey questionnaire were preceded with the definitions of employee sentiment analysis (ESA) and employee sentiment analysis tools (ESAT). They were as follows:

⁷ <https://lattice.com/>

⁸ <https://www.officevibe.com/>

⁹ <https://www.tinypulse.com/>

- ESA – is a process using the techniques of natural language processing (NLP), statistics and algorithms of machine learning to identify, analyse and interpret emotions, opinions and attitudes expressed by employees. It is aimed to understand the general atmosphere among employees, to identify the areas on which the attention should be paid and to monitor the changes in perceiving various work and organizational environment aspects. This analysis may refer to both unstructured text data such as employees' opinions gathered by surveys, emails, social media as well as more structured forms of feedback.
- ESAT – means software or Internet platforms using advanced technologies including Artificial Intelligence (AI) and Natural Language Processing (NLP) to automate the process of employee sentiment analysis. Taking advantage of the deep machine learning algorithms, the software classifies the gathered data to the emotional categories such as positive, neutral or negative sentiments. It may also identify more complex emotions such as satisfaction, frustration, joy or sadness as well as assess the intensiveness of these emotions. These tools allow to process big amounts of data in an effective way in order to get important information concerning employees' moods, emotions and opinions. They enable organisations to identify trends, problems and possibilities in a fast way to improve employees' engagement, satisfaction and general wellbeing. These tools may offer such functions as: engagement surveys, feedback analysis, management dashboards with data visualization and recommendations of actions.

4. Employee sentiment analysis in the light of empirical research results

In the research sample 57.5% of respondents (65 persons) represented the companies of the industry and 42.5% (48 persons) came from the service sector (non-financial service companies). Whereas, when it comes to the age, it was noticed that the representants of three generations participated in the research. Their relation was as follows: 36.6% generation X (41) persons, 50.4% generation Y (57 persons) and 13.3% generation Z (15 persons) (Figure 1). This paper presents the analysis of the respondents' answers concerning their belonging to generations X, Y and Z. Whereas, the analysis of the research results concerning the economic sectors (industry and non-financial services) will be continued, as the authors intend, within further research connected with the use of information tools to ESA.

The first question of the survey was to identify the respondents' awareness about the existence of the employee sentiment analysis tools in the market. The received data were presented in Table 2. Unfortunately, it turned out that while analysing the percentage number of indications, the answer to the question "Have you ever met the issue of using employee sentiment analysing tools?" was "No. I have also never met with the issue of employee sentiment analysis" the most often (40.7% of all respondents). However, the second most often

selected response – “Yes, but I have only heard about them and I do not know examples of such tools” should be assessed positively.

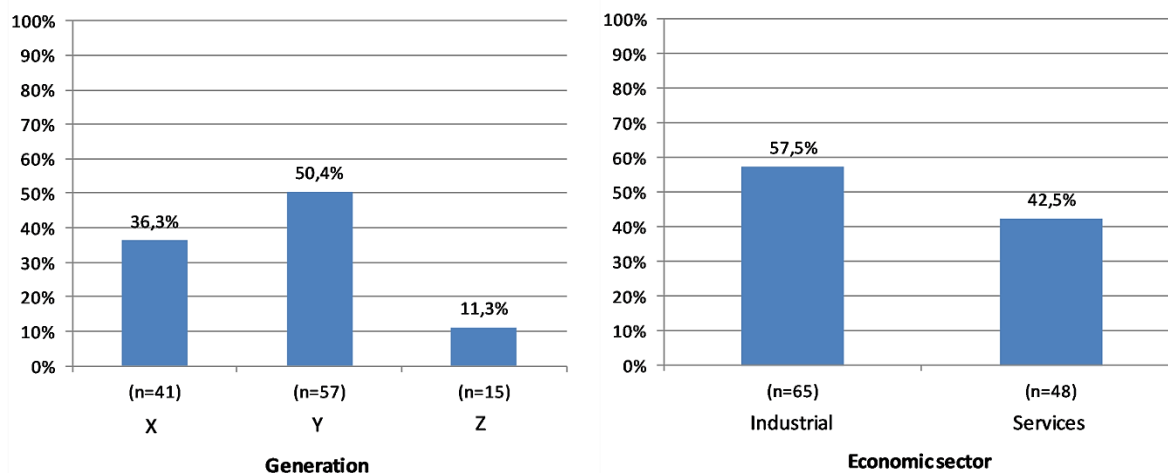


Figure 1. Characteristics of the research group – from the left: division according to the generation, division according to the economic sector.

