ADVANCES IN BUSINESS-RELATED SCIENTIFIC RESEARCH JOURNAL (ABSRJ)

Volume 15, Number 2 (2024) ISSN 1855-931X

# THE ROLE OF ORGANIZATIONAL CULTURE IN INFLUENCING EMPLOYEE PERFORMANCE: EMPIRICAL RESEARCH AT PT KAYULAPIS INDONESIA

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## Abstract

This research aimed to examine the influence of workload and motivation on employee performance, with organizational culture serving as the moderating factor. In order to achieve the aim, an analysis was conducted using a quantitative method on a sample size comprising 133 employees from the jumbo veneer production line of PT Kayulapis Indonesia. Data was collected through the distribution of questionnaires, which were compiled using a Likert scale with 5 (five) alternative answers. Furthermore, the research instruments were tested for both validity and reliability and the

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analytical tools adopted in the context of the investigation comprised multiple regression. The results showed that both workload and motivation positively influenced employee performance. It was also observed that organizational culture effectively moderated the influence of workload and motivation on employee performance. The results provided empirical evidence, which emphasized the role of organizational culture in strengthening the influence of workload and motivation on improving employee performance.

Key Words

Employee performance; motivation; organizational culture; workload; quantitative method.

## INTRODUCTION

Human resources is a very important element, specifically when considering organizational efforts toward the attainment of set goals. In accordance with this statement, Akinyele (2007) conducted an investigation where the substantial importance of human assets in the 21st century was emphasized. Another previous research asserted that management practitioners consider this form of resource as the most invaluable and volatile for any organization (Amha & Brhane, 2020). As observed, the effective and efficient use of human, material, financial, and information resources leads to the attainment of success within an organization (Oshagbemi, 2003). In accordance, it is important to establish that the quality of employees within an organization significantly influences the entire organizational performance. A very critical factor used to determine this quality includes the level of adaptability possessed by the employees to the work environment. As a result, in the current era of Industry 4.0, organizations are compelled to be discerning in the selection of high-quality and competitive human resources, given the strategic role each employee would be playing in the organizational framework.

Ideally, each organization is expected to take immediate steps and make relevant efforts toward the enhancement and cultivation of employee performance in order to actualize set goals. Based on this understanding, it can be concluded that employee performance occupies a very important position in an organizational hierarchy. Generally, the attainment of quality human resources is anchored upon the level of correspondence existing between the workload and capabilities of employees. Organizations usually carry out this activity to foster the augmentation and refinement of employee skills and performance in line with task exigencies and the fundamental priorities or set goals. It is important to also establish that employee performance is susceptible to the influence of workload, and situations where assigned tasks are accompanied by specific completion timeframes. In this situation, the ability of employees to fulfill assigned tasks and adapt

to responsibilities mitigates the transformation of tasks into burdensome workloads. However, failure to meet task requirements leads to the amplification of workload burdens.

In addition to workload, motivation plays a significant role in influencing employee performance. This factor typically creates intense passion driven by interests and aspirations that are aimed at enhancing employee performance. It fosters the development, acceleration, and adoption of attitudes and influences, thereby prompting shifts in behavior toward more favorable actions. It can be concluded that a proper understanding of employee motivation is important for harmonizing employee behavior with organizational expectations, specifically considering how both aspects shape attitudes and, consequently, performance.

Employee performance is simply a combination of effectiveness and efficiency in executing primary tasks, thereby making a substantial contribution to organizational performance. Various research has examined different factors influencing performance, for instance, Mathis & Jackson (2006) elucidated that work design was the primary element influencing employee performance (Mathis & Jackson, 2006). Excessive workload can impede employee focus and undermine performance. As defined by Gibson et al. (2012), issues related to workload are often a result of the assignment of an excessive number of duties and the allocation of insufficient time for the completion of the assigned tasks. According to Robbins et al. (2013), motivation refers to the willingness of employees to give high levels of effort toward organizational goals, contingent upon the capacity of such efforts to satisfy individual needs.

During the course of this investigation, organizational culture was also observed to play a crucial role in achieving shared objectives in an organization. This attribute provides an organization with a distinctive character that sets it apart from others in the same domain. The unique identity also fosters a sense of belonging among members, thereby nurturing loyalty both among the constituents and towards the organization as a whole. As stated by Robbins and Judge (2016), organizational culture represents a collective meaning system adopted by the organization. By leveraging this culture, members of an organization can be organized to collaborate effectively towards common goals, using it as a tool for coordination. In other words, the presence of standards and principles in an organization serves to guide and regulate its employees in pursuit of shared objectives.

The presence of an intact organizational culture fosters a stronger sense of belonging among employees, leading to a greater probability of prioritizing organizational goals and delivering optimum performance. Therefore, instilling organizational culture would typically promote an increased sense of ownership, and in turn, this increased sense fortifies the organization's entire strength. Based on observation, when employees become more deeply integrated into the organizational ethos and are inclined to be wholeheartedly dedicated to the objectives, work performance improves significantly. Therefore, this research aims to explore the ways in which organizational culture moderates the influence of workload and motivation on employee performance.

## LITERATURE REVIEW

In the era of Industry 4.0 and economic globalization, business organization is compelled to cultivate competitive advantages to ensure survival and relevance in the market. Central to this effort is the crucial role of human resources, as elucidated by Rich et al. (2010). Competitive advantage, in this regard, hinges on the presence of employees who possess the requisite skills and competencies capable of making substantial contributions to organizational growth and goal attainment (Liao & Chang, 2004). Based on this understanding, organizations are compelled to concentrate on factors that positively enhance employee performance, with the aim of fostering and sustaining a competitive edge in the market (Dahkoul, 2018).

### Relationship between workload and employee performance

Workload is invariably a determining factor influencing employee performance. Typically, employees burdened with high workloads often encounter challenges in completing assigned tasks in a designated timeline. This arises due to an imbalance between the mental capacity to process additional resources and the requisite abilities for task completion. When the ability to process additional resources falls short of the demands posed by the assignment, it leads to work overload. Previous research investigating the relationship between workload and employee performance, such as those conducted by Adrianto et al. (2020), Lutvi et al. (2021), and Abdullah and Halik (2023), found a positive and statistically significant effect. However, opposing observations have been made from research conducted by Ibrahim et al. (2022) and Tannady (2023), where no significant influence was found between workload and employee performance. Drawing upon the theoretical rationale underpinning the relationship between workload and employee performance and the observations from previous research, Hypothesis 1 (H1) was formulated as follows:

**H1:** Workload has a negative influence on employee performance

### Relationship between motivation and employee performance

Motivation manifests as an urge that emerges within employees, whether consciously or unconsciously, to pursue an action with a specific objective in mind. Based on this understanding, it can be seen that motivation plays a crucial role in influencing employees' enthusiasm for assigned work, thereby significantly influencing performance. Acting as an active driving force, motivation compels employees to carry out actions aimed at fulfilling personal needs and attaining desired goals, leading to the derivation of satisfaction from performed tasks. Based on observation, this phenomenon yields positive repercussions for organizations, as evidenced by the fact that increased employee motivation correlates with enhanced performance to foster the achievement of organizational success. Several investigations

have been conducted with the aim of exploring the relationship between motivation and employee performance. Some of these investigations include Gitongu et al. (2016), Adrianto et al. (2020), and Harefa and Saputra (2023), all of which identified a positive influence of motivation on employee performance. However, an opposing observation was made by Ibrahim et al. (2022), stating that motivation had no significant influence on employee performance. Drawing upon the conceptual elucidation and theoretical rationale underpinning motivation, in addition to the findings gleaned from previous research, Hypothesis 2 (H2) is formulated as follows:

**H2**: Motivation has a positive influence on employee performance

**The relationship between workload, motivation, and employee performance as a moderator of organizational culture**

According to Shahzad et al. (2017), organizational culture encapsulates the shared values and beliefs of employees, which are reflected across all levels of an organization. This notion was further elaborated by Warrick (2017), who emphasized that an organizational environment shapes how members think, behave, and perceive assigned work. Nikpour (2017) defined organizational culture as a composite of beliefs, values, and experiences that manifest in the material arrangements and behaviors of the members of an organization. Furthermore, in organizational culture, distinct manifestations such as innovative and bureaucratic cultures coexist (Tuffaha, 2020). According to Son & Vy (2022), an effective organizational culture serves as a catalyst for inspiring employees toward shared goals and objectives in an organization, thereby harmonizing employee behavior with the organizational strategic trajectory (Son & Vy, 2022). Typically, an innovative culture fosters a creative, results-oriented, and challenging work environment, while a bureaucratic culture embodies organizational structures that are systematic, procedural, and regulated. Both cultures have been observed to thrive in organizations that uphold shared values as an intrinsic part of identity. By cultivating shared values and beliefs in an organizational environment, which, in turn, impacts employee cognition and behavior, organizational culture presents the capability to significantly enhance the influence on employee performance. Based on this observation, Hypotheses 3 and 4 (H3 and H4) can be formulated as follows:

**H3:** Organizational culture moderates the influence of workload on employee performance
**H4:** Organizational culture moderates the influence of motivation on employee performance

## METHOD

This research is based on motivation theory, which was empirically tested in the context of organizational practice. Therefore, the results obtained from

the present investigation are anticipated to either corroborate and fortify this theory or challenge the validity. In accordance, the exploration was carried out using a combination of primary and secondary data. Primary data, serving as the primary dataset, was directly collected from selected respondents through the distribution of questionnaires aimed at soliciting pertinent information. Meanwhile, secondary data was obtained from external sources beyond the scope of the research object and incorporated to provide comprehensive analytical support.

## Sample and procedure

The random sampling method was used in this research with the primary aim of gathering relevant data from employees of PT Kayulapis Indonesia working in the jumbo veneer production line. The research design adopted a cross-sectional method, which included the collection of data at a single point in time. Accordingly, it is important to state that out of 200 employees in the observed section, a total of 133 valid survey questionnaires were distributed and collected in September 2023. The primary data collection method used a questionnaire designed with a 1-5 Likert scale. Meanwhile, secondary data, which was sourced from journals, literature, and other relevant sources, complemented the primary data, providing supplementary knowledge to support the research efforts.

## Measures

The initial step in ordinary least squares regression analysis includes determining the measurements of the research variables. Subsequently, the reliability and validity of each construct were assessed. This evaluation comprises examining the internal consistency, reliability, convergent validity, and discriminant validity of each indicator. Table 1 shows the measurement of research variables using a 1-5 Likert scale.

**Table 1:** Variable measures

| Variable | Measures (Question Items) | | Scale (Likert) (Score: 1-5) |
|---|---|---|---|
| | **Dimensions** | **Indicator** | |
| Workload (Koesomowidjojo,2017) | 1. Working Conditions | a. Work environment<br>b. Work equipment<br>c. Work facilities | 1= strongly disagree<br>2 = disagree<br>3 = neutral<br>4 = agree<br>5 = strongly agree |
| | 2. Use of Working Time | d. Work completion time<br>e. Time left after work<br>f. Work volume | |
| | 3. Targets | g. Work time balance | |
| Motivation Mc Clelland, 1976) | 1. Achievement | a. Desire to achieve | |

| | | |
|---|---|---|
| | | b. Recognition of achievements |
| | 2. Affiliate | c. Interaction with coworkers |
| | | d. Interaction with leadership |
| | 3. Power | e. Influence others |
| | | f. Desire to become a leader |
| Organizational Culture | | |
| Employee Performance (Mangkunegara, 2017) | 1. Quality | a. Accuracy |
| | | b. Accuracy |
| | | c. Skills |
| | | d. Cleanliness |
| | 2. Quantity | e. Number of works |
| | | f. Lots of time |
| | | g. Reliable |
| | | h. Following |
| | 3. Reliable | Instructions |
| | | i. Be careful and thorough |
| | | j. Want to collaborate |
| | **4.** Cooperative Attitude | k. Communication |
| Organizational culture (Robbins, 2016) | 1. Innovation and risk-taking | a. New thoughts/ideas |
| | 2. Attention to detail | b. Innovation |
| | 3. Results orientation | c. Working method |
| | 4. Orientation to individuals | d. Standards of success |
| | 5. Team Orientation | e. Improved results |
| | 6. Aggressiveness | f. Achieving targets |
| | 7. Stability | g. Rewards |
| | | h. Needs of each employee |
| | | i. Solidarity |
| | | j. Team success |
| | | k. Organizational progress |
| | | l. Work hard |
| | | m. Work challenges |
| | | n. Consistency |
| | | o. Shared vision |

## Statistical Tool

This research adopts the concept of pure moderation, solely examining the moderating influence without assuming a direct influence of the moderating variable on the dependent variable. According to a previous investigation, pure moderation simplifies interpretation, as it comprises only the interaction between the independent and moderating variables to be elucidated (Aiken & West, 1991). Furthermore, the analytical tool used for hypothesis testing is ordinary least squares regression analysis, adhering to normality requirements and all classical assumptions. It is also important to establish that the collected data was independent, satisfying the prerequisite for independent responses (Nwanzu & Babalola, 2019).

$$EP = a_{11} + b_{11}WL + b_{12}MTV + e_{11}$$

$EP = a_{21} + b_{21}WL + b_{22}\ WL*OC + e_{21}$
$EP = a_{31} + b_{31}MTV + b_{32}\ MTV*OC + e_{31}$

Here, EP is employee performance, WL is workload, MTV is motivation, and OC is organizational culture.

## RESULTS

### Respondent profile

The demographic breakdown of respondents shows that the majority were male, comprising 70 individuals, accounting for 52.6% of the sample. Additionally, a significant portion of the respondents had a considerable length of service, with the majority having worked for more than 15 years. In terms of age distribution, 58 respondents, accounting for 43.6% of the sample, were aged over 40 years. This demographic profile showed that a substantial proportion of the observed respondents possess sufficient work experience.

### Validity test

Factor analysis was used to conduct validity tests on the variables under investigation, namely workload, motivation, performance, and organizational culture. Based on the analysis, Kaiser-Meyer-Olkin (KMO) values for all variables exceeded 0.5, signifying adequate sample adequacy. Additionally, the loading factor values for each variable were greater than 0.4, confirming the legitimacy and relevance of the analysis.

**Table 2:** Indicators, loadings and validity

| Construct | KMO | Indicator | Loading | Validity |
|---|---|---|---|---|
| Workload | 0.867 | WL1 | 0.843 | Valid |
| | | WL2 | 0.862 | Valid |
| | | WL3 | 0.862 | Valid |
| | | WL4 | 0.861 | Valid |
| | | WL5 | 0.756 | Valid |
| | | WL6 | 0.725 | Valid |
| Motivation | 0.868 | MTV1 | 0.862 | Valid |
| | | MTV 2 | 0.885 | Valid |
| | | MTV 3 | 0.785 | Valid |
| | | MTV 4 | 0.841 | Valid |
| | | MTV 5 | 0.901 | Valid |
| | | MTV 6 | 0.778 | Valid |
| Employee Performance | 0.875 | EP1 | 0.819 | Valid |
| | | EP2 | 0.882 | Valid |
| | | EP 3 | 0.878 | Valid |
| | | EP 4 | 0.689 | Valid |
| | | EP 5 | 0.710 | Valid |
| | | EP 6 | 0.842 | Valid |
| | | EP 7 | 0.828 | Valid |
| | | EP8 | 0.706 | Valid |
| | | EP 9 | 0.784 | Valid |
| | | EP10 | 0.794 | Valid |

| | | | | |
|---|---|---|---|---|
| | | EP 11 | 0.809 | Valid |
| Organizational Culture | 0.877 | OC 1 | 0.724 | Valid |
| | | OC 2 | 0.791 | Valid |
| | | OC 3 | 0.821 | Valid |
| | | OC 4 | 0.821 | Valid |
| | | OC 5 | 0.801 | Valid |
| | | OC 6 | 0.617 | Valid |
| | | OC 7 | 0.558 | Valid |
| | | OC 8 | 0.596 | Valid |
| | | OC 9 | 0.750 | Valid |
| | | OC 10 | 0.698 | Valid |
| | | OC 11 | 0.698 | Valid |
| | | OC 12 | 0.820 | Valid |
| | | OC 13 | 0.767 | Valid |
| | | OC 14 | 0.794 | Valid |
| | | OC 15 | 0.747 | Valid |

## Reliability test

Based on the results of the reliability test, all variables under research, including workload, motivation, performance, and organizational culture, had Cronbach's alpha values exceeding 0.7. As a result, it can be concluded that all variables demonstrated high reliability.

## Regression test

A regression test was carried out to determine the influence of the relationship between the variables in the model. The strength of this relationship is detailed in Table 3.

**Table 3:** Regression test results

| Equation Model | Adj. R Squae | F-test | | T-test | | Conclusion |
|---|---|---|---|---|---|---|
| | 0.616 | F Statistic | Sig | | | |
| $EP=b_{11}WL + b_{12}MTV + e_{11}$ | | 107.047 | 000 | β | Sig | Model Fit |
| Workload | | | | 0.606 | 0.000 | Rejected |
| Motivation | | | | 0.233 | 0.003 | Accepted |
| $EP = a_{21}+ b_{21}WL + b_{22}$ WL*OC + $e_{21}$ | | | | | | |
| $EP = a_{31} + b_{31}MTV + b_{32}$ MTV*OC + $e_{31}$ | | | | | | |
| Interaction of Organizational Culture with Workload | | | | 0.470 | 0.019 | Accepted |
| Interaction of Organizational Culture with Motivation | | | | 0.834 | 0.000 | Accepted |

## Model test

The data presented in Table 3 shows that the model test outcomes indicated an Adjusted R Square value of 61.6%. This value signifies a substantial portion of the variance in employee performance being explained by workload and motivation. Additionally, the F test results showed a significance value (sig-F) of 0.000, which is less than 0.05, satisfying the goodness-of-fit requirements for Ordinary Least Squares (OLS) regression analysis.

### Hypothesis testing

The analysis result showed that employee performance was positively influenced by workload, with a regression coefficient of 0.606 at a significance level of 0.000. This observation led to the rejection of Hypothesis 1, which stated a detrimental influence of workload on performance. Employee performance was also found to be positively influenced by motivation, as evidenced by a regression coefficient of 0.233 at a significance level of 0.003, leading to the acceptance of Hypothesis 2. Furthermore, the influence of workload on employee performance was effectively moderated by organizational culture, as evidenced by a regression coefficient of 0.470 at a significance level of 0.019, all of which supported the acceptance of Hypothesis 3. Organizational culture, was also found to effectively moderate the influence of motivation on employee performance, with a regression coefficient of 0.834 and a significance level of 0.000, leading to the acceptance of Hypothesis 4.

## DISCUSSION

This research investigates the role of organizational culture as a moderator among employees of PT Kayulapis Indonesia to assess the influence of workload and motivation on employee performance. In order to achieve its aim, a regression test was carried out and the results showed a negative correlation between employee performance and workload. This suggests that the performance of an employee would decline proportionally if the assigned workload exceeds the capacity of the individual. These results support the assertion by Gibson et al. (2012) that excess workload is characterized by the assignment of too many tasks and insufficient timeframes to complete the given tasks. Theoretically, the phenomenon implies that an increase in workload leads to a decrease in employee performance, and decreased performance can also be attributed to the increased work stress resulting from excessive tasks. Excessive workload may elicit negative emotional reactions such as headaches, dyspepsia, impatience, as well as physical and mental exhaustion. However, it is also important to establish that an insufficient workload may result in boredom due to a lack of engagement. The results of this research showed a contrary perspective, indicating the role of increased workload in enhancing employee performance. The present observation is supported by the workload indicator with the highest mean, which reflected a safe, comfortable, and conducive work environment. Typically, wiithin a conducive environment, employees do not feel pressured even when facing a workload exceeding the organization's target, specifically when sufficient time is allocated for task completion. The majority of the research respondents, which were aged over 40 years further support these results, as the mature age of the respondents leads to an inherent equipping with deeper knowledge and understanding of the assigned work. The age bracket also

showed respondents' commitment to the organization. The obtained results are in line with previous research conducted by Adrianto et al. (2020), Lutvi et al. (2021), Rusmiyati et al. (2021), Sipayung and Purba (2021), Muslih and Hardani (2022), Abdullah and Halik (2023), Harefa and Saputra (2023), and Usman et al. (2023). However, the findings were inconsistent with those of Tannady (2023) and Ibrahim et al. (2022), where such effects were not observed.

Further analysis was conducted on the collected data with the aim of examining the positive influence of motivation on employee performance. The results obtained from this analysis suggest that employee performance is positively correlated with the level of employee motivation. As a result, it can be inferred that the motivational strategies adopted by organizations prove highly effective in elevating and improving employee performance. Motivation serves as the driving force behind the efforts dispensed by individuals towards the use of inherent skills and potential for the achievement of either personally or organizationally assigned objectives. According to the respondents, an indicator contributing to increased employee motivation in the observed organization is the opportunity to assume a supervisory role. With the ability to influence others, employees can better organize work for each team member, ensuring a balance between available time and target completion. This is evident from indicators receiving low responses, such as excessive demands for employees to undertake diverse tasks. The results of this present research are also consistent with Veliu et al. (2015), Gitongu et al. (2016), Festiningtyas and Gilang (2020), Adrianto et al. (2020), Amha and Brhane (2020), Ryandini and Nurhadi (2020), Sipayung and Purba (2021), Usman et al. (2023), Tannady (2023), and Harefa and Saputra (2023), all of which emphasized motivation as a positive influencer of employee performance. However, the investigation conducted by Ibrahim et al. (2022) reported otherwise and contradicted the results of this research.

Following the data analysis, a moderation regression test was carried out during the course of the investigation. The results showed the moderating influence of organizational culture on the relationship between workload, motivation, and employee performance. Organizational culture, which comprises shared values adopted by all employees and served as a behavioral reference to attain organizational goals, was observed to amplify the influence of workload on employee performance. Additionally, this factor functions as a guiding framework that shapes the attitudes and behaviors of employees. The organizational culture emphasized in this research centers on a shared vision in executing duties and responsibilities. With a shared vision, employees can seamlessly fulfill assigned duties, while staying motivated because of the correspondence between personal aspirations and organizational goals. The moderation regression test also showed that organizational culture effectively moderated the influence of motivation on performance. It was found that an improved reward system for employee performance enhances organizational culture.

## CONCLUSIONS

In conclusion, this research was carried out with a primary focus on the positive influence of workload and motivation on employee performance, with organizational culture serving as the moderating variable. In order to achieve the aim, stepwise multiple regression analysis was performed, and the results showed empirical evidence of the adverse influence of workload on employee performance, with a substantial correlation between high workload and reduced performance. This influence was further amplified by organizational culture, which was found to reinforce the decline in performance under high workload conditions. Accordingly, the analysis also showed a favorable association between employee performance and motivation, where high motivation levels correspond to increased performance. Based on the observation made, organizational culture reinforced this relationship by enhancing the role of motivation in improving employee performance. These findings corroborated a previous investigation carried out by Rijanti et al. (2020), which further reinforced the conclusions drawn in the current research.

### Theoretical contribution

This research enriches the resource management literature, particularly in exploring the intricate relationship between workload, motivation, organizational culture, and employee performance. The investigation was carried out in line with the theory of learning motivation. The theory states that the engagement of individuals in learning activities arises from the desire to attain achievements. This implies that high levels of achievement orientation among employees lead to improved work outcomes and increased performance. It is also important to state that the results resonate with Maslow's theory of human motivation, emphasizing the inherent drive to fulfill various needs as a fundamental influencer of behavior in the workplace.

### Limitations and recommendations for future research

This research used online questionnaires for data collection, which might introduce biases in responses. Future research could mitigate these limitations by incorporating interviews to directly engage participants and address shortcomings associated with online systems. Additionally, the scope of the present investigation was limited to employees in the jumbo veneer production line, and this invariably suggests caution in generalizing results to other work sectors. To address the stated limitation, future investigation could explore various occupational groups, by adopting longitudinal research to examine the stability of workload and the **influence** of motivation on employee performance over time. Longitudinal research would also facilitate the exploration of the consistency and stability of organizational behavior, as a moderator influencing employee performance across different time frames.

## Practical implications

The results obtained from this research offer valuable practical knowledge for organizations to effectively manage employee workload, motivation, and organizational culture. The findings emphasize the importance of balancing high workloads with adequate rewards in order to sustain employee enthusiasm and enhance performance. Based on the observations made, it is suggested that organizations prioritize efforts to continually motivate employees using relevant rewards to foster morale and productivity. Moreover, a positive organizational culture becomes very important in this aspect, primarily because the factor necessitates stakeholders to regularly communicate the organization's vision, evaluate its implementation, and empower employees to contribute to the realization, regardless of whether the culture leans towards innovation or bureaucracy. A strong organizational culture fosters unity among employees, reinforces desired behaviors, and promotes collaboration toward achieving organizational goals. In summary, this culture serves as a guiding framework that shapes employee attitudes and behaviors. Therefore, by nurturing a conducive culture, organizations can strengthen employee motivation, which would invariably lead to improved performance and organizational success.

## REFERENCES


Abdullah, L., & Halik, A. (2023). The effect of organizational culture and workload on employee performance with Job satisfaction as a mediating variable on CV. Asia Raya Komputama Surabaya. *Economic and Business Management International Journal, 3*(1), 30–40.

Adrianto, T., Ilmi, Z., Heksarini, A. (2020). The influence of workload and motivation on employee satisfaction and performance of PT. Gema Soerya Samodra. *International Journal of Economics, Business and Accounting Research, 4*(3), 71–79.

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.* Newbury Park, CA: Sage Publications, Inc.

Akinyele, S. T. (2007), a critical assessment of environmental impact on workers 'productivity in Nigeria, *Research Journal of Business Management, 1*(1), 50–61.

Amha, G. G., & Brhane, F. (2020). Determinant of employee performance in public organization: The case of dessie city municipality office. *International Journal of Marketing & Human Resource Research, 1*(1), 1–13.

Dahkoul, Z. M. (2018). The determinants of employee performance in Jordania organizations. *Journal of Economics, Finance and Accounting, 5*(1), 11–17.,

Festiningtyas, R., & Gilang, A. (2020). The influence of motivation on employee performance. *Almana: Jurnal Manajemen dan Bisnis*, *4*(1), 124–128.

Gibson, J. L., Ivancevich, J. M., Donnelly, J. H., & Konopaske, R. (2012). *Organizations behaviour, etructure and process.* Fourteenth Edition. McGraw-Hill, a business unit of The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas, New York, NY, 10020.

Gitongu, M. K., & Kingi, W., & Uzel, J. M. M. (2016). Determinants of employees' Performance of State Parastatals in Kenya: A case of Kenya Ports Authority. *International Journal of Humanities and Social Science, 6*(10), 197–203.

Harefa, O., & Saputra, A. (2023). The influence of work motivation, work discipline and workload on employee performance at PT Sanwa Engineering Batam. *Jurnal Inovasi Bisnis dan Akuntansi, 4*(2), 445–457.

Ibrahim, M., Saputra, J., Adam, M., & Yunus, M. (2022). Organizational culture, employee motivation, workload and employee performance: A mediating role of communication. *Wseas Transactions on Business Economics, 19*, 54–61.

Koesomowidjojo, S. (2017). *Panduan praktis menyusun analisis beban kerja.* Jakarta: Raih Asa Sukses.

Liao, H., & Chang, A. (2004). A multilevel investigation of factors influencing employee service performance and customer outcomes. *Academy of Management Journal,* 47( 1), 41–58.

Lutvi, M. H., Utaminingtyas, R. R., & Farouk, U. (2021). The influence of organizational culture and workload on employee work performance at PT Angkasa Pura I (Persero) Ahmad Yani International Airport Semarang. *Journal of Business Studies,* 7(1), 91–100.

Mangkunegara, A. A, A, P.( 2017). *Manajemen sumber daya manusia perusahaan*, Bandung : Remaja Rosdakarya

Mathis, R. L., & Jackson, J. H. (2006). *Human Resource Management*. Thomson/South-Western.

McClelland, D. C., Atkinson, J. W., Clark, R. A., & Lowell, E. L. (1976). *The achievement motive.* Irvington.

Muslih, H., & Reyza, T. S. (2022). Effect of work environment and workload on employee performance. *International Journal of Economics, Social Science, Entrepreneurship and Technology*, *1*(1), 23–35.

Nikpour, A. (2017). The impact of organizational culture on organizational performance: The mediating role of employee's organizational commitment. *International Journal of Organizational Leadership, 6*(3), 65–72.

Nwanzu, C. L., & Babalola, S. S. (2019). Psychological capital, task autonomy and innovative work behaviour among public organisation employees. *International Journal of Work Organisation and Emotion*, *10*(4), 322–338.

Oshagbemi, T. (2003) Personal correlates of job satisfaction: Empirical evidence from UK Universities. *International Journal of Social Economics, 30*(12), 1210–1232.

Rich, B. L., Lepine, J. A., & Crawford, E. R. (2010). Job engagement: Antecedents and effects on job performance. *Academy of Management Journal, 53*(3), 617–635.

Rijanti, T., Kasmari, K., Prabowo, R. E., & Sukmaningrum, D. (2020). The role of moderation of organizational culture on the effect of motivation and compensation on employee performance (Studies on district office the Ex. Kawedanan Boja Region, Kendal Regency). Proceedings of the 3rd International Conference of Banking, Accounting, Management and Economics (ICOBAME). *Advances in Economics, Business and Management Research, 169*. Proceedings of the 3rd

Robbins, S. P., Judge, T. A. & Vohra, N. (2013). *Organizational behavior*. Fifteenth Edition. Pearson Education.

Robbins, S. P., & Judge, T. A. (2016). *Organizational ehavior.* 17th Edition, Pearson Education Limited, Upper Saddle River.

Rusmiati, E., Harjadi, D., & Fitriani, L. K. (2021). Analysis of the impact of risk and workload on motivation and impact on employee performance. *International Journal of Economics, Business and Accounting Research*, *5*(2), 356–398.

Ryandini, T. P., & Nurhadi, M. (2020). The influence of motivation and workload on employee performance in hospital. *Indonesian Nurshing Journal of Education and Clinic, 5(*1), 8–14.

Shahzad, F., Xiu, G., & Shahbaz, M. (2017). Organizational culture and innovation performance in Pakistan's software industry. *Technology in Society, 51*, 66–73.

Sipayung, A., & Purba, K. (2021). The effect of motivation, workload, and work envinronment on employee performance through job satisfaction as the intervening variable at the environmental services office of Deli Serdang regency. *South East Asia Journal of Contemporary Business, Economics and Law, 24*(6), 120–129.

Son, N. H., & Vy, P.T. (2022). Determinants influencing performance of employees in publicorganizations: The case of Ho Chi Minh City. *Masyarakat, Kebudayaan dan Politik, 35*(4), 407–421.

Tannady. H. (2023). Analysis of the effect of workload and work motivation on employee Performance in logistics companies. *Jurnal Multidisiplin Madani, 3*(2), 328–335.

Tuffaha, M. (2020). The determinants of employee's performance: A literature review. *Journal of Economics and Management Sciences, 3*(3), 14–24.

Usman., Irwanto., Gadi, R., Jamili., Silam, M. M. M., & Riduan, A. (2023). The influence of workload and motivation on the performance of employees of the Rakat Mufakat Village Bumdes in Tanah Bumbu Regency. *East Asian Journal of Multidisciplinary Research, 2*(5), 1849–1858.

Veliu, K. L., Mimoza, M., & Ujkani, S. (2015). The influence of motivation on job performance: Case study managers of small and medium enterprises (SMEs). *Iliria International Review, 2*, 41–52.

Warrick, D. (2017). What leaders need to know about organizational culture. *Business Horizons, 60*(3), 395–404.

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# FOSTERING INNOVATION THROUGH ETHICAL LEADERSHIP, AFFECTIVE COMMITMENT, AND KNOWLEDGE SHARING

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## Abstract

In the midst of intense competition and rapid changes, employees' innovative behavior is crucial as it determines the organization's sustainability. This quantitative study seeks to explore how ethical leadership and affective commitment give impact on innovative work behavior, with knowledge sharing acting as a mediator. There were 333 private school teachers in Indonesia responded to an online questionnaire and became the research participants. The research data underwent analysis through Structural Equation Modeling using AMOS version 24.0. The results of the study indicate that ethical leadership and affective commitment directly and indirectly influence the innovative work behavior. Knowledge sharing has a positive effect on innovative work behavior and serves as a mediator for the influence of ethical leadership and affective commitment on innovative work behavior. The implications of this research are significant for education leaders, especially in the appointment of school principals or preparing

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prospective school leaders, and in managing employee behavior to foster and enhance innovation.

Key Words

Affective commitment; ethical leadership; innovative work behavior; knowledge sharing.

## INTRODUCTION

The demands and requirements for professional and reliable employees necessitate educational institutions to undertake reforms to adjust to the changing times and meet stakeholders' expectations. These reforms should enable innovation to thrive within the school environment. Opoku et al. (2019) suggested that in the current business globalization climate and competitive advantage, it was crucial for organizations to pursue various strategies to generate innovative employees' behavior because innovation served as a driver for organizational sustainability and development (Zhang, 2020), and to create competitive advantage and providing products/services according to customer needs (Lei et al., 2020). Efforts to promote and encourage innovation have become a strategic goal for all types of organizations: private and public, for-profit and non-profit, large and small (Battistelli et al., 2019). According to Jia et al. (2022), individuals running in the education segment need to exhibit innovative behavior because it is necessary to keep pace with and adapt to the developments of new knowledge within relevant disciplines. This behavior can be fostered and enhanced through leadership roles, employee commitment, and the implementation of knowledge management.

Several scientific studies have indicated that leadership has a positive influence on employees' and organizations' ability to innovate (Khaola & Coldwell, 2019 ; Vladić et al., 2021). School principals can influence teachers' innovative work behavior by practicing positive leadership behaviors (Khaola dan Oni, 2020). Teachers' affective commitment is a key element in school effectiveness, which can influence students' academic achievements (Maiti et al., 2021). Therefore, affective commitment becomes crucial amidst the competitive challenges of human resources in educational institutions. Similarly, organizational learning and knowledge sharing are two important aspects that should be encouraged, nurtured, and supported by leaders in any organizations (Alblooshi et al., 2020).

This study is intended to discover the roles of ethical leadership, affective commitment, and knowledge sharing on innovative work behavior among private school teachers in Indonesia. While ethical leadership and affective commitment have received attention from previous researchers, some issues remain unexplored, especially regarding their influence on innovative

work behavior. Similarly, in the empirical research field on leadership and innovative work behavior, there are inconsistent outcomes, hence the need to identify and investigate more mediators to help clarify both variables. Knowledge sharing, used as a mediating variable, has not been previously utilized by researchers. Thus, this research is expected to fill the gap in previous research.

## LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

### Ethical Leadership

Ethical leadership pertains to the way leaders serve as exemplary figures for their followers, demonstrating behavior that normatively fits by using power and treating others ethically and fairly (Robbins & Judge, 2022). The necessity for ethical behavior arises from the ability of leaders to make impartial and just decisions confidently, without causing distress or negative impact on the emotions of their subordinates (Kumar et al., 2023). There is a pressing demand for cultivating a greater number of ethical leaders within numerous organizations. This is essential to inspire employees to mirror leaders' conduct and confidently express constructive opinions and suggestions. Such practices foster enhanced decision-making and cultivate a work environment conducive to improved performance and team effectiveness (Dua et al., 2023).

Ethical leadership is characterized by ethically satisfying traits, demonstrating behaviors of consideration, care, fairness, honesty, openness, and trust (Brown et al., 2005; Alblooshi et al., 2020; Su et al., 2021). Ethical leaders prioritize norms, principles, values, standards, and ethics both in theory and in practice while carrying out various tasks. They effectively communicate these considerations to team members, departments, and the organization as a whole, thereby fostering a more effective workplace environment (Kumar et al., 2023). As moral exemplars, ethical leaders are distinguished by genuine sincerity, empathy, and unwavering integrity. Leaders can influence disciples by demonstrating care and kindness towards them and focusing on the common interests and well-being (Su et al., 2021).

### Affective commitment

Affective commitment denotes the favorable emotional connection, enthusiasm, and zeal that employees harbor, compelling them to willingly participate actively in the organization's endeavors. Employees maintain a robust connection with the organization and derive pride from their membership within it (Jafri, 2010; Javed et al., 2021). In simpler terms, commitment involves a sense of attachment and loyalty. Affective commitment specifically pertains to the emotional connection, identification, and engagement of workers with an organization. This emotional bond influences personal attributes, organizational structures, and work experiences (Kumari & Afroz, 2013). Employees possessing robust affective commitment persist in their association with the organization due to their

desire to do so. Affective commitment is developed when employees and the organization have mutually beneficial interactions (Abbasi et al., 2022).

**Knowledge sharing**

Knowledge sharing within organizations occurs among individuals through interactions and daily conversations among employees, thereby influencing the innovation capabilities of individual employees (Nham et al., 2020). The focus of knowledge sharing is on transferring data between individuals or groups to create mutual understanding and new insights. Knowledge can be established and distributed by coworkers, teams, and organizations through group learning to generate new knowledge and enrich the active knowledge repository, thus creating new solutions. This collective knowledge contributes to human capacity development and has a significant impact on the long-term performance of the organization (Andrade et al., 2023).

Knowledge sharing is highly valuable for organizations because throughout this process, efficiency can be enhanced, waste can be avoided, training costs can be reduced, and risks can also be minimized. When employees actively share knowledge, it not only enhances the accumulation of knowledge but also facilitates the adoption of innovative work behaviors among employees. Knowledge requires to be shared so that each person can understand and utilize it to their work (Nguyen *et al*., 2019).

**Innovative work behavior**

Innovation is one of the necessary ways for organizations to survive and strive with other organizations. Mere knowledge and skills are insufficient for an organization to endure in competitive environments (Batmomolin et al., 2022). Innovation can be assessed based on its uniqueness, novelty, and possible effect. Innovation requires three main steps: ideation, implementation, and the outcomes obtained from executing the idea and the associated changes. The goal of innovation in education is to elevate the overall efficiency, capability, and quality of the learning experiences (Serdyukov, 2017).

Individual innovative work behavior is at the core of the creativity and innovation process, thus being a crucial element in the success of an organization (Khaola dan Musiiwa, 2021). The conduct is manifested in employees' capacity to discover innovative solutions to challenges through original thought processes, aiming to boost performance, foster excellence, and ensure long-term effectiveness (Javed et al., 2021).

**Ethical leadership (EL) and innovative work behavior (IWB)**

Moral values are crucial in achieving success. Moral executives and leaders must present ethical visions and missions, build a culture with strong shared ethical standards within the organization, move beyond personal financial concerns and gains, support individuals' creativity, products and services quality, and sustainable development for the overall well-being of individuals within the organization (Asif et al., 2019). Leaders need to allocate time and effort to implement and practice moral perspectives to enhance the organization's ability to innovate (Lei et al., 2020).

Ethical leaders can shape workers' perceptions of personal competencies and workspace relationships (Zahra & Waheed, 2017) by engaging in open two-way communication, sincerely listening to what staff have to say, and encouraging employees to express concerns and opinions, thereby stimulating subordinates to suggest new ideas to elevate work strategies (Jin et al., 2022).

**H1**: EL positively influences IWB.

**Ethical leadership (EL) and knowledge sharing (KS)**

Leaders create a supportive environment for knowledge management, enabling employees to train and nurture knowledge and skills. This facilitates access to significant knowledge, promotes collaboration, and encourages employees to allocate knowledge and expertise with colleagues without hindrance (Lei et al., 2020). Leaders want employees to share knowledge because the shared knowledge will benefit the company (Wu, 2021). Ethical leaders actively encourage and motivate employees to share knowledge, both on an individual basis and within group settings (Bavik et al., 2018) because ethical leaders possess values of honesty, principles, and trustworthiness, followers are likely to trust them in the workplace environment (Wu, 2021). Ethical leadership creates an organizational climate that can influence cognition and develop a positive capacity for knowledge sharing and creation in the workplace (Xia & Yang, 2020; Goswami & Agrawal, 2023).

The leader upholds principles of dignity, honesty, fairness, and integrity in their interactions with employees, fostering an environment where employees feel valued and respected. They actively paticipate employees in decision-making processes and encourage their participation. By promoting normative and ethical behavior through open communication, the leader cultivates a positive perception of their personality among followers (Saeed et al., 2022). Ethics-focused leadership can significantly contribute to positively altering employees' behavior towards knowledge sharing (Le dan Lei, 2018).

**H2**: EL positively influences KS.

**Affective commitment (AC) and innovative work behavior (IWB)**

Affective commitment describes the emotional bond, identification, and engagement of employees with the organization. Employees who possess strong affective commitment choose to remain with the institution because of their desire to do so (Abbasi et al., 2022). Workers who exhibit affective commitment to the organization demonstrate better performance and can generate new views and recommendations in performing tasks. Affective commitment serves as a catalyst, propelling employees to deeply comprehend and wholeheartedly adopt the values and objectives of the organization. This motivation compels them to exert greater efforts towards achieving these goals, often through novel and innovative approaches (Hakimian et al., 2016).