Source: own study.

Thus, it turns out that 37.2% of all respondents heard about the ESA. Nevertheless, this group of respondents does not know the examples of employee sentiment analysis tools.

Table 2.

Awareness of the existence of employee sentiment analysis tools

Have you ever met the issue of using the employee sentiment analysing tools?	Generation (number of indications)			Total (number of indications %)
	X (n=41)	Y (n=57)	Z (n=15)	
Yes. I also know the examples of such tools.	-	5	-	4,4
Yes, but I have only heard about them and I do not know examples of such tools.	21	16	5	37,2
No, but I know the issue of the employee sentiment analysis.	15	5	-	17,7
No. I have also not met the issue of the employee sentiment analysis.	5	31	10	40,7

Source: own study.

In the next questions the respondents were asked to present their opinion concerning the following statement “I think that using the employee sentiment analysis tools by employers is beneficial to build good psycho-social working conditions” (Figure 2). The 4-grade Likert scale in the range from 1 (‘I strongly disagree’) to 4 (‘I strongly agree’) was used in the question. The response “I rather agree” was selected the most often – 51% of respondents from X generation, 63% of respondents from Y generation and 67% of respondents from Z generation, respectively. Analysing this response, the tendency may be noticed that the younger the generation, the stronger the opinion about the beneficial influence of using the employee sentiment analysis tools by employers on building the good psycho-social working conditions.

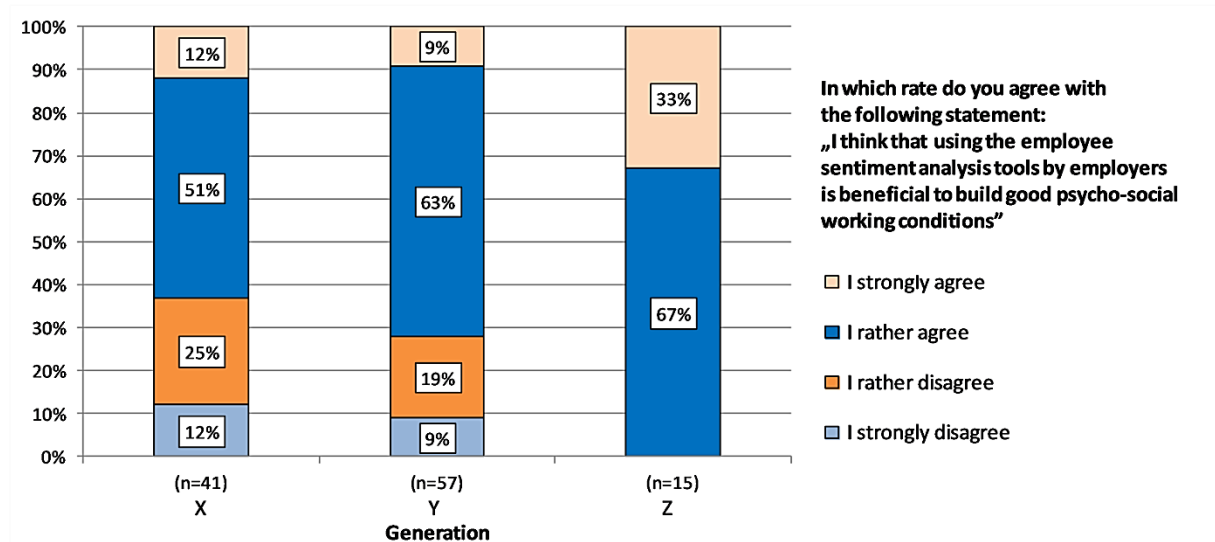


Figure 2. General approach to “Employee Sentiment Analysis Tools”.

Source: own study.

Referring to the formulated research question RQ1, it is possible to state that the awareness level of managers and specialists in big companies about the existence of information tools to employee sentiment analysis is rather low. However, their attitude to the potential use of these tools by their employers should be assessed as positive, accepting their use.