The findings of the study by Azinga et al. (2023) in textile and clothing manufacturers in Ghana concluded that affective commitment was crucial in

driving employees' innovative work behavior because commitment implied psychological attachment, a sense of ownership, and high motivation from employees contributing to organizational development. Jain (2022), focusing on healthcare workers in India, and Tajeddini et al. (2023), examining small and medium-sized enterprises in Turkey, both discovered a noteworthy and affirmative correlation between affective commitment and innovative work behavior. Contrastingly, Batmomolin et al. (2022) presented divergent findings, indicating that affective commitment did not exert a significant influence on the innovative behavior of employees within public institutions.

**H3**: AC positively influences IWB.

**Affective commitment (AC) and knowledge sharing (KS)**

Employees with affective commitment, which involves identifying and embracing the organization's values, tend to care about the organization's success. Oneway employees express this concern is through positive social actions, such as sharing knowledge with their colleagues (Ficapal-Cusí et al., 2020). Research by Ouakouak & Ouedraogo (2019) and Luo et al. (2021) concluded that affective commitment positively influences the intention to share knowledge and knowledge sharing, especially tacit knowledge sharing (Sharif et al., 2022). Marques et al. (2019) also proved that high affective commitment of employees to the organization can lead to a raise in the maturity level of knowledge transfer and knowledge management.

**H4:** AC positively influences KS.

**Knowledge sharing (KS) and innovative work behavior (IWB)**

Knowledge sharing is a voluntary act, making the knowledge possessed by someone ready to be understood, absorbed, and utilized by others, ultimately resulting in shared ownership of knowledge between the transmitter and the recipient (Nham et al., 2020). The willingness to contribute and gather knowledge enables an increase in employees' innovative work behavior (Nguyen et al., 2019; Muhammed et al., 2020).

Knowledge sharing is one aspect of knowledge management initiatives to better understand not only stimulates workforces to partake in knowledge sharing but also its outcome on personal job and how these impacts contribute to the sustainability of the business (Muhammed et al., 2020). Knowledge sharing enables individuals to explore deeper, think innovatively, and adopt behaviors aimed at acquiring new skills. Moreover, it significantly contributes to fostering creativity and innovative work behavior (Vandavasi et al., 2020; Lim & Ok, 2021; Islam et al., 2022).

**H5:** KS positively influences IWB

**Knowledge sharing (KS) as a mediator**

Alfaridi et al. (2020) highlighted that knowledge sharing serves as a mediator in the relationship between ethical leadership and organizational innovation. Similarly, Lei et al. (2020) discovered that both tacit and explicit knowledge sharing mediate the impact of ethical leadership on both radical and incremental innovation. Moreover, Goswami dan Agrawal (2023) revealed

that knowledge sharing acts as a mediating aspect between ethical leadership and the process of knowledge creation.

According to Jnaneswar dan Ranjit (2021), knowledge sharing is a purposeful mechanism that enables the transfer of intellectual capital from one individual to another. This movement can be from leaders to subordinates and vice versa, or from one employee to another. The ethical treatment demonstrated by leaders stimulates positive ethical practices from employees as well, in the form of participation in positive activities such as knowledge sharing when needed (Arsawan et al., 2022), and innovative work behavior. The findings of the study by Khorakian et al. (2019) demonstrated that sharing best practices and sharing mistakes mediated the influence of ethical behavior on innovative work behavior. Ethical leaders inspire their followers to share knowledge, experiences, skills, prototypes, procedures, manuals, and job reports with their colleagues within the organization. This practice encourages employees to generate fresh ideas related to work methods, processes, products, and services (Goswami & Agrawal, 2023).

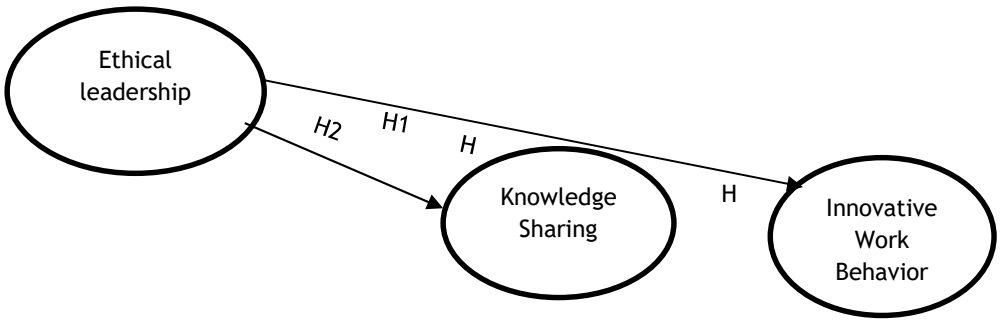
**H6:** KS mediates the influence of EL on IWB.

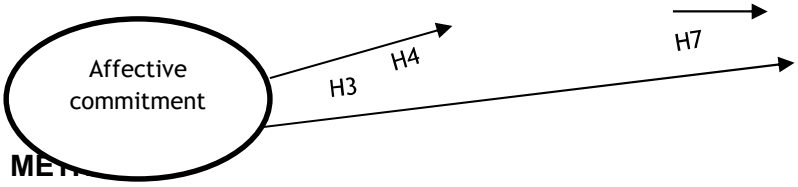
Ahmed et al. (2018) conducted research suggesting that employees' knowledge sharing plays a critical role in linking high-commitment work systems with innovative work behavior. Their study indicated that steadfast loyalty work systems enable and encourage employee knowledge sharing, which in turn fosters innovative work behavior. This is because the act of information exchange by employees is essential for recombining, translating, and generating new knowledge and ideas, as highlighted in their findings. The choice to disseminate knowledge hinges on employees' perceptions of the costs, benefits, and personal factors such as personality traits and intrinsic motivation, which shape this decision (Devi, 2023). Employees who cultivate a strong sense of affective commitment toward the organization are inclined to share knowledge with their staff more readily. The knowledge transferred will be enriched by the organization's processes, products, and services, thereby contributing to the enhancement of the organization's competitiveness and the provision of added value to customers in the long run (Marques et al., 2019).

**H7:** KS mediates the influence of AC on IWB

Drawing from a review of existing literature and the formulation of hypotheses, the proposed research framework is depicted in Figure 1.

**Figure 1:** Conceptual framework






## METHODS

This study is a causal investigation designed to explore the impact of ethical leadership and affective commitment on innovative work behavior, with knowledge sharing acting as a mediator. Primary data were gathered through a questionnaire distributed online via Google Forms to participants from late June to mid-July 2023.

The population of the study consists of 4000 teachers from 112 reputable private high schools in three major provinces in Indonesia: West Java, Central Java, and East Java. Using purposive sampling technique, 15 private high schools were selected as the research sites, and 333 voluntary teachers responded to and completed the distributed questionnaires.

To measure ethical leadership, ten statement items adopted from Brown et al. (2005) were utilized. Affective commitment was measured using eight statement items developed by Allen & Meyer (1990). The measurement of knowledge sharing utilizes eight statements adapted from the study by De Vries et al. (2006), while innovative work behavior is measured using nine items developed by Janssen (2000). All items in the research instrument were rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Descriptive statistical data analysis entails computing the mean of respondents' responses. For examining the influence of variables on each other, Structural Equation Modeling is employed using AMOS software version 24.0.

## FINDINGS

### Respondent characteristics

The majority of participants are female educators (53.2%), with over half aged above 50 years (34.8%), and possessing a bachelor's degree as their highest educational attainment (78.7%), and have been employed at the same school for more than 20 years (31.5%). More respondent profile details can be found in Table 1.

**Table 1:** Respondent Profile

| Characteristics | Frequency | Percentage |
|---|---|---|
| Age | | |
| < 30 years | 52 | 15.6 |
| 30 - 40 years | 93 | 27.9 |
| 41 - 50 years | 72 | 21.7 |
| > 50 years | 116 | 34.8 |
| Education | | |

| | | | |
|---|---|---|---|
| Bachelor's degree | | 262 | 78.7 |
| Master's degree | | 71 | 21.3 |
| Gender | | | |
| Male | | 156 | 46.8 |
| Female | | 177 | 53.2 |
| Length of employment | < 5 years | | |
| 5 - 10 years | | 75 | 22.5 |
| 11 - 15 years | | 63 | 19.0 |
| 16 - 20 years | | 48 | 14.4 |
| > 20 years | | 42 | 12.6 |
| | | 105 | 31.5 |

## Validation and reliability testing

Validation and reliability testing follows the criteria set by Hair et al. (2019) based on factor loadings and Cronbach's alpha values. With a sample size above 250, the instrument will be considered valid if it has a factor loading of at least 0.35. The instrument is considered reliable or has internal consistency if the Cronbach's Alpha value is greater than 0.60.

The data in table 2 show that all items from the variables ethical leadership, affective commitment, knowledge sharing, and innovative work behavior are valid because they have a factor loading > 0.35. Similarly, all questionnaire items have Cronbach's Alpha values > 0.60, indicating that this questionnaire is valid and reliable for use as a research data collection instrument.

**Table 2:** Instrument validity and reliability

| Variables | Items | Factor Loading | Cronbach's Alpha | Decision | |
|---|---|---|---|---|---|
| Ethical Leadership | EL1 | .778 | 0.953 | Valid & Reliable | |
| | EL2 | .835 | | | |
| | EL3 | .785 | | | |
| | EL4 | .804 | | | |
| | EL5 | .881 | | | |
| | EL6 | .875 | | | |
| | EL7 | .820 | | | |
| | EL8 | .895 | | | |
| | EL9 | .840 | | | |
| | IL10 | .879 | | | |
| Affective Commitment | AC1 | .532 | 0.860 | Valid & Reliable | |
| | AC2 | .446 | | | |
| | AC3 | .782 | | | |
| | AC4 | .497 | | | |
| | AC5 | .868 | | | |
| | AC6 | .890 | | | |
| | AC7 | .872 | | | |
| | AC8 | .896 | | | |
| Knowledge Sharing | KS1 | .764 | 0.861 | Valid & Reliable | |
| | KS2 | .734 | | | |
| | KS3 | .768 | | | |
| | KS4 | .694 | | | |
| | KS5 | .678 | | | |
| | KS6 | .692 | | | |
| | KS7 | .682 | | | |
| | KS8 | .734 | | | |

| | | | | | |
|---|---|---|---|---|---|
| Innovative Behavior | Work | IWB1 | .750 | | Valid & Reliable |
| | | IWB2 | .788 | | |
| | | IWB3 | .805 | | |
| | | IWB4 | .781 | | |
| | | IWB5 | .806 | 0.937 | |
| | | IWB6 | .831 | | |
| | | IWB7 | .860 | | |
| | | IWB8 | .855 | | |
| | | IWB9 | .868 | | |

**Descriptive Statistics**

The mean score of respondents' answers to ethical leadership is 4.375. This indicates that school leaders have demonstrated virtues as role models, are trustworthy, live according to ethical and moral standards, discuss ethics and values with employees, make fair decisions, and courageously discipline employees who violate ethical standards. The success achieved by the school is obtained through ethical, correct, and morally accountable means.

The mean score for affective commitment among respondents is 4.421, indicating that teachers experience emotional attachment to the school. This emotional connection stems from the school's meaningfulness to them, the alignment of school issues with their own concerns, their integration into the school community, and their strong sense of ownership toward the institution.

The average score obtained by respondents for knowledge sharing practices is 4.037, indicating that teachers are actively engaged in the process of giving and receiving information, knowledge, and skills to others. They willingly disseminate the knowledge they possess, participate in discussions or idea exchanges, and provide support and assistance to others in gaining new understanding or enhancing their abilities. These activities reflect a collaborative culture among them and demonstrate a commitment to assisting each other in achieving common goals.

The typical rating for innovative work behavior among respondents stands at 4.000, indicating that the majority of respondents have rated themselves as actively adopting new, creative, and innovative practices in carrying out their duties as teachers. This may include the use of creative teaching methods, experimenting with new approaches to learning, or creating new solutions to challenges faced in the educational environment. A high score suggests that teachers are receptive to change and inclined to explore new methods to improve their work effectiveness.

**Model fitness and hypothesis testing**

Testing model fitness refers to the proposal by Hair et al. (2019) obtained from statistical calculations using AMOS version 24.0. In absolute fit indices, the RMSEA (Root Mean Square Error of Approximation) value shows 0.076 < 0.08 and the RMR (Root Mean Square Residual) value is 0.036 also < 0.08. Incremental fit indices, including Normed Fit Index (NFI), Tucker Lewis Index (TLI), Comparative Fit Index (CFI), and Incremental Fit Index (IFI), are all above 0.90, thus categorized as a good fit. In the Parsimony fit index, the Normed Chi Square (NCS) value is 3.450. Therefore, it can be concluded

that this research model falls under the category of goodness-of-fit, allowing the hypothesis testing to proceed.

The outcomes of hypothesis testing, as shown in table 3, indicate that the p-values for H1 to H7 are all < 0.05. Therefore, It can be inferred that with a confidence level of 95%, all proposed research hypotheses are supported.

**Table 3:** Hypotheses testing results

| Hypotheses | Estimate | P-value | Decision |
|---|---|---|---|
| EL→IWB | 0,086 | 0,023 | H1 Supported |
| EL→KS | 0,101 | 0,028 | H2 Supported |
| AC→IWB | 0,194 | 0,000 | H3 Supported |
| AC→KS | 0,343 | 0,000 | H4 Supported |
| KS→IWB | 0,301 | 0,000 | H5 Supported |
| EL→KS→IWB | 0,031 | 0,036 | H6 Supported |
| AC→KS→IWB | 0,103 | 0,000 | H7 Supported |

## DISCUSSION

Drawing from the statistical findings, it can be inferred that ethical leadership fosters a favorable impact on IWB. H1 is confirmed. The result is compatible with previous studies conducted by Zahra & Waheed (2017); Özsungur (2019); Lei et al. (2020); Jia et al. (2022);Jin et al. (2022); Iqbal et al. (2020); Musenze & Mayende (2023) in various countries, including China, Pakistan, Vietnam, Turkey, and Uganda, in companies, SMEs, research institutions, and higher education. These findings indicate that a leader who possesses ethics and morality and implements leadership processes guided by ethical and moral principles will foster innovative behavior among teachers in the school environment. In other words, teachers will be motivated to behave innovatively when ethical leadership is applied in schools. According to Liu et al. (2023), ethical leaders are characterized by their ability to make decisions that prioritize ethical considerations within the organization. They demonstrate genuine care and interest for their workers, actively fostering interpersonal relationships built on reciprocal respect and trust. Furthermore, they establish an environment of psychological safety for employees. When employees feel psychologically safe, they are more likely to become deeply engaged in their job, exhibiting increased enthusiasm and focus. This heightened engagement often leads to the generation of numerous ideas and beneficial behaviors that drive innovation.

Ethical leaders have the ability to inspire employees to consider ethical perspectives and serve as exemplary models, thereby fostering an ethical climate within the organization. By demonstrating ethical leadership styles, leaders cultivate an environment where moral conduct is prioritized. This environment, characterized by elevated ethical standards, communicates the expectation for employees to consistently make ethical decisions and actions in their roles. These guiding principles encourage employees to prioritize task performance aligned with ethical considerations (Tabiu, 2023). Organizations can boost employee commitment and foster positive

behaviors by cultivating an ethical work environment. This, in turn, will contribute to a more innovative organizational culture (Hong et al., 2023). This finding is consistent with the expectations of Dua et al. (2023) that many organizations require leaders who possess strong ethical values within the organization, especially in scenarios of scandal, fraud, and deception, which are symptoms of eroded ethical values. Leaders should be chosen and assessed based on their capability and commitment to uphold strong ethical values. Managers have a responsibility to foster, endorse, and uphold ethical leadership, as employees often mirror the ethical conduct of their leaders. This, in turn, can mitigate instances of unethical behavior within the organization. Furthermore, managers must establish an environment where employees feel empowered to express suggestions, directions, ideas, views, and interests, including implementing clear codes of ethics. Such codes serve as guiding principles for ethical behavior and decision-making among employees.

This study's findings suggest that ethical leadership yields a beneficial impact on knowledge sharing. H2 is supported. This finding indicates that if ethical leadership is implemented in schools, the exchange of knowledge and skills among teachers will proceed smoothly. This outcome aligns with the conclusions drawn in earlier studies conducted by Bavik et al. (2018); Le & Lei (2018); Tu et al. (2020); Su et al. (2021); Alfaridi et al. (2020); Chaman et al. (2021); Xia & Yang (2020); Wu, 2021; Koay & Lim (2022); Saeed et al. (2022); Goswami & Agrawal (2023). This discovery is likewise in accordance with the research conducted by Khan et al. (2019) who observed that when employees have high normative perceptions, their perceived behavioral control over knowledge sharing also increases, directly influencing knowledge-sharing behavior. Knowledge sharing is indispensable in any organization and across all roles as it is vital for the growth and sustainability of others and for fostering a positive work environment. Ethical leadership can have a positive impact on the attitudes of subordinates, thereby significantly contributing to the improvement of both individual and organizational performance, as highlighted by Jin et al. (2022).

The statistical analysis reveals that affective commitment exerts a positive effect on innovative work behavior. Thus, H3 is confirmed. It suggests that the long-term rational choice of teachers to be part of a school community, formally identified with the school, and emotionally attached, having a strong sense of ownership towards the school, can lead teachers to develop themselves optimally by generating brilliant ideas, both for improving the quality of learning and providing pleasant services to students, parents, and the community. A teacher who has a strong commitment to the school will develop emotional bonds and foster unity with students, parents, and colleagues. Emotional bonds include feelings of joy, affection, and pride in the school's vision, mission, goals, values, and culture. Hakimian et al. (2016) stated that employees with high affective commitment enjoy being in the organization, and as a result, they are more attentive to organizational goals and produce positive efforts and performance, which leads them to exhibit innovative behavior.

The research findings provide empirical evidence that emotional dedication enhances the likelihood of individuals sharing their knowledge in a positive manner. H4 is supported. This discovery aligns with the results of earlier research conducted by Ouakouak dan Ouedraogo (2019) and Sharif et al. (2022). Inspired by these findings, teachers who identify themselves with the school, are committed, loyal, and willing to work for a lifetime at the same school will be generous in sharing what they have learned. The higher the teachers' commitment to the school and the values embodied in the school, the more it can guide teachers to develop themselves through the knowledge and skills shared by colleagues, while also encouraging an attitude of sharing intellectual wealth and best practices. For committed teachers, the knowledge gathered or shared is equally significant in developing the school to be of higher quality and more trustworthy. High affective commitment of teachers to their school will also increase their sense of ownership of the school. High ownership will enhance social interaction among employees through shared experiences and communication patterns. Increased ownership plays a crucial role in developing a collective mindset, which ultimately enhances knowledge sharing among employees (Seo, 2023).

Based on the statistical test results, knowledge sharing positively influences innovative work behavior. This finding corroborates hypothesis H5 and is in line with previous studies conducted by Dong Phung et al. (2017); Kim & Park (2017); Ahmed et al. (2018); Munir & Beh (2019); Muhammed et al. (2020); Vandavasi et al. (2020); Anser et al. (2021); Jnaneswar & Ranjit (2021); Lin & Shin (2021); Arsawan et al. (2022); Islam et al. (2022); Escribá-Carda et al. (2023); Yepes & López (2023); Batmomolin et al. (2024). The process of exchanging goodwill, where teachers actively shared knowledge, experiences, ideas, and information with colleagues through various means, had a positive effect on innovation. The exchange of ideas and experiences allowed teachers to gain new perspectives and insights from their peers. This stimulated creative thinking and encouraged the exploration of new ideas. Additionally, through knowledge sharing, teachers could collaborate to collectively address challenges and obstacles encountered in teaching or serving students and parents. Such collaboration could generate innovative ideas that might have been difficult to achieve individually. Teachers who actively shared knowledge tended to continue learning and self-improvement, thereby enhancing their abilities and capacities to cope with rapid changes and apply the latest practices in teaching, especially in technology and new teaching methods that could stimulate creativity and innovation. Sharing experiences and innovative ideas could encourage teacher creativity in developing teaching methods, problem-solving approaches for students, and school governance.

The research outcomes indicate that ethical leadership impacts innovative work behavior by fostering knowledge sharing as an intermediary mechanism. H6 is supported. Knowledge sharing can facilitate ethical leadership in promoting innovative behavior. Knowledge sharing enables the establishment of a sense of security and mutual trust among employees and

leaders. When employees feel secure to share ideas and information, an environment that supports ethics, trust, and collaboration is created. Ethical leadership values and encourages collaboration by helping to create an environment where new ideas can emerge through the exchange of ideas.

The statistical analysis findings suggest that the impact of affective commitment on innovative work behavior is effectively mediated by knowledge sharing. This supports the hypothesis H7. In the school setting, the sharing of knowledge and information among teachers acts as a potent tool for dedicated and loyal educators to nurture creativity and innovation within the institution. When engaging in knowledge sharing, teachers with a strong sense of emotional commitment to the school will acquire fresh insights and endeavour to put them into practice, aiming to enhance the already high standard of classroom learning and deliver outstanding services to students. Through the exchange of knowledge, experiences, information, and ideas among colleagues, individuals tend to experience increased commitment and moral engagement in their workplace. This commitment to active involvement and engagement within the school environment will inspire teachers to boldly take risks and generate new ideas that promote innovation, thus fostering positive change within the institution. Azizi et al. (2023) argue that like weaving golden threads amidst a wilderness of ideas, achieving the desired level of knowledge creation and innovation within an organization requires more than just honing employees' skills and knowledge. They emphasize the need for targeted development, where knowledge sharing becomes its core, weaving a spirit of collaboration within the organization. When employees are motivated, they have the potential to enhance their capabilities and produce higher-quality outputs in knowledge discovery within a condensed timeframe.

## CONCLUSION AND MANAGERIAL IMPLICATIONS

The research findings indicate that ethical leadership and affective commitment have direct and indirect impacts on teachers' innovative work behavior. The positive practice of knowledge sharing among teachers directly promotes teachers' innovative work behavior. To foster innovative behavior in the school ecosystem, ethical leadership should serve as a leadership model, knowledge sharing among internal stakeholders should be encouraged, and teachers' affective commitment should be maintained and enhanced. The discoveries aid in enhancing comprehension regarding the interactions among ethical leadership, affective commitment, knowledge sharing, and innovative work behavior in the context of educational institutions.

Some managerial implications that can be suggested based on the research findings. Firstly, if aiming to enhance teachers' innovative behavior, school management may consider appointing or preparing school principals who have ethical capacities and abilities to practice ethics and morality in personal life and leadership. Ethical standards should be one of the requirements that must be fulfilled by candidates to be appointed to structural

and functional positions in schools such as principals, vice principals, class teachers, subject coordinators, student organization advisors, and others. Furthermore, school administrations should actively encourage ethical leadership styles among teachers by evaluating, advocating, promoting, and recognizing all dimensions of ethical leadership behavior. This approach fosters a culture where more individuals are motivated to exemplify ethical leadership styles within the school environment. Additionally, school management can bolster ethical leadership by offering comprehensive training to both structural and functional officials within the school.Educational leader needs to pay attention and support teachers who have long served in the school by providing tenure awards such as cash bonuses, gold rings, or other compensations to appreciate their dedication, such as travel tickets to visit historical places abroad, refreshment programs abroad, or family vacations for employees, and others tailored to the school's capabilities. Additionally, school management also needs to provide compensation for teachers who enjoy sharing their knowledge and skills and for teachers who innovate by providing ideas or innovative works.

Amid the widespread issue of the presence of artificial intelligence with applications capable of answering all questions asked, knowledge sharing remains relevant in promoting innovative behavior because the best practices performed by one teacher will greatly enrich other teachers and add value to global knowledge management. The knowledge and skills possessed by an individual due to diligence and work results can help other employees to develop themselves, thus advancing together. Therefore, it needs to be supported by policies and routine programs such as the establishment of knowledge sharing platforms, regular team meetings, and open communication channels to encourage teachers to actively share knowledge, experience, and skills.

This study has numerous constraints, namely that this research was conducted in educational institutions, particularly private schools in Indonesia, which are characterized by a collective culture. Therefore, replication studies with respondents from manufacturing or other service industries are needed, or it could also be conducted in other countries with different cultures. Second, future research could use mediating variables that are closely related to internal factors of teachers, such as psychological capital (Karimi et al., 2023), achievement motivation and trust. Third, this study only selected ethical leadership style, whereas there are several other positive leadership styles that can promote teachers' innovative behavior in schools. Therefore, future research could utilize, for example, inclusive leadership, servant leadership, digital leadership, empowerment leadership, and collaborative leadership. Fourth, further research can examine the potential moderating effects of organizational culture or the external environment on the relationship between ethical leadership, affective commitment, knowledge sharing, and innovative work behavior. Furthermore, contrasting the dynamics of these connections across various cultural contexts or sectors could yield a more profound understanding of the universality or particularity of the findings from this study.

## REFERENCES


Abbasi, A. S., Rashidi, Z., & Ghani, U. (2022). Inclusive Leadership and Employees' Knowledge Hiding Behaviors: The Mediating Role of Interpersonal Trust and Affective Commitment as a Moderator. *Pakistan Journal of Commerce and Social Sciences*, *16*(4), 452–471.

Ahmed, F., Hassan, A., Ayub, M. U., & Klimoski, R. (2018). High Commitment Work System and Innovative Work Behavior: The Mediating Role of Knowledge Sharing. *Pakistan Journal of Commerce and Social Sciences*, *12*(1), 29–51.

Alblooshi, M., Shamsuzzaman, M., & Haridy, S. (2020). The relationship between leadership styles and organisational innovation : A systematic literature review and narrative synthesis. In *European Journal of Innovation Management* (Vol. 24, Issue 2, pp. 338–370). Emerald Group Holdings Ltd. https://doi.org/10.1108/EJIM-11-2019-0339.

Alfaridi, N., Prabowo, H., Manurung, H. A., & Hamsal, M. (2020). Ethical Leadership on Organizational Innovation and the Role of Knowledge Sharing. *Advances in Transportation and Logistics Research*, 807–812.

Allen, N. J., & Meyer, J. P. (1990). The measurement and antecedents of affective, continuance and normative commitment to the organization. *Journal of Occupational Psychology*, *63*(1), 1–18. https://doi.org/10.1111/j.2044-8325.1990.tb00506.x

Andrade, R. D., Pinheiro, P. G., Pontes, M. D. M., & Pontes, T. L. D. (2023). Unleashing Knowledge Sharing in Emerging Economy Startups: A Multilevel Analysis. *Sustainability (Switzerland)*, *15*(13). https://doi.org/10.3390/su151310338.

Arsawan, I. W. E., Kariati, N. M., Shchokina, Y., Prayustika, P. A., Rustiarini, N. W., & Koval, V. (2022). Invigorating Employee's Innovative Work Behavior: Exploring Sequential Mediating Role of Organizational Commitment and Knowledge Sharing. *Business: Theory and Practice*, *23*(1), 117–130. https://doi.org/10.3846/btp.2022.15684.

Asif, M., Qing, M., Hwang, J., & Shi, H. (2019). Ethical leadership, affective commitment,work engagement, and creativity: Testing a multiple mediation approach. *Sustainability (Switzerland)*, *11*(16). https://doi.org/10.3390/su11164489.

Azinga, S. A., Obeng, A. F., Ellis, F. Y. A., & Ansah, M. O. (2023). Assessing the effects of transformational leadership on innovative behavior: the role of affective commitment and psychological capital. *Evidence-Based HRM*. https://doi.org/10.1108/EBHRM-05-2022-0119.

Azizi, N., Akhavan, P., Ahsan, A., Khatami, R., Haass, O., & Saremi, S. (2023). Influence of motivational factors on knowledge sharing methods and knowledge creation process in an emerging economic context. *Knowledge Management & E-Learning: An International Journal*, *15*(1), 115–132. https://doi.org/10.34105/j.kmel.2023.15.007.

Batmomolin, A., Supriatna, D., Hananto, T., Tanuwijaya, J., & Sadana S. MS. (2022). Mediating Role of Intrapreneurship Competency and Affective Commitment in the Influence of Training and Development on Employees' Innovative Behavior. *Quality - Access to Success*, *23*(191). https://doi.org/10.47750/qas/23.191.09.

Batmomolin, A., Tanuwijaya, J., & Usman, B. (2024). Organizational Commitment. *EPRA International Journal of Multidisciplinary Research (IJMRA)*, *10*(3), 538–547. https://doi.org/10.36713/epra16274.

Battistelli, A., Odoardi, C., Vandenberghe, C., Di Napoli, G., & Piccione, L. (2019). Information sharing and innovative work behavior: The role of work-based learning, challenging tasks, and organizational commitment. *Human Resource Development Quarterly*, *30*(3), 361–381. https://doi.org/10.1002/hrdq.21344.

Bavik, Y. L., Tang, P. M., Shao, R., & Lam, L. W. (2018). Ethical leadership and employee knowledge sharing: Exploring dual-mediation paths. *Leadership Quarterly*, *29*(2), 322–332. https://doi.org/10.1016/j.leaqua.2017.05.006.

Brown, M. E., Treviño, L. K., & Harrison, D. A. (2005). Ethical leadership: A social learning perspective for construct development and testing. *Organizational Behavior and Human Decision Processes*, *97*(2), 117–134. https://doi.org/10.1016/j.obhdp.2005.03.002.

Chaman, S., Zulfiqar, S., Shaheen, S., & Saleem, S. (2021). Leadership styles and employee knowledge sharing: Exploring the mediating role of introjected motivation. *PLoS ONE*, *16*(9 September). https://doi.org/10.1371/journal.pone.0257174.

De Vries, R. E., Van Den Hooff, B., & De Ridder, J. A. (2006). Explaining knowledge sharing: The role of team communication styles, job satisfaction, and performance beliefs. *Communication Research*, *33*(2), 115–135. https://doi.org/10.1177/0093650205285366.

Devi, N. C. (2023). Paradoxical leadership and employee creativity: knowledge sharing and hiding as mediators. *Journal of Knowledge Management*. https://doi.org/10.1108/JKM-10-2022-0779.

Dong Phung, V., Hawryszkiewycz, I., Chandran, D., & Minh Ha, B. (2017). Knowledge Sharing and Innovative Work Behaviour: A Case Study from Vietnam. *Australasian Conference on Information Systems*.

Dua, A. K., Farooq, A., & Rai, S. (2023). Ethical leadership and its influence on employee voice behavior: role of demographic variables. *International Journal of Ethics and Systems*, *39*(2), 213–235. https://doi.org/10.1108/IJOES-10-2021-0200.

Ficapal-Cusí, P., Enache-Zegheru, M., & Torrent-Sellens, J. (2020). Linking perceived organizational support, affective commitment, and knowledge sharing with prosocial organizational behavior of altruism and civic virtue. *Sustainability (Switzerland)*, *12*, 1–20. https://doi.org/10.3390/su122410289.

Goswami, A. K., & Agrawal, R. K. (2023). It's a knowledge centric world! Does ethical leadership promote knowledge sharing and knowledge creation? Psychological capital as mediator and shared goals as moderator. *Journal of Knowledge Management*, *27*(3), 584–612. https://doi.org/10.1108/JKM-09-2021-0669.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate Data Analysis Eighth Edition* (Eighth Edition). Annabel Ainscow. www.cengage.com/highered.

Hakimian, F., Farid, H., Ismail, M. N., & Nair, P. K. (2016). Importance of commitment in encouraging employees' innovative behaviour. *Asia-Pacific Journal of Business Administration*, *8*(1), 70–83. https://doi.org/10.1108/APJBA-06-2015-0054.

Hong, Y., Kim, B. J., & Kim, M. J. (2023). The Knowledge-Sharing Implications of Social Responsibility of Firms: The Importance of Ethical Climate. *Behavioral Sciences*, *13*(7). https://doi.org/10.3390/bs13070608.

Iqbal, Z. A., Abid, G., Contreras, F., Hassan, Q., & Zafar, R. (2020). Ethical leadership and innovativework behavior: The mediating role of individual attributes. *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(3). https://doi.org/10.3390/joitmc6030068.

Islam, T., Zahra, I., Rehman, S. U., & Jamil, S. (2022). How knowledge sharing encourages innovative work behavior through occupational self-efficacy? The moderating role of entrepreneurial leadership. *Global Knowledge, Memory and Communication*. https://doi.org/10.1108/GKMC-02-2022-0041.

Jafri, H. M. (2010). Organizational Commitment and Employee's Innovative Behavior - A Study in Retail Sector. *Journal of Management Research*, *10*(1), 62–68.

Jain, P. (2022). Cultural intelligence and innovative work behavior: examining multiple mediation paths in the healthcare sector in India. *Industrial and Commercial Training*, *54*(4), 647–665. https://doi.org/10.1108/ICT-08-2021-0061.

Janssen, O. (2000). Job demands, perceptions of effort-reward fairness and innovative work behaviour. *Journal of Occupational and Organizational Psychology*, *73*(3), 287–302. https://doi.org/10.1348/096317900167038.

Javed, T., Mahmood, S., Khan, S., & Ullah, H. (2021). The Mediating Role of Affective Commitment between Creative Self- Efficacy , Authentic Leadership and Innovative Behaviour among Academic Employees of Higher Education Sector of Punjab , Pakistan. *IRASD Journal of Management Volume*, *3*(3), 429–447. https://doi.org/https://doi.org/10.52131/jom.2021.0303.0056429iRASD.

Jia, K., Zhu, T., Zhang, W., Rasool, S. F., Asghar, A., & Chin, T. (2022). The Linkage between Ethical Leadership, Well-Being, Work Engagement, and Innovative Work Behavior: The Empirical Evidence from the Higher Education Sector of China. *International Journal of Environmental Research and Public Health*, *19*(9). https://doi.org/10.3390/ijerph19095414.

Jin, X., Qing, C., & Jin, S. (2022). Ethical Leadership and Innovative Behavior: Mediating Role of Voice Behavior and Moderated Mediation Role of Psychological Safety. *Sustainability (Switzerland)*, *14*(9). https://doi.org/10.3390/su14095125.

Jnaneswar K, & Ranjit, G. (2021). Organisational justice and innovative behaviour: Is knowledge sharing a mediator? *Industrial and Commercial Training*, *53*(1), 77–91. https://doi.org/10.1108/ICT-04-2020-0044.

Karimi, S., Ahmadi Malek, F., Yaghoubi Farani, A., & Liobikienė, G. (2023). The Role of Transformational Leadership in Developing Innovative Work Behaviors: The Mediating Role of Employees' Psychological Capital. *Sustainability*, *15*(2), 1267. https://doi.org/10.3390/su15021267.

Khan, M., Fawad Ali, H., & Qaisar Danish, R. (2019). Role of attitude towards knowledge sharing, perceived norms and perceived control to predict knowledge sharing behavior among auditors in service organizations of Pakistan. *UK The Business and Management Review*, *10*(3).

Khaola, P., & Coldwell, D. (2019). Please Lead Me, My Commitment is Low: Interactive Effects of Commitment and Leadership on Innovative Behavior. In *International Journal of Innovation Management*. World Scientific Publishing Co. Pte Ltd. https://doi.org/10.1142/S1363919619500154.

Khaola, P. P., & Musiiwa, D. (2021). Bolstering innovative work behaviours through leadership, affective commitment and organisational justice: a three-way interaction analysis. *International Journal of Innovation Science*, *13*(5), 610–626. https://doi.org/10.1108/IJIS-10-2020-0205.

Khaola, P. P., & Oni, F. A. (2020). The influence of school principals' leadership behaviour and act of fairness on innovative work behaviours amongst teachers. *SA Journal of Human Resource Management*, *18*(0), 1–8. https://doi.org/10.4102/sajhrm.v18i0.1417.

Khorakian, A., Mohammadi Shahroodi, H., Jahangir, M., & Nikkhah Farkhani, Z. (2019). Innovative Work Behavior in Public Organizations: The Roles of Ethical and Knowledge Sharing Behaviors. *Creativity Research Journal*, *31*(2), 164–173. https://doi.org/10.1080/10400419.2019.1607444.

Kim, W., & Park, J. (2017). Examining structural relationships between work engagement, organizational procedural justice, knowledge sharing, and innovative work behavior for sustainable organizations. *Sustainability (Switzerland)*, *9*(2). https://doi.org/10.3390/su9020205.

Koay, K. Y., & Lim, P. K. (2022). Ethical leadership and knowledge hiding: testing the mediating and moderating mechanisms. *Journal of Knowledge Management*, *26*(3), 574–591. https://doi.org/10.1108/JKM-02-2021-0091.

Kumar, A., Singh, S., & Singh, A. K. (2023). Ethical Leadership in Organization: Conceptual Overview. In *Ethics and Values in Organization: Contemporary Issues and Challenges* (pp. 51–65). Anu Books, Meerut. https://doi.org/10.31995/book.ab274-m23.chapter4.

Kumari, N., & Afroz, N. (2013). The Impact of Affective Commitment in Employees Life Satisfaction Affective Commitment in Employees Life Satisfaction. *Global Journal of Management and Business Research Interdisciplinary*, *13*(7), 1–7.

Le, P. B., & Lei, H. (2018). Fostering knowledge sharing behaviours through ethical leadership practice: The mediating roles of disclosure-based trust and reliance-based trust in leadership. *Knowledge Management Research and Practice*. https://doi.org/10.1080/14778238.2018.1445426.

Lei, H., Ha, A. T. L., & Le, P. B. (2020). How ethical leadership cultivates radical and incremental innovation: the mediating role of tacit and explicit knowledge sharing. *Journal of Business and Industrial Marketing*, *35*(5), 849–862. https://doi.org/10.1108/JBIM-05-2019-0180.

Lim, S. G. (Edward), & Ok, C. "Michael." (2021). Knowledge sharing in hospitality organizations: A meta-analysis. *International Journal of Hospitality Management*, *95*. https://doi.org/10.1016/j.ijhm.2021.102940.

Lin, Z., & Shin, H. (2021). Structural relationship between organizational justice, organizational trust, and knowledge sharing and innovative behavior: Focus on professors from Chinese sport universities. *Journal of Physical Education and Sport*, *21*(2), 882–893. https://doi.org/10.7752/jpes.2021.02110.

Liu, X., Huang, Y., Kim, J., & Na, S. (2023). How Ethical Leadership Cultivates Innovative Work Behaviors in Employees? Psychological Safety, Work Engagement and Openness to Experience. *Sustainability (Switzerland)*, *15*(4). https://doi.org/10.3390/su15043452.

Luo, C., Lan, Y., (Robert) Luo, X., & Li, H. (2021). The effect of commitment on knowledge sharing: An empirical study of virtual communities. *Technological Forecasting and Social Change*, *163*. https://doi.org/10.1016/j.techfore.2020.120438.

Maiti, B. R., Sanyal, S. N., & Mazumder, R. (2021). Antecedents and consequences of organizational commitment in school education sector. *International Journal of Organizational Analysis*, *29*(3), 716–735. https://doi.org/10.1108/IJOA-02-2020-2041.

Marques, J. M. R., La Falce, J. L., Marques, F. M. F. R., De Muylder, C. F., & Silva, J. T. M. (2019). The relationship between organizational commitment, knowledge transfer and knowledge management maturity. *Journal of Knowledge Management*, *23*(3), 489–507. https://doi.org/10.1108/JKM-03-2018-0199.

Morshedi, A., Nezafati, N., Shokuhyar, S., Tanhaeean, M., & Karami, M. (2023). A Markov-based assessment of Knowledge Management Models at Universities. *Iranian Journal of Management Studies*, *16*(3), 593–612. https://doi.org/10.22059/ijms.2022.338388.674945.

Muhammed, S., Osmanaj, V., Kulakli, A., & Zaidi, S. F. H. (2020). Evaluating task knowledge as a mediator in the relationship between knowledge sharing and innovative work behaviour. *IC3K 2020 - Proceedings of the 12th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management*, *3*, 40–50. https://doi.org/10.5220/0010015000400050.

Munir, R., & Beh, L. S. (2019). Measuring and enhancing organisational creative climate, knowledge sharing, and innovative work behavior in startups development. *The Bottom Line*, *32*(4), 269–289. https://doi.org/10.1108/BL-03-2019-0076.

Musenze, I. A., & Mayende, T. S. (2023). Ethical leadership (EL) and innovative work behavior (IWB) in public universities: examining the moderating role of perceived organizational support (POS). *Management Research Review*, *46*(5), 682–701. https://doi.org/10.1108/MRR-12-2021-0858.

Nguyen, T. P. L., Nguyen, K. N., Do, T. D., & Nguyen, T. T. M. (2019). Knowledge sharing and innovative work behavior: The case of Vietnam. *Uncertain Supply Chain Management*, *7*(4), 619–634. https://doi.org/10.5267/j.uscm.2019.5.001.

Nham, T. P., Tran, N. H., & Nguyen, H. A. (2020). Knowledge sharing and innovation capability at both individual and organizational levels: An empirical study from Vietnam's telecommunication companies. *Management and Marketing*, *15*(2), 275–301. https://doi.org/10.2478/mmcks-2020-0017.

Opoku, M. A., Choi, S. B., & Kang, S. W. (2019). Servant leadership and innovative behaviour: An empirical analysis of Ghana's manufacturing sector. *Sustainability (Switzerland)*, *11*(22), 2–18. https://doi.org/10.3390/su11226273.

Ouakouak, M. L., & Ouedraogo, N. (2019). Fostering knowledge sharing and knowledge utilization: The impact of organizational commitment and trust. *Business Process Management Journal*, *25*(4), 757–779. https://doi.org/10.1108/BPMJ-05-2017-0107.