The next questions regarded the existence of possible respondents’ fears connected with the privacy and data security in the context of potential use of employee sentiment analysis tools by the employer. The question was as follows: “In which rate would you have fears connected with your data privacy and security if your employer used the employee sentiment analysis tools?” Possible responses: “No fears”, “Slight fears”, “Some fears” and “Great fears”. As many as 67% of respondents from Z generation selected the response “No fears”. The respondents from generations X and Y selected the answer “Some fears” the most often – 51% for generation X and 54% for generation Y, respectively. The fact should be emphasized that the respondents representing generation Z gave only extreme responses – “No fears” and “Great fears”. Moreover, the response “Great fears” constituted the biggest percentage of indications among generations X, Y and Z – 33% for Z generation, 25% for X generation and 9% for Y generation.

Whereas, referring to the research question RQ3, fears regarding data privacy and security arising from the use of employee sentiment analysis tools depend on the respondents’ belonging to the particular generation. The younger the generation, the lower the declared fears are.

The fourth question referred to the opinion of tested managers and specialists to the statement: “Using the employee sentiment analysis tools by employers affects the employees’ engagement in a positive way” (Figure 3).

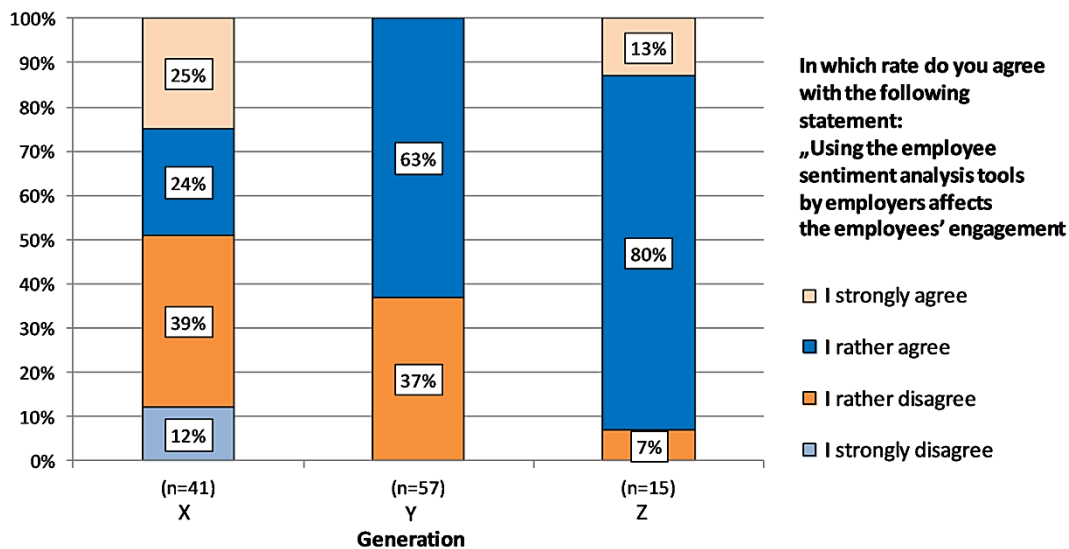


Figure 3. Influence on the employees' engagement.

Source: own study.

The 4-grade Likert scale in the range from 1 ('I strongly disagree') to 4 ('I strongly agree') was used in the question. The response "I rather disagree" was selected the most often among the respondents from X generation (39%), "I rather disagree" – generation Y (63%) and "I rather agree" – generation Z at the level of 80%. Summing up the indications "I strongly agree" and "I rather agree" in the particular generations, it can be noticed that the younger the generation, the more they agree with the statement presented in the survey.

The respondents were also asked to present their opinion about the following statement: "I accept the possibility of giving feedback (e.g. from the employees' surveys, notes from interviews, internal emails, social media) to the employer with the use of the employee sentiment analysis tools". The 4-grade Likert scale in the range from 1 ('I strongly disagree') to 4 ('I strongly agree') was also used in the question. The most often indicated response by the respondents from generation Y and Z was "I rather agree" – 63% and 67%, respectively. Whereas, the respondents belonging to generation X indicated the answer "I strongly disagree" the most often (Figure 4).