Özsungur, F. (2019). The impact of ethical leadership on service innovation behavior. *Asia Pacific Journal of Innovation and Entrepreneurship*, *13*(1), 73–88. https://doi.org/10.1108/apjie-12-2018-0073.

Rattanawichai, N., Wiriyapinit, M., & Khlaisang, J. (2022). Success Factors to Promote Innovative Behavior in Organizations. *Proceedings of the 18th European Conference on Management Leadership and Governance*, 499–505.

Robbins, S. P. 1943-, & Judge, T. A. (2022). *Essentials of organizational behavior* (S. Robbins & T. Judge, Eds.; Fifteenth Edition). Pearson Education.

Saeed, I., Khan, J., Zada, M., Zada, S., Vega-Muñoz, A., & Contreras-Barraza, N. (2022). Linking Ethical Leadership to Followers' Knowledge Sharing: Mediating Role of Psychological Ownership and Moderating Role of Professional Commitment. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.841590.

Seo, J. (2023). Why Does the Impact of Psychological Empowerment Increase Employees' Knowledge-Sharing Intention? A Moderated Mediation Model of Belonging and Perceived Organizational Support. *Behavioral Sciences*, *13*(5), 1–11. https://doi.org/10.3390/bs13050387.

Serdyukov, P. (2017). Innovation in education: what works, what doesn't, and what to do about it? *Journal of Research in Innovative Teaching & Learning*, *10*(1), 4–33. https://doi.org/10.1108/jrit-10-2016-0007.

Sharif, S., Lodhi, R. N., Iqbal, K., & Saddique, F. (2022). Gender disparity in leadership boosts affective commitment and tacit knowledge sharing about libraries. *International Journal of Organizational Analysis*, *30*(5), 1212–1234. https://doi.org/10.1108/IJOA-12-2020-2549.

Su, X., Lin, W., Wu, J., Zheng, Q., Chen, X., & Jiang, X. (2021). Ethical Leadership and Knowledge Sharing: The Effects of Positive Reciprocity and Moral Efficacy. *SAGE Open*, *11*(2). https://doi.org/10.1177/21582440211021823.

Tabiu, A. (2023). Impact of ethical leadership, HRM practices and ethical climate on organizational citizenship behaviors in Nigerian local governments. *International Journal of Public Leadership*. https://doi.org/10.1108/IJPL-06-2022-0038.

Tajeddini, K., Budur, T., Gamage, T. C., Demir, A., Zaim, H., & Topal, R. (2023). Impact of diversity management on innovative work behavior: mediating role of human resource management and affective commitment. *Journal of Management Development*, *42*(1), 29–53. https://doi.org/10.1108/JMD-06-2022-0154.

Tu, Y., Zhang, Y., Lu, X., & Wang, S. (2020). Differentiating two facets of trust in colleagues: How ethical leadership influences cross-team knowledge sharing. *Leadership and Organization Development Journal*, *41*(1), 88–100. https://doi.org/10.1108/LODJ-06-2019-0260.

Vandavasi, R. K. K., McConville, D. C., Uen, J. F., & Yepuru, P. (2020). Knowledge sharing, shared leadership and innovative behaviour: a cross-level analysis. *International Journal of Manpower*, *41*(8), 1221–1233. https://doi.org/10.1108/IJM-04-2019-0180.

Vladić, N., Maletič, D., & Maletič, M. (2021). Determinants of innovation capability: An exploratory study of inclusive leadership and work engagement. *Quality Innovation Prosperity*, *25*(2), 130–152. https://doi.org/10.12776/qip.v25i2.1596.

Wu, W. L. (2021). How Ethical Leadership Promotes Knowledge Sharing: A Social Identity Approach. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.727903.

Xia, Z., & Yang, F. (2020). Ethical Leadership and Knowledge Sharing: The Impacts of Prosocial Motivation and Two Facets of Conscientiousness. *Frontiers in Psychology*, *11:581236*. https://doi.org/10.3389/fpsyg.2020.581236.

Yepes, V., & López, S. (2023). The Knowledge Sharing Capability in Innovative Behavior: A SEM Approach from Graduate Students' Insights. *International Journal of Environmental Research and Public Health*, *20*. https://doi.org/10.3390/ijerph20021284.

Zahra, T. T., & Waheed, A. (2017). Influence of Ethical Leadership on Innovative Work Behavior: Examination of Individual-Level Psychological Mediators. *Pakistan Journal of Commerce and Social Sciences*, *11*(2), 448–470.

Zhang, X. (2020). The Relationship of Coaching Leadership and Innovation Behavior: Dual Mediation Model for Individuals and Teams across Levels. *Open Journal of Leadership*, *09*(01), 70–83. https://doi.org/10.4236/ojl.2020.91005.

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# ANALYSIS OF CYBER-ATTACKS IN SOME GEOPOLITICALLY EXPOSED COUNTRIES IN EUROPE

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## Abstract

The goal of the research was to determine, analyse and compare the type and number of cyber-attacks in the chosen countries: Germany, the United Kingdom, Serbia, and Slovenia. In all four countries, we set up honeypots and in Germany, we installed the fifth server for managing and collecting data from honeypots. Each of the four servers had the identical setup of six sensors: secure shell sensor, file transfer protocol sensor, vulnerable website sensor, server message block sensor, point-to-point tunnelling protocol sensor, and sensor for structured query language protocol for working with databases SQL. Data collection lasted for 12 days in February 2021, during which we detected a total of 1.847.395 attacks. The server in the United Kingdom captured 31,53% of the overall traffic, the server in Germany 23,26%, the server in Serbia 22,71%, and the server in Slovenia 22,50% of the overall traffic. After exporting all unique IP addresses from all four servers, we found a significant 12,89% overlap of IP addresses attacking both the Slovenian server and at least one of the other servers. Moreover, we analysed 124 unique samples of malicious code uploaded on the Slovenian server, and all of them were identified before our data capture, confirming that no zero-day vulnerabilities were cached on the Slovenian server.

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Key Words

Cybersecurity; cyber-attacks; honeypot; Germany; the United Kingdom; Serbia; Slovenia.

## INTRODUCTION

Cybersecurity is essential for building a resilient, green, and digital Europe. One of the key objectives is to achieve strategic autonomy while maintaining an open economy. This includes strengthening the capacity for independent decision-making in cybersecurity to enhance the EU's leadership in the digital domain and its strategic capabilities.

Cyber-attacks and cybercrime are becoming increasingly problematic and appearing in more sophisticated forms across Europe. This trend is expected to continue in the future, as there will be an estimated 22.3 billion Internet of Things devices connected worldwide by 2024 (European Council, n. d.). Given these predictions, both government institutions and the economy are aware of the importance of cybersecurity and defence. Therefore, on March 22, 2021, the EU Council adopted conclusions on the EU's cybersecurity strategy in the digital decade (European Council, 2021).

European Council addresses several areas for action in the coming years, including the establishment of a common cybersecurity unit, the implementation of key internet security standards, support for robust encryption, and the creation of a network of secure operation centres across the EU. Additionally, the European Cybercrime Centre, established under Europol, will assist EU member states in investigating cybercrimes and dismantling criminal networks.

The five most common threats in the past years identified by the European Union Agency for Cybersecurity are: system infection with malware, two different methods of cyberattacks, malicious emails with phishing attempts, attacks through web applications, and unsolicited emails (European Parliament, 2023). Many companies are engaged in security solutions or services to protect users and the information-communication environment from cyber-attacks. These include, for instance, antivirus systems, firewalls, and systems that use artificial intelligence for attack detection. The success of companies in catching attackers depends on how they have set up systems for detecting and collecting attacks. These systems, based on heuristics, artificial intelligence, and known attack patterns, identify new malicious patterns appearing on the internet.

Cyber-attacks can be divided into two categories based on their focus. The first category includes targeted attacks. The goal of such attacks is to infiltrate the precisely chosen target. The second category consists of automated attacks. The entire internet space is limited to $2^{32}$ IP address spaces, overseen by the non-profit organization ICANN, which distributes these addresses among countries. Malicious attackers create harmful

software capable of autonomously and continuously searching for vulnerable systems online, without human interaction. To identify and study such malicious software, we deployed sensors on our own information-communication and electronic means in multiple European countries. These sensors appeared as different services running on seemingly vulnerable software. The sensors were able to record the type and scope of attacks and, in some cases, the malicious code even automatically exploited the sensors.

Of course, many online services display cyber-attacks in real time based on such sensors, but these services do not provide results that can be used for research purposes. Therefore, we decided to set up our independent system and use the acquired data for further analysis. We stored all attempted attacks in a database, which formed the basis for analysis. We collected data from our servers in Germany, the United Kingdom, Serbia, and Slovenia. The countries were chosen based on their geopolitical exposure in Europe.

The purpose of this research was to determine, analyse and compare the type and number of cyber-attacks in the chosen countries. We assumed that due to its size and limited geopolitical and economic influence, Slovenia is not the primary target of hacker attacks, resulting in a smaller number of cyber-attacks compared to other countries. Further, we studied the origin of cyber-attacks. We assumed that the sources of cyber-attacks targeting Slovenia are distinct from those targeting Germany, the United Kingdom, and Serbia. We looked for any patterns or trends in the origin of cyber-attacks that would help us understand the goals and tactics of cyber attackers who target Slovenia and other countries under study. Finally, we assumed that a zero-day vulnerability file would not be uploaded to a server in Slovenia. Zero-day vulnerabilities are highly valuable to cyber attackers as they offer the advantage of being unpatched and undetected by security measures. We evaluate the level of security and potential danger of exploiting such vulnerabilities in Slovenia's information-communication infrastructure by looking into the existence or absence of zero-day vulnerability files in the country's server.

**H1:** The number of cyber-attacks in Slovenia is statistically smaller than the number of cyber-attacks in Germany, the United Kingdom, and Serbia.

**H2:** The origin of cyber-attacks in Slovenia is different from the origin of cyber-attacks in Germany, the United Kingdom, and Serbia.

**H3:** A zero-day vulnerability file will not be uploaded to a server in Slovenia.

## MATERIALS AND METHODS

For the purpose of our research, we have set up four servers, one in Germany near the city of Nuremberg, one in the United Kingdom near

London, one in Serbia in Belgrade, and the last one in Slovenia in Ljubljana. We selected Germany and England because both countries are among the top five EU countries in terms of the number of cyber-attacks in all international statistics. This is an expected fact, as Germany is considered the economic engine of Europe. The United Kingdom, on the other hand, stands out as the country with the highest number of cyber-attacks in the EU in 2018. This is likely attributed to various factors, including the country's decision to leave the European Union, the impact of the COVID-19 pandemic, and the historically close ties with the United States of America. Serbia was selected as one of the study's countries, which is noteworthy because it isn't a part of the EU but is nonetheless in Europe. Serbia's participation in the study enables a larger and more varied perspective on cyberattacks in the region of Europe. Compared to EU members, Serbia may have different cybersecurity dynamics and problems.

In all four countries, we set up honeypots, virtual systems used as a trap to detect and prevent unauthorized access. Honeypots are security systems designed to detect and prevent unauthorized access or use of a computer system. They capture unauthorized users and hackers within the network in a way that allows them to be identified and prevented from causing further trouble (Lutjevich et al., n. d.).

In Germany, we installed the central software Modern Honey Network, a centralized server for managing and collecting data from our honeypots. To detect attacks, we installed on each server virtual vulnerable software called sensors. These are services that are virtually vulnerable and can be exploited by attackers. The software does not allow the complete takeover of the server but is designed to record attacks and upload files to the servers. Each executed attack on the service is logged in the database. Data collection for the research lasted 12 days and was conducted in February 2021.

All virtual private servers had the same configuration, running the Linux Ubuntu version 18.04 operating system, with the following vulnerable sensors:

- Secure Shell Sensor (SSH),
- File Transfer Protocol Sensor (FTP),
- Vulnerable Website Sensor,
- Server Message Block (SMB) Sensor
- Point-to-Point Tunneling Protocol (PPTP) Sensor,
- Sensor for Structured Query Language protocol for working with databases SQL.

All sensors sent data in real-time to the central server, responsible for collecting all the data and storing it in the database. The central server was located in Germany and did not have any sensors installed. All sensors presented themselves as outdated versions of services with known vulnerabilities. Attackers were able to connect to some sensors, exploit them, and upload malicious software to the server, while other servers were only used to record the number of requests made.

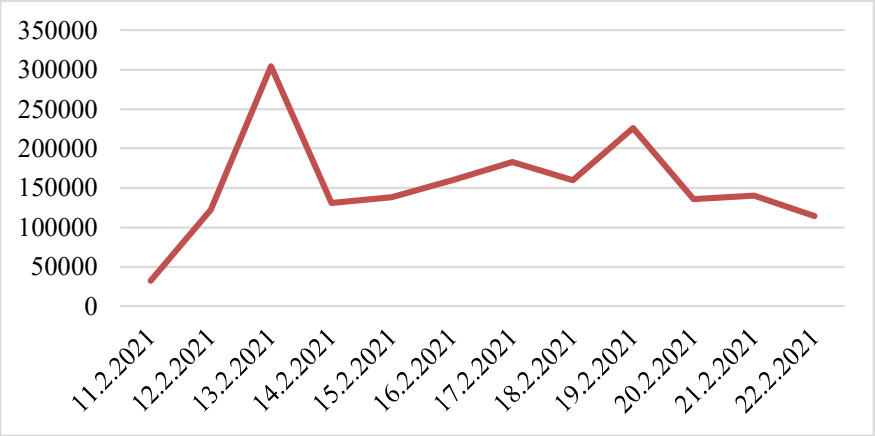
After setting up the sensors on all four servers, we verified whether they corresponded to the desired configuration. For testing the publicly accessible

services, we used Nmap (version 14), a powerful and versatile network scanning tool that helps to discover open ports and services on target systems. To minimize the risk of obtaining inaccurate or incomplete data, we manually checked each sensor before starting the data collection procedure.

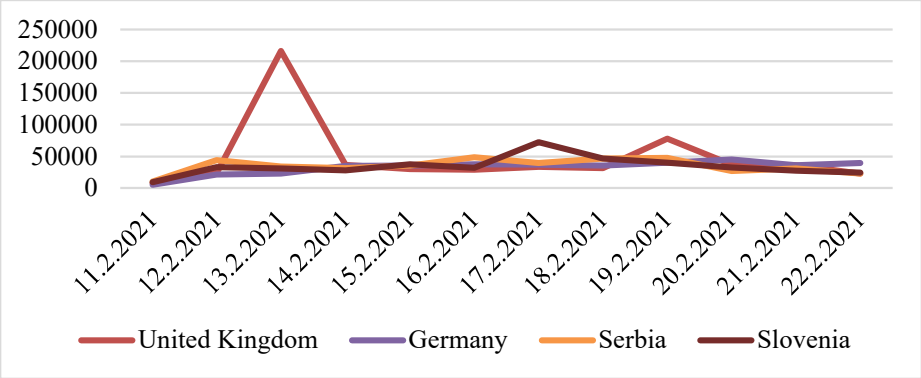
## RESULTS

We collected the data for 12 days: from February 11, 2021, at 00:00 to February 22, 2021, at 00:00. During this period, we detected a total of 1.847.395 attacks across all sensors, which served as our primary source of information for conducting the analysis. On average, we observed 1,78 attacks per second. The lowest number of attacks (32.146) occurred on the first day of setup. This relatively low number of intrusion attempts on the first day can be attributed to the fact that servers were newly exposed to the internet. However, the number remains substantial, confirming that the internet is a hazardous space where various cyberattacks constantly occur. On the second day of data collection, we already recorded 122.480 detections on the sensors. The highest number of attacks was observed on the third day, reaching 304.411 incidents. The reason is the notable increase in attack attempts on the server in the United Kingdom. For the remaining days, there were more than 130.000 intrusion attempts per day, with the seventh day and the ninth day showing over 182.000 attacks.

**Graph 1:** The number of all attacks per day

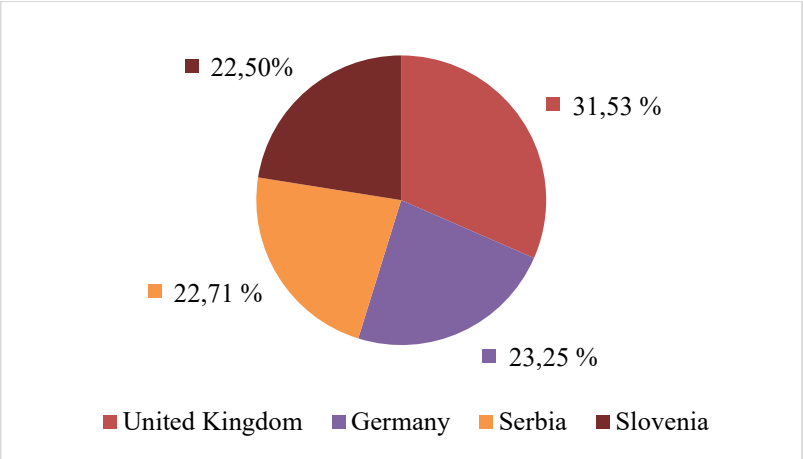


**Graph 2:** The number of all attacks per day per country




Graph 2 shows the number of all attacks distributed by days and countries. Summing up all the attacks for each country, we observed 582.562 intrusion attempts in the United Kingdom, 429.562 in Germany, 419.631 in Serbia, and 415.640 in Slovenia. The highest number of attacks was recorded in the United Kingdom, which was an expected result considering the other EU statistics regarding the number of cyberattacks. On the other hand, the lowest number of attacks was recorded in Slovenia with the highest number on February 17, 2021, with a total of 72,421 incidents.

**Graph 3:** The percentage of attacks on individual servers

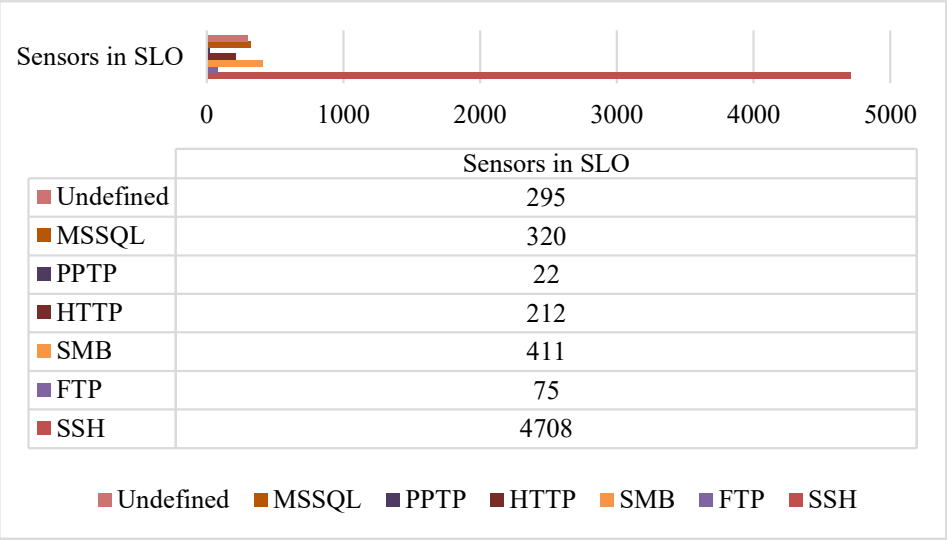



Further, we counted the number of unique IP addresses that attack individual countries during the observed period. In Serbia, we detected 13.644 unique IP addresses, in the United Kingdom 10.533 unique IP addresses, in Slovenia 10.104 unique IP addresses, and in Germany only 8,845 unique IP addresses. From this data, it can be concluded that each IP address in Germany sent an average of 48,56 requests, in Slovenia 41,13, in Serbia 30,75, and the United Kingdom 55,30. This means that attackers targeting

the server in the United Kingdom are the most aggressive, sending the highest number of requests to the service during their attacks.

We compared IP addresses between the sensors on the Slovenian server and the sensors in other countries. During the observed period, we detected a total of 33.022 unique IP addresses on the German, United Kingdom, and Serbian servers. From February 11, 2021, to March 7, 2021[1], we identified 13,830 IP addresses on the Slovenian server. Therefore, we compared a total of 46.852 addresses. Graph 4 illustrates the number of individual IP addresses that were recorded on both the Slovenian server and on servers in other observed countries. The sensor for SSH has the highest number, with 4.708 IP addresses attacking Slovenian cyberspace and also being active elsewhere in Europe. It is followed by the SMB server with 411 IP addresses and the database sensor with 320 IP addresses. The FTP sensor had the lowest number of connections with 75, followed by PPTP with 22. In total, there were 6.043 detected addresses, representing 12,89% of all addresses, that attacked both Slovenian server and servers in other observed countries, which is higher than expected.