In the last, sixth question, the respondents were to express their opinion concerning the question: In which rate do you agree with the following statement: "I think that the employers should inform employees about using the employee sentiment analysis tools". The possible answers were: "I strongly agree", "I rather agree", "I rather disagree" and "I strongly disagree". The managers and specialists of big companies representing the particular generations had the same opinion. The most often indicated response was "I strongly agree" (generation X – 63%, generation Y – 83% and generation Z – 66%) and "I rather agree" (generation Z – 25%, generation Y – 17% and generation Z – 33%).

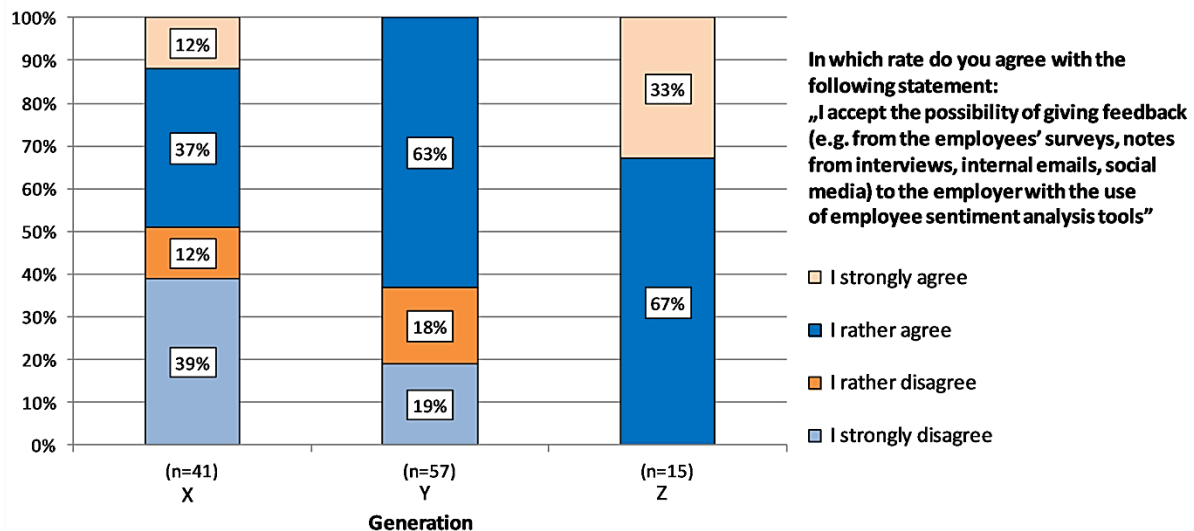


Figure 4. Openness on feedback and communication.

Source: own study.

Referring to the formulated research question RQ2, it turns out that the younger the generation, the more they see the positive influence of the use of employee sentiment analysis tools by employers on their engagement as well as they declare the readiness to take up work in the organisation which uses such tools. However, there is a condition that the employers inform their employees about using sentiment analysis tools.

The results of the conducted survey research presented above should be treated as an attempt to take new voice in the scientific discussion about the possibility to use employee sentiment analysis and employee sentiment analysis tools. As this subject is widely recognised in the literature, the issue of the awareness identification of managers and specialists in big companies concerning the possibilities of the sentiment analysis tools use is recognised poorly.

Maximising the wellbeing of employees in modern companies constitutes the priority of good practices of the sustainable human resources management. The organisations are obliged to possess the set of current information and data from internal interested parties about the employees' experience in their professional lives to shape friendly conditions of the working environment in a proper way. Work satisfaction and the employee's effort in the work process may cause positive feeling of satisfaction or be a source of disappointment (negative emotions). High level of employees' satisfaction contributes to the growth of motivation, performance and wellbeing, whereas dissatisfaction leads to the growth of the level of rotation and disturbances in the company functioning (Wijngaards, 2020).

By matching review data concerning the influence of employee sentiment analysis with firm level financial data, the analyses find that an 1% increase in positive ratings increases market value by approximately 0.68-0.73% and the company revenue by about 0.62-1.01%. It confirms the enormous meaning which has the employee sentiment analysis which in consequence contributes to the financial results in the real world (Feng, 2023).