**Graph 4:** The number of IP addresses that were detected on the Slovenian server and at least one other server




| | Sensors in SLO |
|---|---|
| Undefined | 295 |
| MSSQL | 320 |
| PPTP | 22 |
| HTTP | 212 |
| SMB | 411 |
| FTP | 75 |
| SSH | 4708 |

Moreover, the overall analysis revealed that we detected 72 patterns of malicious code on both the Slovenian server and at least one other server. Additionally, 52 patterns were found exclusively on the Slovenian server. With these statistics, we cannot confirm the second hypothesis that Slovenian server would be attacked from different sources than servers in other parts of Europe. The highest level of matching was observed with the server in Germany, which experienced an increased number of attacks on the first and on second day of data collection. A total of 55 matching patterns

[1] We extended the observation on Slovenian server.

were detected on both servers. On the server in the United Kingdom, we detected 31 identical patterns, and on the server in Serbia, 37 identical patterns.

During data analysis, we worked with the hashed value of the files in the form of MD5[2]. We analysed all the hashed values on the website Virustotal, an online service where you can upload files, URLs, or search through an existing database of known patterns of malicious code. In the case of the server in Slovenia, after examining all the patterns, we found that all MD5 values were already entered into online services before we started capturing the traffic. With this, we confirmed the third hypothesis, which states that a zero-day vulnerability file will not be uploaded to a server in Slovenia.

## DISCUSSION

Cyber-attacks refer to malicious actions carried out by individuals or organisations to breach, exploit, or interfere with computer systems, networks, or electrical equipment. A cyberattack may steal, alter, or destroy a specified target by hacking into a private network or otherwise susceptible system. These attacks may be carried out for a variety of reasons, such as monetary gain, political objectives, espionage, or just to disrupt services. As of today, cyberattacks have become increasingly sophisticated and dangerous. Moreover, in the digital era, cyber-attacks are a major worry because they can result in data breaches, the theft of sensitive information, financial losses, and damage to vital infrastructure.

To achieve the goal of our study, we have set up four servers, in Germany, the United Kingdom, Serbia, and Slovenia. We installed six sensors on each of the four servers: secure shell sensor, file transfer protocol sensor, vulnerable website sensor, server message block sensor, point-to-point tunnelling protocol sensor, sensor for structured query language protocol for working with databases SQL. All sensors presented themselves as outdated versions of services with known vulnerabilities. Attackers were able to connect to some sensors, exploit them, and upload malicious software to the server, while other servers were only used to record the number of requests made.

Data collection on the sensors was conducted for 12 days, during which we detected a total of 1.847.395 attacks, attempted attacks, connections, and queries. This data served as the basis for our analysis. The server in the United Kingdom captured 31,53% of the overall traffic, the server in Germany 23,26%, the server in Serbia 22,71%, and the server in Slovenia captured 22,50% of the overall traffic. These findings confirmed our first hypothesis that the number of cyber-attacks in Slovenia is smaller than the number of cyber-attacks in Germany, the United Kingdom, and Serbia. Moreover, we exported all unique IP addresses from the captured data that were

[2] A128-bit cryptographic hash function that is commonly used to produce a fixed-size representation of data.

associated with attacks on the sensor in Slovenia. We then used a web service's API to determine the country of origin for each IP address. We found only 11 IP addresses associated with Slovenia, some of them were listed on blacklists, indicating that their malicious activities were detected by other sensors. One of the IP addresses was linked to a legitimate web service, suggesting that an intrusion had occurred on a server that was being exploited for further attacks.

In the second hypothesis, we claimed that the server in Slovenia would be targeted by different sources compared to other parts of Europe. However, after exporting all unique IP addresses from all four servers, we found a significant 12,89% overlap of IP addresses attacking both the Slovenian server and at least one of the other servers. This indicates that 6.043 sources attacked both the Slovenian server and another server. Let us point out that the servers were not connected in a way that would allow the attacker to discover the locations of the other servers. This further confirms that the internet is a global space, and Slovenia is not exempt from cyber threats.

One of the sensors allowed attackers to exploit the server and upload malicious files. Each file's fingerprint was calculated and used for further research. We hypothesized that no "zero-day" vulnerability files would be uploaded to the server in Slovenia. These files contain vulnerabilities unknown to software and hardware manufacturers, making system administrators believe they are safe because they have installed all security patches and updates. Analysing 124 unique samples of malicious code uploaded during the data capture, we discovered three different types of malware. The majority of the files distributed ransomware WannaCry. Some samples were related to the worm Conficker, which exploits vulnerabilities in Windows operating systems, while others were associated with the Trojan horse that opens backdoors on infected systems, allowing attackers to gain access. We checked all samples against online databases of malicious software to determine when they were first detected. All our samples were identified before our data capture, confirming that no zero-day vulnerabilities were confirmed on the Slovenian server.

Throughout the data capture, we experienced several cyberattacks. Notably, the server in London experienced a massive attack on the third day of data capture. We initially believed that an attack had occurred on the web server sensor, but further investigation disproved this assumption. The administrator of an unknown website linked its domain to our server's IP address, which was detected by the sensors. The traffic from the website was temporary and ceased shortly after. On the thirteenth day of data capture, we encountered system slowdowns and bottlenecks due to resource limitations on the servers. Capturing such data is highly resource-intensive for the server, as log files and the database quickly fill up, leading to disk space shortages.

Our research has merely confirmed the fact that the increasing reliance on technology, interconnected systems, and the rapid expansion of the internet has provided cybercriminals with more opportunities to exploit vulnerabilities and launch various types of cyberattacks. There is no doubt

that the current cyberattacks are sophisticated and complex. As cloud services become increasingly popular, concerns about the security of data stored in the cloud have grown. Cyber attackers are incorporating artificial intelligence and machine learning into their tools and techniques making attacks more automated, adaptive and difficult to detect. Ransomware attacks have become particularly prevalent and lucrative for cybercriminals, cybercriminals have shifted focus to target the supply chain of organizations. With the proliferation of IoT devices, security vulnerabilities have emerged, making them attractive targets for cyberattacks. Let us also mention Dark Web and Cybercrime-as-a-Service.

Despite these efforts, cyberattacks are likely to continue to be a challenging problem in the future. To stay one step ahead of cybercriminals and safeguard the digital ecosystem, it will be necessary to maintain constant awareness, collaboration, and innovation.

## CONCLUSION

The goal of this study was to examine and track cyber-attacks coming from various geographical locations to develop a thorough picture of the global cybersecurity landscape. We intended to gather information on cyber incidents from various geographic regions and multiple ports of entry on the internet by setting up servers in Germany, the United Kingdom, Serbia, and Slovenia. Using this strategy, we were able to examine the patterns and trends of cyberattacks coming from various regions. We were also able to discover potential cybersecurity weaknesses in particular areas and comprehend the strategies, methods, and procedures used by threat actors from various locations thanks to the distributed server arrangement. Thanks to this insightful information we can create stronger and more focused cybersecurity strategies and defences.

Additionally, having servers in these four countries enables us to cooperate with regional law enforcement and cybersecurity specialists to share knowledge, exchange threat intelligence, and together strive to reduce and effectively respond to cyber threats. Due to the fact that cyber dangers are not confined by national boundaries and frequently call for a coordinated worldwide response, international cooperation is essential in the fight against cybercrime.

In conclusion, our research using the four servers installed in Germany, the United Kingdom, Serbia, and Slovenia aimed to provide a thorough analysis of cyber threats and attacks from various origins, strengthen global collaboration in cybersecurity efforts, and improve the overall security posture in the digital environment.

## REFERENCES

European Council. (22. 3. 2021). Cybersecurity: Council adopts conclusions on the EU's cybersecurity strategy. https://www.consilium.europa.eu/en/press/press-

releases/2021/03/22/cybersecurity-council-adopts-conclusions-on-the-eu-s-cybersecurity-strategy

European Council. (n. d.). Cybersecurity: how the EU tackles cyber threats. https://www.consilium.europa.eu/en/policies/cybersecurity

European Parliament. (21. 3. 2023). Cybersecurity: main and emerging threats. https://www.europarl.europa.eu/pdfs/news/expert/2022/1/story/20220120STO21428/20220120STO21428_en.pdf

Lutjevich, B., Clark, C., & Cobb, M. (n. d.). What is a honeypot? https://www.techtarget.com/searchsecurity/definition/honey-pot

Špehonja, B. (2021). Analiza kibernetskih napadov v geopolitično izpostavljenih državah na območju Evrope v primerjavi s Slovenijo [Master's thesis, GEA College – Faculty of Entrepreneurship]. ReVIIS. http://revis.openscience.si/IzpisGradiva.php?id=8357&lang=slv&prip=rul:14889991:d3

Advances in Business-Related Scientific Research Journal
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# DO UNIVERSITES PROVIDE APPROPRIATE KNOWLEDGE OF PUBLIC SECTOR ACCOUNTING? THE CASE OF SLOVENIA, BOSNIA AND HERZEGOVINA, AND CROATIA

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## Abstract

After several decades of developing the role of accounting in the public sector as a technical tool, there are some new perspectives emphasising the potential of accounting in a broader socio-political context. Nowadays, public sector organisations, especially universities and other educational institutions, must follow the principles of good governance and be accountable to a variety of stakeholders. The modest amount of previous research, especially for the Eastern European countries, was the motivation to investigate the topics and competencies in the undergraduate and postgraduate public higher education programmes in Slovenia, Bosnia and Herzegovina and Croatia on the one hand, and to assess the perception of the knowledge of accountants acquired in formal higher education on the other. The results show that in all three countries there are only a small number of study programmes, especially in undergraduate programmes, while accountants on average perceive their knowledge acquired at university as insufficient for their work.

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Key Words

Public sector accountants; study programmes; knowledge of public sector accountants; accounting reforms.

## INTRODUCTION

Given that investment in education is essential for development, it is also true that the form of this investment is of critical importance in addressing the key challenges to educational outcomes, especially in less developed countries. Better decision making, more engagement in the political process, and positive spillover effects to those around the educated person are just a few benefits of education (Todaro and Smith, 2011). Public sector accounting education has come into the focus of the scientific community in the last few years, with interest in public sector accounting shifting from purely technical and contextual knowledge to a more interdisciplinarity aspect.

New Public Management (NPM) has occupied the focus of public sector accounting, especially in Anglo-Saxon countries, giving it the role of a technical language and framework for public sector reforms. Although public sector accounting has undergone tremendous development over the last three decades, there are some new perspectives to develop it beyond its traditional role as a technical tool. Several studies have emphasised the importance of the societal impact of accounting (Miller and Power, 2013; Vosselman, 2014; Modell, 2014), which should be specifically relevant to the public sector. Public sector accounting is expanding its role in modern society and a growing number of stakeholders are demanding accountability, transparency, openness and participation. This trend in public governance (management) emphasises the importance of governments' ability to manage, govern and monitor contracts, partnerships and relationships to protect the public interest (Cohen et al., 2021). The public sector should be reconceptualized from a mere environment and space to an arena of public interest, with a focus more on the realization of public policies than on the organizations and concrete spaces (Steccolini, 2019). This new public sector paradigm could be framed by good governance theory, which is becoming the dominant theory for analysing contemporary socio-political content (Keping, 2018; Ongaro and van Thiel, 2018). It refers to the process of public governance/administration[1] that maximizes the public interest in a way that ensures active participation between citizens and government. It assumes that success depends on mutual participation in public debate, consultation, and subsequent public policy formulation, which in practice means the involvement of government agencies, interest groups, businesses, and civil society. The theory of good public governance includes six basic principles such as legality, transparency, rule of law, responsiveness, efficiency, and

[1] See the connection in Kovac et al., 2016, pp. 132.

accountability (Keping, 2018). The last principle refers to accountability mechanisms, which are crucial in democracies as they aim to identify appropriate behaviour and organizational performance (Schillemans, 2016).

Since the implementation of public sector reforms is more successful in countries where civil servants are better educated (Soll, 2014; Adam at al., 2019; Sciulli and Sims, 2008; Heiling, 2020), our main objective was to investigate the conditions for public sector accounting education (PSAE) in three countries (the former Yugoslavia). Based on good governance theory and the principle of accountability, our work is a pioneering attempt to assess the practise of public sector accounting, focusing mainly on the courses within higher education programmes at the university level on the one hand, and on the specifics of public sector accountants' knowledge on the other. The ongoing development of an internationally harmonised public sector accounting system as well as recent societal challenges (AI, climate, energy, and war crises) were the motivation for investigating PSAE systems in countries with common history and similar institutional traditions but very different current status.

Using the desk research methodology and conducting a survey among accountants, the aim of the paper is to provide answers to two research questions:

1. Which topics and competencies are most frequently covered in (undergraduate and postgraduate) public university courses in Slovenia, Bosnia and Herzegovina (BiH), and Croatia?
2. How do accountants evaluate the knowledge they obtained during formal university education?

The paper is divided into 4 sections. Following on from the introduction, the second chapter is dedicated to a review of the literature, the third presents the methodology, and the fourth contains the results of our research. The results chapter is divided into subchapters according to two research questions. The fifth chapter is the discussion, and the last is the conclusion.

## LITERATURE REVIEW

The public sector is a powerful part of any society, and the economic consequences of its decisions are significant. Inspired by NPM ideas, intensive public sector reforms have taken place during the last three decades. Pioneers like New Zealand, Australia, and the UK have focused on improving public sector financial management by implementing accrual accounting and budgeting in order to achieve better value from important public spending, and other countries, especially in Europe, have followed this trend (Cordery, 2013). In 2020, 49 (out of 165) countries reported using accrual accounting in their financial reporting, 57% of which use IPSAS directly, indirectly, or as a reference point (IFAC and CIPFA, 2020). Nevertheless, public sector accounting in the EU is characterised by shortcomings and a lack of comparability, which has encouraged EU to start discussion about potential implementation of EPSAS implementation. In

recent years, some important preparatory steps have been made towards comprehensive accounting reforms, and several countries have also made important steps forward (PwC, 2020).

Countries report different results as far as public sector accounting reforms are concerned (Brusca and Martinez, 2016; Jorge et al., 2019; Jones and Caruana, 2016; Argento et al., 2018), but rarely do these ex-post analyses include the available resources engaged (Antipova and Bourmistrov, 2013; Christiaens et al., 2010). The results of previous studies (Steccolini, 2019) reveal that public sectors in different countries are influenced by different aspects of public sector accounting, and so different actors (like politicians, managers, accountants, economists, advisors, and policy makers) and differences in culture, perceptions, expectations, and professional norms have resulted in different public sector accounting systems. The fact that public sector accounting matured at an intersection between various disciplines – public administration and management, financial and management accounting, political science, sociology, psychology, public finance, etc. – might influence the topics of the public sector accounting courses in education systems in different countries. Finally, public sector accounting systems of Slovenia, Croatia, and BiH have rarely been researched, although there have been some pioneer attempts to compare ex-Yugoslavian countries (Jovanović, 2015; Kostić et al., 2019).

The topic of public sector accounting education (PSAE) has been very modestly researched in the existing literature. In recent years, there have been a few papers, like Adam et al., 2019; Thom, 2019; Heiling, 2020; Karatzimas, 2020; Karatzimas et al., 2022; Cohen and Karatzimas, 2022, addressing different perspectives on the influence of PSAE on various public concepts (like accountability and trust, public sector reforms, etc.), while the literature review of the private sector is much more impressive. Apostolou (2013, 2016) reports on 291 articles and 104 instructional cases in the period from 2010 to 2012 (Apostolou, 2013), and an additional 256 articles published in the period 2013–2014 (Apostolou, 2015). Schmidt and Günther (2016) revealed the dominance of Anglo-American papers in a systematic literature review of 236 papers on public sector accounting research in higher education published in 83 scientific journals between 1980 and 2014. In aforementioned modest volume of literature focusing on PSAE, there are some interesting findings. Adam et al., 2019 verified human resources knowledge and competence potential for future public sector accounting reforms in four EU countries (Germany, Italy, Portugal, and Spain) and, via survey questionnaires among professors, assessed the potential for future IPSAS/EPSAS implementation. For Australia, Sciulli and Sims (2008) confirmed a very limited scope of teaching in Australian universities. Similarly, Heiling (2020) suggests rethinking full study programmes at master level due to the growing complexities of public sector accounting, as well as its increasingly interdisciplinary nature. Finally, Karatzimas (2020) shared research findings on the role that better public sector accounting knowledge among citizens might have, claiming that democratic participation could be enhanced by educating citizens on the issues of public accounting,

making them able to better understand, monitor, and evaluate the performance of public administration.

Recent trend of PSAE research is exposing the need for accounting to move away from technical issues and focus more on societal impacts including non-financial aspects, digitalization, artificial intelligence, even soft skills, etc. (Heiling et al, 2023; Globočnik-Žunec, 2018). Even In this theoretical framework, there are two important issues to be addressed and further researched in our paper. Firstly, higher education institutions have not engaged with the changes in public sector reforms that have taken place in recent decades (Adam at al., 2019), and secondly, PSAE is mainly delivered by business schools rather than colleges, schools, or departments offering public affairs programmes or courses of public sector accounting (Neves at al., 2022). Those two issues will be the in-depth research challenge of our paper, focusing mainly on research into public university courses on one side, and public sector accountants' perception of their own education and knowledge on the other.

## METHODOLOGY

The methodological framework of this study is adapted for the interdisciplinary nature of the problem studied (Patton, 1990), and enables a comprehensive analysis of previous studies of education in the field of public sector accounting. This study is based on the analysis of primary and secondary sources, focusing mainly on the systematic review of the web pages of public universities specialising in social science. Aside from collecting data on university programmes focused on public sector accounting or on the public sector more generally, the main focus of the paper was to explore the courses within those programmes. The syllabuses of the public university courses in undergraduate (8) and postgraduate (16) programmes that include topics relating to public sector accounting in the loosest sense was collected. For the first step, a systematic and in-depth review of syllabuses was conducted. In the second step, the following data were collected: a) the name of the university, b) the study programme, c) the name of the course, d) topics, e) competences[2], f) number of pedagogical hours, g) share of ECTS as %, and h) the total number of ECTS per programme. Additionally, the conditions for public sector accountants licencing were researched for all three countries.

Due to the specifics of the topic, the second research question was explored via a survey. Since accountants' knowledge and education has turned out to be an important determinant of PSAE (Adam et al., 2019; Sciulli and Sims, 2008; Heiling, 2020), these two determinants have been incorporated into the research framework of this study. The non-probability technique of sampling has been used, which help researchers to subjectively

[2]Competences are context-dependent knowledge, skills, and approaches that are inseparable and in which emotional, motivational, normative, and ethical elements play an important role, and which are only partly objectively measurable (Budding et al, 2022).

select unit that represents the population under study. Unlike probability sampling, non-probability sampling does not involve random selection rather samples are selected based on accessibility (Etikan et al., 2016). The available databases of accountants' contacts for all three countries have been used. The databases consist of contacts from central government (ministries and other included units), municipalities, and other public sector units (public institutions and public agencies)[3]. The total number of public sector accountants in Slovenia is around 2,500, in Croatia more then 4,000, while the authors do not possess the data for BiH (900 licenced public sector accountants). As far as respondents to the survey are concerned, the "accountants" were named professionals of any rank from accounting and budgetary departments (including bookkeepers excluding other officials). After a few pilot tests of the questionnaire in all three countries, the survey was conducted online in Slovenia and Croatia, and on site in BiH in late 2021 and early 2022. The response rate was 30 respondents in Slovenia, 71 respondents in BiH, and 76 in Croatia.

As mentioned above, the desk research of the first and secondary resources was conducted to isolate precise data about 24 courses offered among 16 study programmes. A survey methodology was used for the second research question. Aside from collecting various independent variables (gender, age, education, position of work, organisation, etc.), the main idea was to assess accountants' perceptions regarding how sufficient they find the knowledge they obtained during their university educations for the tasks they are working on. On a scale from 1 – "I do not agree" to 5 – "I completely agree", participants rated the statement, "I find my knowledge of public sector accounting obtained at university level to be insufficient for my work at my job in the accounting department", as well as statements concerning the obtaining of additional knowledge and information.