ESA provides HR departments¹⁰ with incredibly useful and current information about the employee feelings about the company, examining how they communicate in their workplace (Dhanalakshmi, Sri Devi, 2020).

ESA provides the insight into positive and negative emotions, feelings thus into employee attitudes and approaches concerning the human resources policy, organisational culture, conditions of the working environment (Costa, Veloso, 2015). It contributes to the level of work satisfaction (Putra et al., 2023) of this group of interested parties and their loyalty towards the employer, determines the level of staff rotation (Dhanalaski, Seri Devi, 2023) or unwanted rate of human resources shortage (Xie, 2022), which in consequence indicates the level of future company profits (Moniz, Jong, 2014). Measuring the employee experience, the organisations may react to the needs, expectations or fears of employees proactively by tracking and detecting positive or negative trends in sentiments among the staff (Ramendran et al., 2024). According to Saxena et al. (2023), the general sentiment results and general productivity results are correlated positively, which means that the employee having a positive attitude to the work process is at the same time the more productive employee.

5. Conclusion

The key factor of firm competitive advantage is becoming the implemented modern IT and AI technologies which stimulate and positively influence on the increase in competences of firm human resources. The proper assessment of expectations, preferences, reviews as well as sentiments of organization participants is significant for the efficient management of employee life cycle starting from the recruitment and selection process to keeping the employee with high morale and career and achievement management.

Providing each employee with the work satisfaction and high level of wellbeing in an organization, which promotes supporting environment of cooperation, oriented on productivity is a challenge included in the objectives of sustainable human resource management.

ESA may help the organization determine their strengths and weaknesses presenting at the same time the ranking of so-called employer's brand value. It can also help the candidates looking for a job to optimize decisions by providing the information if the jobs offered at the

¹⁰ The example of the use of employee feedback sentiment analysis system which gathers and processes employee opinion from the websites is Glasdoor.com, Indeed.com that builds the picture of employee attitude and moods – providing monthly report to the HR workers. It includes the total number of positive or negative comments informing about the assessment of the level of remuneration, opinions, referring to the pressure phenomenon in the work process, work life balance, promotion prospects, work culture. The companies may then use this knowledge to reflect and understand social moods of various employee groups in a better way concerning the company brand, possessing the full awareness of requirements and preferences of work process participants. Such knowledge may be useful for both solving particular problems and introducing repair actions at the operational level as well as for introducing changes in the whole organization (Dhanalakshmi, Sri Devi, 2020).

labour market correspond to the future employees' expectations and possibilities (Dina, Juniarta 2020).

Examining the awareness level of managers and specialist in big companies about the existence of ESAT is a preliminary stage of research connected with building positive working environment. The authors think that further research should focus on the use of other modern information technologies – among others Internet platforms with built-in AI tools shaping employees' wellbeing.

References

1. Al-Qablan, T.A., Noor, M.H.M., Al-Betar, M.A. (2023). A survey on sentiment analysis and its applications. *Neural Computing and Applications*, 35(29), pp. 1-35, doi: 10.1007/s00521-023-08941-y.
2. Baj-Rogowska, A. (2019). Analiza sentymentu jako narzędzie monitorowania wyników finansowych przedsiębiorstwa. *Przedsiębiorczość i Zarządzanie*, 12(1), pp. 125-139.
3. Birjali, M., Kasri, M., Beni-Hssane, A. (2021). A comprehensive survey on sentiment analysis: Approaches, challenges and trends. *Knowledge-Based Systems*, 226, 107134, doi: 10.1016/j.knosys.2021.107134.
4. Chaturvedi, I., Cambria, E., Welsch, R.E., Herrera, F. (2018). Distinguishing between facts and opinions for sentiment analysis: Survey and challenges. *Information Fusion*, 44, pp. 65-77, doi: 10.1016/j.inffus.2017.12.006.
5. Costa, A., Veloso, A., (2015). Employee Analytics through Sentiment Analysis. *Brazilian Symposium on Databases At: Petrópolis - RJ - Brazil, Conference Paper, Vol. 30*, doi: 10.13140/RG.2.1.1623.3688.
6. Dhanalakshmi, R., Sri Devi, T. (2020). Adaptive cognitive intelligence in analyzing employee feedback using LSTM. *Journal of Intelligent & Fuzzy Systems*, 39(6), pp. 8069-8078, doi: 10.3233/JIFS-189129.
7. Dina, N.Z., Juniarta, N. (2020). Aspect based Sentiment Analysis of Employee's Review Experience. *Journal of Information Systems Engineering and Business Intelligence*, 6(1), pp. 79-88, doi: 10.20473/jisebi.6.1.79-88.
8. Feng, S. (2023). Job satisfaction, management sentiment, and financial performance: Text analysis with job reviews from Indeed.com. *International Journal of Information Management Data Insights*, 3(1), 100155, doi: org/10.1016/j.jjime.2023.100155.
9. Ligthart, A., Catal, C., Tekinerdogan, B. (2021). Systematic reviews in sentiment analysis: a tertiary study. *Artificial Intelligence Review*, 54, pp. 4997-5053, doi: 10.1007/s10462-021-09973-3.