## RESULTS

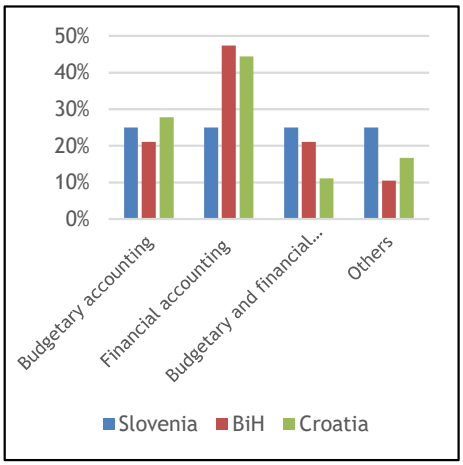
### Analysis of the topics and competencies of university PSA courses'

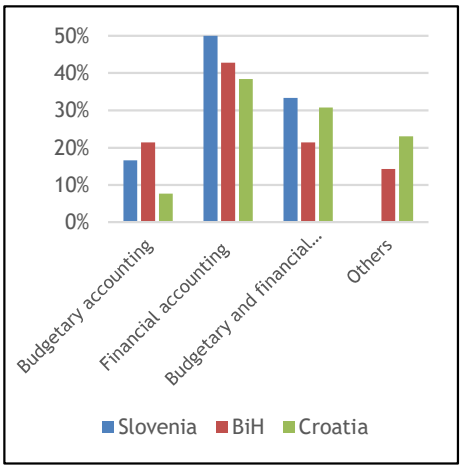
The desk research on courses in higher education institutions (HEI) reveals that there are only nine PSA courses (within nine study programmes) across the three countries at the graduate (undergraduate) level offering topics and knowledge on public sector accounting (one in Slovenia, four in BiH, and four in Croatia), while only three are compulsory. The majority is named "accounting for non-profit organizations", which includes broader topics then public sector accounting. The in-depth analysis of the topics and competencies from the syllabuses reveals that in all three countries a majority of topics and competences is dedicated to financial accounting. In all three countries, only a few of the basic courses and the predominant financial accounting topics and skills could be described as " state of the art".

[3]The public enterprises are entities under jurisdiction of private law and corresponding accounting rules, so they were excluded from our survey.

The titles of the courses are very similar, as are the topics within the courses. It is interesting to note that only one programme includes the topic of auditing (Slovenia) and only one mentions IPSAS. Summarised results are presented in Graph 1 and Graph 2, while more detailed results are available in Appendix 1.

**Graph 1 and 2:** Undergraduate courses in Slovenia, BiH, and Croatia according to topics (Graph 1_left) and competences (Graph 2_right)

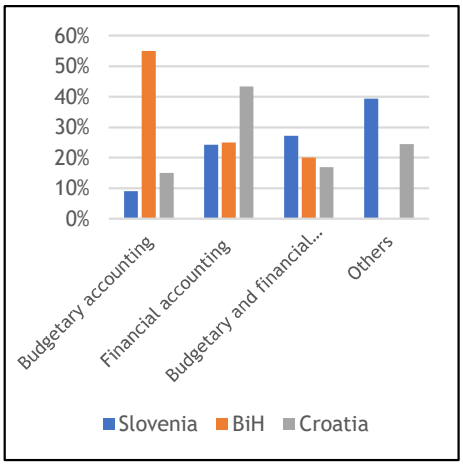


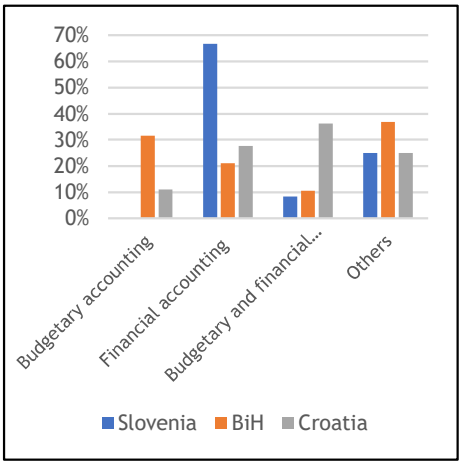




There are many more programmes and courses at the postgraduate level in all three countries. Some programmes at the postgraduate level are even more specific, like Management and Economics in Healthcare in Slovenia, and Public Sector and Environmental Economy in BiH. From the Appendix 2, it can be observed that in Croatia at the University of Rijeka, there are three university specialist study programmes, one of which is Public Sector Management. At this programme, there are two courses: Management and Accounting in Public Sector and Accounting for budgetary and non-profit organizations. Also interesting is that only in Croatia, there is a doctoral programme (Economics and Business Economics) at which Financial reporting for non-profit organizations is placed.

The analysis reveals that the most obvious differences among countries can be seen in topics and competencies. In Slovenia, financial accounting is predominant among competencies, while budgetary accounting is most frequently named in BiH syllabuses, and in Croatian, budgetary and financial reporting. In BiH, a few courses explicitly list IPSAS as a topic, while international accounting standards in general is a topic on Croatian courses. In Slovenia, topics are much more general. Out of nineteen courses at postgraduate level, eleven are compulsory, while others are elective. Summarised results are presented in Graph 3 and Graph 4, while more detailed results are available in Appendix 1.

**Graph 3 and 4:** Postgraduate courses in Slovenia, BiH, and Croatia according to topics (Graph 3_left) and competences (Graph 4_right)




Additionally, our research explored the legal and other requirements required for public sector accountants. The research results reveal that there are no legal conditions determined for the public sector accountant profession in Slovenia, although the education programme exists (Rulebook on the conditions for obtaining the title of state internal auditor and certified state internal auditor, Official Gazette No. 50/15 and 79/15).

BiH is the only one of the three countries that has legislated the conditions for the accounting profession in the public sector. The laws in the field of accounting and auditing stipulate that only qualified and certified professionals, who have obtained a license from approved professional associations, may sign financial statements. Ongoing professional education is also required to maintain this licensure. There is no specific title for public sector accountants. Rather, all accountants, regardless of whether they work in the public or private sector, acquire a single title, although there are separate training programmes for accountants working in the private and public sectors. Applicants with a degree in business administration (economics) specialising in accounting and auditing may be exempt from certain courses (exams) if they can prove that they have passed an exam largely consistent with the curriculum of the license-level course (Act on accounting and auditing of the Federation of BiH, Official Gazette of the Federation of BiH, No. 15/21 and The rule on the method of issuing and withdrawal licenses to certified accountants and certified accountants accounting technicians).

In Croatia, the profession of accountant in the public sector is neither certified nor regulated. There are no prescribed or uniform conditions or job descriptions for accountants in the public sector. Moreover, there are no prescribed conditions for permanent training, although permanent training for persons working in public finance is defined (Budget Act, Official Gazette 144/2021).

## Analysis of accountants' perception of their knowledge and permanent education

Before presenting the results regarding the paper's second research question, survey respondents' genders, ages, and education levels are presented in Table 1.

**Table 1:** Distribution of survey respondents by gender, age, and educational level

| | | Slovenia (n=30) | BiH (n=71) | Croatia (n=75) |
|---|---|---|---|---|
| Gender | Female | 100.0% | 81.7% | 86.7% |
| | Male | 0.0% | 18.3% | 13.3% |
| Age | 20 to 30 years | 0.0% | 5.6% | 1.3% |
| | 31 to 40 years | 26.7% | 31.0% | 30.7% |
| | 41 to 50 years | 30.0% | 31.0% | 34.7% |
| | 51 to 60 years | 43.3% | 23.9% | 25.3% |
| | over 60 years | 0.0% | 8.5% | 8.0% |
| Finished school/education | High school | 3.3% | 7.0% | 21.3% |
| | Professional School | 26.7% | 2.8% | 10.7% |
| | Undergraduate university degree | 66.7% | 85.9% | 56.0% |
| | Postgraduate university degree (master or PhD degree) | 3.3% | 4.2% | 12.0% |

It can be observed that most respondents in all three countries are female with undergraduate university degree of education. They are quite evenly distributed in age groups, although in BiH and Croatia the sample included accountants, being more than 60 years old and in Slovenia the largest share of those are more than 50 years old.

The survey results (see Table 2) show that more than half of the accountants in all three countries perceive their knowledge obtained during formal university education to be insufficient for work in their current workplace. In Slovenia and BiH such answers were given by approximately half the participants, while more than three-fifths (61.3%) of accountants from Croatia perceive their formally obtained knowledge as insufficient for their current job (answers 'I agree' and 'I completely agree'). Only a few accountants stated that the knowledge they acquired during formal education was sufficient to work in their current position - every eighth accountant from BiH, every tenth accountant from Slovenia, and barely 3% of the accountants from Croatia.

**Table 2:** The perception of accountants surveyed of the sufficiency of the knowledge they obtained at university level for working in an accounting department

| I do not find knowledge I obtained during university education to be sufficient for the tasks that I am working on at my job in an accounting department. | BiH | | HR | | SLO | |
|---|---|---|---|---|---|---|
| | f | % | f | % | f | % |

| | | | | | | |
|---|---|---|---|---|---|---|
| I do not agree | 9 | 12.7% | 2 | 2.7% | 3 | 10.0% |
| I partly agree | 20 | 28.2% | 4 | 5.3% | 8 | 26.7% |
| I neither agree nor disagree | 6 | 8.5% | 23 | 30.7% | 4 | 13.3% |
| I agree | 29 | 40.8% | 24 | 32.0% | 11 | 36.7% |
| I completely agree | 7 | 9.9% | 22 | 29.3% | 4 | 13.3% |
| Total | 71 | 100.0% | 75 | 100.0% | 30 | 100.0% |
| **Mean value (M)** | 3.07 | | 3.80 | | 3.17 | |

With the aim of obtaining more detailed insight in characteristics of respondents, who on average evaluated their knowledge as generally insufficient, our analysis has been deepened. The survey results revealed that there were differences in the percentage of respondents who graduated in accounting and finance module; in Slovenia 43.3%, in BiH 59.2%, and in Croatia 23%. In this manner, our study focused on exploring the differences in perception of those accountants who graduated in accounting and finance module and those who graduated on other universities. Using the Mann-Whitney test (see Table 3) for each country, it turned out that, for the most part, there are no statistically significant differences between these two groups, with the exception of Slovenia. For Slovenian respondents statistically significant degree ($U = 59.5$; $p = 0.027$) of differences were confirmed, which means that Slovenian respondents with university degree at accounting and finance perceive their knowledge as less insufficient than respondents with other education.

**Table 3:** Results of the Mann-Whitney (U) test

| I do not find the knowledge I obtained during university education to be sufficient for the tasks that I am working on at my job in an accounting department. | Graduated at University, Department of Economics - Module Accounting and Finance | | | Other education | | |
|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD |
| BiH (U = 526.5; p = 0.311) | 42 | 3.19 | 1.292 | 29 | 2.90 | 1.235 |
| CRO (U = 439.0; p = 0.541) | 17 | 3.88 | 1.111 | 57 | 3.75 | 0.987 |
| SLO* (U = 59.5; p = 0.027) | 13 | 2.62 | 0.961 | 17 | 3.59 | 1.326 |

Very similar test (Kruskal-Wallis ($X^2$)) has been made for the same variable ("Knowledge acquired during formal education was not sufficient for me to work in my current position") according to age of accountants and presented in Table 4.

**Table 4:** The results of the Kruskal-Wallis ($X^2$) test

| I do not find the knowledge I obtained during university education to be sufficient for the tasks that I am working on at my job in a accounting department | 40 years or under | | | Between 41 and 50 years | | | Over 50 years | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | N | M | SD |
| BiH (χ2 = 1,685; df = 2; p = 0,431) | 26 | 2.92 | 1.262 | 22 | 2.95 | 1.174 | 23 | 3.35 | 1.369 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CRO (χ2 = 1,176; df = 2; p = 0,555) | 24 | 3.67 | 1.204 | 26 | 3.96 | 1.038 | 25 | 3.76 | 0.779 |
| SLO (χ2 = 2,678; df = 2; p = 0,262) | 8 | 3.63 | 1.408 | 9 | 2.67 | 1.225 | 13 | 3.23 | 1.166 |

The results revealed (Table 4) that neither the age of the respondents nor their level of education has a significant impact on whether they consider the knowledge they acquired during their formal education to be sufficient for their work in the accounting departments of public sector organisations.

The perception of accountants in all three countries as far as knowledge obtained at the undergraduate level has turned to be insufficient on average (exception was Slovenia when comparing group of respondents, who graduated in accounting and finance with respondents with other education). Due to the fact that nowadays knowledge and competencies should be continuously supplemented, our study also investigated the methods by which accountants are continually supplementing their knowledge. The survey results (see Table 5) revealed that in all three countries, the respondents on average strongly (in BiH 4,41, in Croatia 4,30 and in Slovenia 4.24 out of 5) agree that consultations with colleagues from their profession or from other related institutions are their most frequently applied way to obtain fresh knowledge and information, while the respondents on average least agree with the statement that application to university is their most frequently applied method.

**Table 5:** Most often applied methods for ongoing knowledge acquisition

| Which is most frequent way you obtain additional knowledge and information about your profession? | BIH | | | HR | | | SLO | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | N | M | SD |
| Consultations with colleagues from my profession, or other related institutions | 68 | 4.41 | 0.717 | 76 | 4.30 | 0.849 | 29 | 4.24 | 0.951 |
| Self-study of literature and legal frameworks | 68 | 4.09 | 0.876 | 76 | 4.36 | 0.860 | 30 | 4.23 | 1.006 |
| Forwarding questions to, and reading the explanations of, competent authorities (e.g. the Ministry of Finance) | 69 | 3.70 | 1.019 | 76 | 3.67 | 1.076 | 30 | 4.07 | 0.907 |
| Attending seminars and other forms of education | 68 | 4.28 | 0.826 | 76 | 3.64 | 0.919 | 30 | 3.43 | 0.935 |
| Contracting professional consultants | 68 | 3.47 | 1.000 | 76 | 3.29 | 1.069 | 30 | 1.43 | 0.935 |
| Application to university (master's degree, specialization) | 68 | 3.15 | 0.833 | 76 | 2.17 | 0.526 | 28 | 1.36 | 0.951 |

In this research step, the influence of education and age on the methods by which accountants are continually supplementing their knowledge has been proceeded. It turned out (for details see Appendix 3 and Appendix 4) that in all three countries, the most commonly applied methods are consultation with other professional colleagues, and self-study of literature and legal frameworks. In this regard, BiH stands out in terms of the frequency with which with seminars and other forms of continuing education are pursued, while Slovenian respondents more frequently ask questions and read explanations provided by the competent authorities. In contrast to BiH and Croatia, the hiring of professional consultants is rarely done in Slovenia, while it seems to be widespread in BiH and Croatia. When it comes to

obtaining further knowledge at university, the respondents from BiH (compared to other two countries) reported the highest frequency. The analysis of the characteristics of the survey respondents did not reveal statistically significant differences in terms of age, although the level of education proved to be an important (and statistically significant) factor in Slovenia. Respondents with a university degree apply "application to the university" less than those without a university degree, while statistically significant differences between the two groups appear regarding the method of attending seminars and other forms of continuing education, as well as regarding consultation with other colleagues.

Furthermore, we were interested in how the sufficiency of knowledge acquired in formal education is related to the ongoing knowledge acquisition, because this provides us with information on how accountants compensate the lack of knowledge acquired in formal education. Using Spearman's coefficient, we examined the correlation between the perceived sufficiency of knowledge acquired in formal education and the frequency of using methods for ongoing knowledge acquisition. The results (Spearman's ρ and p value) are presented in table 6.

**Table 6:** Correlation between sufficiency of knowledge acquired in formal education and applied methods for ongoing knowledge acquisition

| | BIH (n = 68) | | HR (n = 75) | | SLO (n = 30) | |
|---|---|---|---|---|---|---|
| | ρ | p | ρ | p | ρ | p |
| Consultations with colleagues from my profession, or other related institutions | -0.103 | 0.404 | -0.106 | 0.366 | 0.352 | 0.061 |
| Self-study of literature and legal frameworks | **0.239** | **0.050** | 0.096 | 0.411 | 0.096 | 0.615 |
| Forwarding questions to, and reading the explanations of, competent authorities (e.g. the Ministry of Finance) | **0.259** | **0.031** | -0.002 | 0.984 | **0.442** | **0.014** |
| Attending seminars and other forms of education | 0.146 | 0.234 | -0.145 | 0.216 | 0.300 | 0.107 |
| Contracting professional consultants | 0.145 | 0.238 | -0.068 | 0.560 | 0.277 | 0.139 |
| Application to university (master's degree, specialization) | 0.102 | 0.407 | **-0.225** | **0.052** | -0.085 | 0.669 |

It was found that accountants from Bosnia and Herzegovina who tend to rate the knowledge acquired in formal education lower, more frequently engage in self-study of literature and legal frameworks, as well as forwarding questions to and reading the explanations of competent authorities (e.g., the Ministry of Finance). Although the correlations prove to be weak, they indicate the direction of which methods accountants use more frequently to compensate for the lack of knowledge. The lower accountants from Slovenia rate the knowledge acquired in formal education, the more frequently they engage in forwarding questions to and reading the explanations of competent authorities. The correlation is moderately strong.

It is interesting that the lower accountants from Croatia rate the knowledge acquired in formal education, the less frequently they seek knowledge through formal education (enroll in master's studies and specialization). The correlation is weak and borderline statistically significant, but it opens the possibility for interpretation that those Croatian

accountants who had a poorer experience with formal education are less likely to seek further knowledge through continued formal education, and conversely, the better the experience with the knowledge acquired in formal education, the more likely they are to continue formal education.

## DISCUSSION

The field of PSAE has recently developed into a very interesting area of research, even if the number of papers is still quite limited. The introduction of accrual accounting in the public sector based on various international (e.g. IPSAS) and national accounting standards over the last 20 to 30 years seems to have been a great accelerator of education needs (Adam et al., 2020). This trend has become even more significant in the post-pandemic period as EU Member States have agreed on financial recovery plans to overcome the crisis. If previously high implementation costs have hindered public sector accounting reforms, it is now evident that it is time to establish budgets and plans that take into account not only information technology and professional accounting standards, but also accounting education (Cohen et al., 2021). However, the biggest challenges of the PSAE field seem to be its isolation from other disciplines, especially its influence on public policy on the one hand and its lack of theorization on the other (Steccolini, 2019).

Nevertheless, there are nowadays some studies (Steccolini, 2019; Moore, 2014; Grossi et al., 2023) that show the potential of accounting research in a broader socio-political context. Based on the theory of good governance (Kovac et al., 2016), the role of government has changed over time (Aristovnik et al., 2022). Government has emerged as one of many actors in an increasingly crowded policy arena and therefore needs to renew its characteristics in response to new challenges. The (good) public governance paradigm argues that governments and the public sector need to strengthen accountability, transparency, openness and participation in response to stakeholder heterogeneity (Grossi and Steccolini, 2014).

The last point refers more broadly to accountability mechanisms, including the education system, which are among the most important building blocks for the improvement of public sector organisations. Nowadays, public sector organisations, especially universities and other educational institutions, must follow the principles of good governance and be accountable to a variety of stakeholders (e.g. government agencies, inspectorates, auditors, media, etc.). Accordingly, public accountability is a pervasive factor in the professional lives of public managers, bureaucrats and all professionals associated with the aforementioned institutions working in an increasingly dense web of accountability. There is a great certainty that their strategic and operational decisions, actions and files will be criticised by a variety of external accountability forums (Schillemans, 2016).

As public sector accountants are directly or indirectly part of these networks of accountability, their knowledge and skills need to be reassessed. The results of our research show that the number and variety of university courses (and study programmes) differ across countries, which

can be explained (at least partially) by the population (Slovenia 2 million, BiH 3.2 million and Croatia 4 million) and the size of the country, but this is not crucial for the main objective of the study. The analysis of the topics and competences covered in the study programmes shows that there are only a few (8) undergraduate courses (and programmes) in public sector accounting in the three countries, while the universities offer a larger number of postgraduate programmes (16). Considering that all courses are offered within undergraduate business programmes, it is clear that accounting knowledge applicable to the public sector is difficult to obtain, especially at the undergraduate level. Nevertheless, it is of great importance to reflect on whether it makes sense to distinguish between the public and private sectors, as this distinction is becoming increasingly blurred and outdated. This is because new forms of organising economic activities, deciding on public interests and values and providing public services are emerging and spreading, not to mention that in most Western countries the share of GDP managed through public budgets and public services can reach around 50% (Steccolini, 2019).

The findings of our study reveal that a slight majority of respondents in all three counties agree that they did not obtain sufficient knowledge at university for their professional work. Consequently, ongoing knowledge improvement based on expert consultation and training are popular in BiH, where application to university is also a much more positively perceived solution than in the other two countries. The results of our research confirm the commonly known facts in the field, where the accounting profession does not have a high status in the public sector, neither from the perspective of reputation nor from the perspective of salary. The public policy regarding the provision of PSAE in business schools confirms the findings of previous studies (Neves at al., 2022) as well as the finding that universities have not addressed the changes of public sector reforms (Adam at al., 2019). Nevertheless, there are some differences between Slovenia, Croatia, and BiH. Slovenia and Croatia, as EU members, have permanent economic and especially financial management and fiscal control, respectively, which poses some challenges to public accounting systems in terms of coordination and reporting. All of this has not accelerated reforms or improvements in public accounting systems, especially in Slovenia, where the basic regulation (the Public Finance Act) has not been fundamentally changed since year 2000. Massive training or licencing of public sector accountants does not occur because the public sector salary system is too inflexible and consequently does not offer stimulating rewards. On the contrary, there is much more activity in BiH, where international organizations (such as the IMF) encourage decision makers to improve the system of public financial management and, consequently, accounting. This situation is reflected in several study programmes (see Appendix 1 and 2) and in the need for academic training and knowledge.