10. Moniz, A., De Jong, F. (2014). Sentiment Analysis and the Impact of Employee Satisfaction on Firm Earnings. *European Conference on Information Retrieval*, pp. 519-527. doi: 10.1007/978-3-319-06028-6_51.
11. Nasukawa T., Yi J. (2003). *Sentiment analysis: Capturing favorability using natural language processing*. Proceedings of the 2nd International Conference on Knowledge Capture (K-CAP'03), ACM, New York, USA, pp. 70-77, doi: 10.1145/945645.945658.
12. Pang, B., Lee, L., Vaithyanathan, S. (2002). *Thumbs Up? Sentiment Classification Using Machine Learning Techniques*. Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP), pp. 79-86.
13. Putra, F.S., Puspitasari, I. (2023). Implementation of Sentiment Analysis in HR Management and Development Planning Using Topic Modelling on Employee Review. *Kontigensi: Jurnal Ilmiah Manajemen*, 11(2), pp. 409-417, doi: 10.56457/jimk.v11i2.358.
14. Raghunathan, N., Kandasamy, S. (2023). Challenges and Issues in Sentiment Analysis: A Comprehensive Survey. *IEEE Access*, 11, doi: 10.1109/ACCESS.2023.3293041.
15. Ramendran, C., Kumar Moona Haji, R., Amin, A., Marti, E.G., Nikolić, J.L. (2024). *Enhancing employee retention through sentiment analysis of workplace communication in the healthcare industry*. Proceedings of the ISC - Sinteza 2024.
16. Sainju, B., Hartwell, Ch., Edwards, J. (2021). Job satisfaction and employee turnover determinants in fortune 50 companies: Insights from employee reviews from Indeed.com. *Decision Support Systems*, 148(3), 113582, doi: 10.1016/j.dss.2021.113582.
17. Saxena, S., Deogaonkar, A., Pais, R.S., Pais, R. (2023) Workplace Productivity Through Employee Sentiment Analysis Using Machine Learning. *International Journal of Professional Business Review*, 8(4), doi: 10.26668/businessreview/2023.v8i4.1216.
18. Valdivia, A., Luzon, M.V., Cambria, E., Herrera, F. (2018). Consensus vote models for detecting and filtering neutrality in sentiment analysis. *Information Fusion*, 44, pp. 126-135, doi: 10.1016/j.inffus.2018.03.007.
19. Wijngaards, I., Burger, M., Van Exel, J. (2020). Unpacking the Quantifying and Qualifying Potential of Semi-Open Job Satisfaction Questions through Computer-Aided Sentiment Analysis. *Journal of Well-Being Assessment*, 4, pp. 391-417, doi: 10.1007/s41543-021-00040-w.
20. Xie, J., Su, R.L.G., Song, J. (2022). An analytical study of employee loyalty and corporate culture satisfaction assessment based on sentiment analysis. *Frontiers in Psychology*, 13, doi: 10.3389/fpsyg.2022.971569.
21. Yusof, N.N., Mohamed, A., Abdul-Rahman, S. (2015). Reviewing Classification Approaches in Sentiment Analysis. In: M. Berry, A. Mohamed, B. Yap (eds.), *Soft Computing in Data Science. SCDS 2015. Communications in Computer and Information Science*, 545 (pp. 43-53). Singapore: Springer, doi: 10.1007/978-981-287-936-3_5.