The small number of courses (and study programmes) and pedagogical hours covering public sector topics and competences in all three countries might explain the survey results, whereby accountants perceive their knowledge as insufficient, especially in a context where neither age nor level

of education have influenced results. In this respect, the universities of BiH are offering by far the highest number of courses (and study programmes) that could be connected with public sector accountants' professional requirements. Given the fact that BiH has undergone much more intensive reforms in public sector financial management, supported by external consultants (like IMF), than the other two countries have had, the diversity of public sector accounting courses and study programmes (relative to number of inhabitants) is not surprising. Unfortunately, previous studies (Sciulli and Sims, 2008; Cordery, 2013) did not conclude that public sector reforms (especially those that are ongoing) create the need for undergraduates to be exposed to public sector accounting topics (Sciulli and Sims, 2008; Cordery, 2013), nor that there is a need for specific public sector accounting programmes and topics, beyond the re-engineering of existing syllabuses (Heiling, 2020). Aside from our own research, there are the findings (Adam et al., 2020) that only a few existing university syllabuses cover international standards, and that it might be a challenge for universities to expand the scope of programmes (Cohen et al., 2021). Furthermore, according to an ongoing discussion on the influence of accounting theory on accounting practice, and on its impact on good governance paradigm (Steccolini, 2019; Jansen, 2018) on one side and the challenges of global environment (reflecting in ESG) on the other should reflect in the study programmes of PSA field to narrow the gap between the demand and supply side of PSAE field as soon as possible. Namely, findings of our study reveal that nor principles (like accountability, transparency, etc.) and not global challenges (sustainable reporting) are addressed in public sector including PSAE programmes in Slovenia, Croatia and BiH.

This paper presents a pioneering attempt to contribute to the improvement of PSAE by exploring three eastern European countries' higher education systems. A major limitation of the paper is that it is unable to isolate and explore the answers of respondents, who graduated at one of the study programmes presented in the first part of our study and those respondents that did not graduate. In this context, our paper could not provide differences in knowledge of respondents, who graduated at programmes listed (Appendix 1), nevertheless the statistically significant differences in knowledge for Slovenia have been proved. In the context of international comparativeness, the future research challenge to analyse PSAE in countries outside Eastern Europe is seen as valuable perspectives on global trends and best practices compared to our research paper.

## CONCLUSION

Our work complements the modest scope of research in PSAE for the eastern countries of the former common state (Yugoslavia). This pioneering attempt to explore the state of university programmes and courses in public accounting resulted in a comprehensive analysis of undergraduate and post graduate programmes in all three countries, on the one hand, and an assessment of the acquired knowledge of accountants at the university level,

on the other. The assessment showed that the scope of courses, especially at the undergraduate level, is modest and that accountants' knowledge is insufficient. The research focused mainly on the assessment of technical and contextual knowledge, not considering the skills and competencies related to the publicness concept in public accounting. Public governance as a post-NPM idea extends the mission and role of public sector accountants toward publicness, including the concepts of public interest and public value. Considering these facts, university programmes and courses should take steps toward these progressive ideas that do not neglect the neoliberal (NPM) approach to accounting, but disseminate it at a collaborative, co-productive, and open level.

## REFERENCES

Adam, B., Brusca, I., Caperchione, E., Heiling, J., Jorge, S. M. F., & Rossi, F. M. (2019). Are higher education institutions in Europe preparing students for IPSAS? International Journal of Public Sector Management, 33(2/3), 363–378.

Antipova, T., & Bourmistrov, A. (2013). Is Russian public sector accounting in the process of modernization? An analysis of accounting reforms in Russia. Financial Accountability & Management, 29(4), 442–478.

Apostolou, B., Dorminey, J. W., Hassell, J. M., & Watson, S. F. (2013). Accounting education literature review (2010–2012). Journal of Accounting Education, 31(2), 107–161.

Apostolou, B., Dorminey, J. W., Hassell, J. M., & Rebele, J. E. (2015). Accounting education literature review (2013–2014). Journal of Accounting Education, 33(2), 69–127.

Argento, D., Peda, P., & Grossi, G. (2018). The enabling role of institutional entrepreneurs in the adoption of IPSAS within a transitional economy: The case of Estonia. Public Administration and Development, 38(1), 39–49.

Aristovnik, A., Murko, E., & Ravšelj, D. (2022). From neo-Weberian to hybrid governance models in public administration: Differences between state and local self-government. Administrative Sciences, 12(1), 26.

Brusca, I., & Martínez, J. C., (2016). Adopting International Public Sector Accounting Standards: a challenge for modernizing and harmonizing public sector accounting. International Review of Administrative Sciences, 82(4), 724–744.

Budding, T., de Jong, G., & Smit, M. (2022). New development: Bridging the gap—analysis of required competencies for management accountants in the public sector. Public Money & Management, 42(7), 565–568.

Budget Act, Official Gazette of the Republic of Slovenia, No. 87/08, 136/12 and 15/15.

Christiaens, J., Reyniers, B., & Rollé, C. (2010). Impact of IPSAS on reforming governmental financial information systems: a comparative study. International Review of Administrative Sciences, 76(3), 537–554.

Cohen, S., Rossi, F. M., Caperchione, E., & Brusca, I. (2021). Debate: If not now, then when? Covid-19 as an accelerator for public sector accrual accounting in Europe. Public Money & Management, 41(1), 10–12.

Cohen, S., & Karatzimas, S. (2022). New development: Public sector accounting education for users - embedding eLearning and technology in teaching. Public Money & Management, 42(4), 291–293.

Cordery, C. (2013). Does public services accounting belong in the curriculum? Pacific Accounting Review, 25(1), 101–116.

Etikan, I., Alkassim, R., & Abubakar, S. (2016). Comparison of snowball sampling and sequential sampling technique. Biometrics and Biostatistics International Journal, 3(1), 55.

Globočnik Žunac, A. (2018). Academic communication in business studies. Advances in Business Related Scientific Research Journal, 9(2), 1–17.

Grossi, G., & Steccolini, I. (2014). Guest editorial: Accounting for public governance. Qualitative Research in Accounting & Management, 11(2), 86–91.

Grossi, G., Steccolini, I., Adhikari, P., Brown, J., Christensen, M., Cordery, C., ... & Vinnari, E. (2023). The future of public sector accounting research. A polyphonic debate. Qualitative Research in Accounting & Management, 20(1), 1–37.

Heiling, J. (2020). Time to rethink public sector accounting education? A practitioner's perspective. Journal of Public Budgeting, Accounting & Financial Management, 32(3), 505–509.

Heiling, J., Adam, B., Jorge, S., & Karatzimas, S. (2023). PMM CIGAR theme: Public sector accounting—educating for reform challenges. Public Money & Management, 43(7), 722–724.

Jansen, E. P. (2018). Bridging the gap between theory and practice in management accounting: Reviewing the literature to shape interventions. Accounting, Auditing & Accountability Journal, 31(5), 1486–1509.

Jones, R., & Pendlebury, M. (2010). Public sector accounting. 6th ed. Essex, England: Pearson Education.

Jones, R., & Caruana, J. (2016). Governmental accounting in Malta towards IPSAS within the context of the European Union. International Review of Administrative Sciences, 82(4), 745–762.

Jorge, S., Brusca, I., & Nogueira, S. P. (2019). Translating IPSAS into national standards: An illustrative comparison between Spain and Portugal. Journal of Comparative Policy Analysis: Research and Practice. 21(5), 445–462.

Jovanović, T. (2015). Should Slovenia Transform the Accounting in Public Sector? Central European Public Administration Review, 13(3-4), 67–82.

Karatzimas, S. (2020). The beneficial role of government accounting literacy in developing participatory citizens. Accounting Education, 29(3), 229–246.

Karatzimas, S., Heiling, J., & Aggestam-Pontoppidan, C. (2022). Public sector accounting education: A structured literature review. Public Money & Management, 42(7), 543–550.

Keping, Y. (2018). Governance and Good Governance: A New Framework for Political Analysis. Fudan Journal of the Humanities and Social Sciences, 11(1), 1–8.

Kostić, M., Jovanović, T., & Jurić, J. (2019). Cost Management at Higher Education Institutions – Cases of Bosnia and Herzegovina, Croatia and Slovenia. Central European Public Administration Review, 17 (1), 131–148.

Kovač, P., Tomaževič, N., Leben, A., & Aristovnik, A. (2016). Reforming public administration in Slovenia: between theory and practice of good governance and good administration. International journal of public policy, 12(3-6), 130–148.

Miller, P. & Power, M. (2013). Organizing, and Economizing: Connecting Accounting Research and Organisation Theory. The Academy of Management Annals, 7 (1), 37–41.

Modell, S. (2009). Institutional research on performance measurement and management in the public sector accounting literature: a review and assessment. Financial Accountability and Management, Vol. 25(3), 277–303.

Neves, F. R., de Aquino, A. C. B., & da Silva, P. B. (2022). New development: The challenges of public sector accounting education in business schools. Public Money & Management, 42(7), 569–572.

Ongaro, E., & van Thiel, S. (eds) (2018). The Palgrave Handbook of Public Administration and Management in Europe. London: Palgrave Macmillan.

Parker, L. D. (2005). Corporate governance crisis down under: post-Enron accounting education and research inertia. European Accounting Review, 1(2), 383–394.

Patton, M. (1990). Qualitative Evaluation and Research Methods. 2nd ed. Thousand Oaks, CA: Sage Publications.

Poljašević, J., Vašiček, V., & Jovanović, T. (2019). Comparative review of dual reporting in public sector in three south-east European countries. Journal of Public Budgeting, Accounting & Financial Management, 31(3), 325–344.

PwC (2020). Government accounting, EPSAS and supporting the COVID-19 response. 20. 01 2024.

Schmidt, U., & Günther, T. (2016). Public sector accounting research in the higher education sector: a systematic literature review. Management Review Quarterly, 66 (4), 235–265.

Sciulli, N. & Sims, R. (2008). Public sector accounting education in Australian Universities: obstacles and opportunities. Asian Review of Accounting, 16(3), 246-262.

Schillemans, T. (2016). Calibrating Public Sector Accountability: Translating experimental findings to public sector accountability. Public Management Review, 18(9), 1400–1420.
Steccolini, I. (2019). Accounting and the post-new public management: Re-considering publicness in accounting research. Accounting, Auditing & Accountability Journal, 32(1), 255–279.
Thom, M. (2019). Teaching public financial management: an integrated approach to a critical subject. Teaching Public Administration, 37(1), 92–106.
Todaro, M., & Smith, S. (2011). Economic Development. 11th ed. Harlow, England: Addison-Wesley, Pearson.
Yin, R. (2003). Case study research: design and methods. 3rd ed. Thousand Oaks: CA, Sage Publications.
Office of the Government of the Republic of Slovenia for Development and European Cohesion Policy (2022). Recovery and Resilience plan of Slovenia. Ljubljana: Government of the Republic of Slovenia.
Vosselman, E. (2014). The 'performativity thesis' and its critics: Towards a relational ontology of management accounting. Accounting and Business Research, 44(2), 181–203.

## Appendix 1

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **SLOVENIA** | | | | | |
| University of Ljubljana | Administration | Accounting/ Compulsory | Financial management of public sector organizations<br>Accounting and reporting in public sector organizations<br>Auditing in the public sector | essential accounting categories (accrual and cashflow principle);<br>the basic and final bookkeeping transactions;<br>the balance sheet, the profit and loss accounts;<br>the specifics of accounting in private company and public entity;<br>the budget and accounting reports | 45 |
| **BOSNIA AND HERZEGOVINA** | | | | | |
| University of Sarajevo | Management | Accounting for Non-profit Organizations/ Compulsory | Accounting of budget organization<br>Accounting principles<br>Standards in public sector accounting<br>Financial reports in the public sector | key concepts from the field of budget accounting;<br>recording transactions (principles and standards for the state sector and applicable regulations);<br>financial reporting (examination and assessment of financial statements and data and using appropriate methods when compiling financial reports) | 30 |
| University of Tuzla | Economics | Public Sector Accounting/ Elective | Budget and budgetary accounting<br>Accounting principles in the public sector<br>Budgetary planning<br>Recording and analysing transactions in budgetary organizations | budgetary accounting;<br>budgetary reporting;<br>recording transactions and events in public sector entities | 60 |
| University of Bihać | Accounting and Auditing | Accounting for Non-profit Organizations/ Elective- | Main characteristics of accounting in non-profit organizations<br>Accounting processes in the public sector<br>Financial reporting<br>Budgetary processes<br>Treasury and management of public expenditures<br>Recording transactions in the public sector | the application of key concepts in the field of accounting in non-profit organizations;<br>preparation and presentation of financial reports in non-profit organizations | 90 |
| University of Zenica | | Accounting for Non-profit Organizations / Elective | Characteristics of non-profit organizations<br>IPSAS<br>Chart of accounts for non-profit organizations<br>Financial statements | profit and non-profit sector accounting requirements;<br>legislation and regulation;<br>accounting standards;<br>accounting frameworks;<br>financial reports;<br>surveillance and auditing | 60 |
| **CROATIA** | | | | | |
| University of Split | Business Studies - Accounting and Auditing | Accounting for Non-profit Organizations / Elective course | Accounting for budgetary and non-profit organizations<br>Types of organizations<br>Institutional and professional framework of accounting<br>Budget classifications<br>Chart of accounts and accounting rules, financial statements, and annual reports<br>Application of the chart of accounts | underlying settings of non-profit and public sector entities;<br>accounting systems of non-profit and public sector entities;<br>the basic static and dynamic elements of financial statements of non-profit organizations and public sector entities;<br>financial statements of non-profit and public sector entities;<br>chart of accounts for non-profit organizations and the chart of accounts for public sector entities | 60 |
| University of Zagreb – Faculty of Law | Professional Tax Study | Accounting and Financial Reporting in the Public Sector / Elective course | Budgetary system regulations<br>Public financial management cycle<br>Budget classifications<br>Professional framework of accounting<br>Basic accounting | the legal framework of the budget and budget processes;<br>theoretical and practical knowledge of public sector accounting;<br>application of the accounting framework on examples of | 60 |

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| | | | | | |
|---|---|---|---|---|---|
| | | | categories<br>Interpretation of business changes and financial statements of budgetary users | typical business events of public sector entities;<br>financial reporting framework and financial statements of public sector entities | |
| Faculty of Tourism and Rural Development in Požega | Accounting | Budget Accounting / Compulsory course | Basic accounting categories in a budgetary system<br>Accounting records of changes in asset, liability, sources of ownership, income, cost, receipt, and expenditure<br>Regulations in the budgetary system<br>Business results and balance sheet of a budgetary users<br>Interpretation of business changes and financial statements of budgetary users. | the basic accounting categories in the budget system;<br>accounting records of business changes in assets, liabilities, sources of ownership, revenue, expenses, receipts and expenditure, according to the current regulations in the budget system;<br>calculating the result (deficit or surplus) and drawing up a balance sheet;<br>interpretation of content of financial statements of public sector entities | 60 |

*1 – University, *2 – Study Programme, *3 – Course / Type, *4 – Topics, *5 – Competences, *6 – Number of pedagogical hours

## Appendix 2

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **SLOVENIA** | | | | | |
| University of Ljubljana | Management and Economics in Healthcare | Accounting for Healthcare Organizations/Compulsory Course | Definition of accounting fields<br>Financial reporting to external users and accounting for decision-making in healthcare organizations<br>Peculiarities of public healthcare institutions that impacts financial reporting<br>Legal bases of financial reporting<br>Financial reporting to external users<br>Supervising the performance of the health institutions<br>Annual report,<br>Balance sheet<br>Income statement<br>Accounting for decision making<br>Various cost classification<br>Determination of product cost | the importance of accounting information for decision-making in healthcare organizations;<br>understanding the content of financial statements of health organizations;<br>the basic concepts of healthcare costs;<br>accounting information for business decisions in healthcare | 24 |
| | | Economic Analysis of Healthcare/ Compulsory Course | Analysis based on cost minimization<br>Analysis of costs and effects / performance<br>Peculiarities of impact assessment<br>Decision rules<br>Analysis of costs and effects / performance in practice<br>Cost-benefit analysis<br>Sensitivity analysis<br>Analysis of costs and benefits in practice | the basic methods and knowledge of economic analysis in healthcare | 24 |
| | Accounting and Auditing | Public Sector Accounting/ Compulsory Course | Regulative framework of public sector accounting in Slovenia | importance of public sector accounting;<br>particularities in the recording of assets and liabilities in the | 30 |

| | | | | | |
|---|---|---|---|---|---|
| | | | Accounting and budget accounting in public sector enterprises<br>Accounting treatments in non-profit organisations<br>Accounting treatments in state administration<br>Costing in budget beneficiaries<br>Planning in public sector organisations<br>Performance reports of direct and indirect budget beneficiaries<br>International public sector standards and its use in practice | public sector;<br>latest developments in the international public sector accounting | |
| | | Auditing/ Compulsory Course | Governmental auditing | the purpose of governmental auditing | 45 |
| University of Maribor | Accounting and Auditing | Accounting for Specific Organizations/Compulsory Course | Types, operations and accounting of non-profit organizations<br>Types, operations and accounting of financial organizations<br>Institutional and professional frameworks of accounting<br>Accounting statements and annual reports<br>Accounting information for internal users<br>Accounting of other special organizations | theory and characteristics of accounting in financial, non-profit, and other special types of organizations; institutional frameworks of accounting, basic financial statements and the use and applicability of modern methods and cost and management accounting tools in these organizations | 26 |
| | Management in Heath Organizations | Accounting for Non-profit and Financial Organizations/Compulsory Course | Types, operations and accounting of non-profit organizations<br>Financial statements and annual reports<br>Types, operations and accounting of financial organizations<br>Institutional and professional frameworks of accounting<br>Accounting statements and annual reports<br>Accounting information for internal users<br>Accounting of other special organizations | theory and characteristics of accounting in financial, non-profit, and other special types of organizations; institutional frameworks of accounting, basic financial statements and the use and applicability of modern methods and cost and management accounting tools in these organizations | 26 |
| **BOSNIA AND HERZEGOVINA** | | | | | |
| University of Banja Luka | Finance and Auditing in the Public Sector | Financial Reporting in the Public Sector / Compulsory Course | Financial reporting according to IPSAS<br>Financial statements<br>Reporting of budget execution | the differences and similarities between financial and budget reporting and between financial and non-financial reports in the public sector; the specifics of reporting in public sector entities according to International Accounting Standards for Public Sector and state reporting according to the methodology of the International Monetary Fund | 48 |

| | | | | | |
|---|---|---|---|---|---|
| University of Sarajevo | MBA | Public Sector Accounting / Compulsory Course | Basic accounting categories<br>Accounting systems in the public sector<br>IPSAS financial statements in the public sector | the basic accounting categories;<br>accounting and budgetary system;<br>IPSAS in recording transaction in public sector entities | 60 |
| | Public Sector and Environmental Economy | Public Sector Accounting / Compulsory Course | Basic accounting categories<br>Accounting systems in the public sector<br>IPSAS financial statements in the public sector | the basic accounting categories;<br>accounting and budgetary system;<br>IPSAS in recording transaction in public sector entities | 60 |
| University of Mostar | Accounting and Finance | Budgetary Accounting / Elective course | Main elements of budgetary accounting<br>Budgets<br>Budget reports<br>Budgetary classification | tracking of changes in budget accounting;<br>analysing business result of the budget user;<br>analysing financial statements of budget users | 60 |
| University of Zenica | Accounting and Auditing Management | Budget Accounting and Planning<br>Elective course | Accounting and control<br>Budget equalization<br>Budget preparation<br>Revenues and expenditures<br>Program budgeting<br>Consolidation of budget<br>Budget execution | managing budgets;<br>budgeting; standards;<br>balance maintenance;<br>public debt management | 60 |
| **CROATIA** | | | | | |
| University of Zagreb – Faculty of Economics and Business | Business Economics - Accounting and Auditing | Accounting for Non-profit Organizations / Compulsory course | Accounting for budgetary and non-profit organizations<br>Types of organizations<br>Institutional and professional framework of accounting<br>Budget classifications<br>Chart of accounts and accounting rules<br>Financial statements and annual reports<br>International public sector accounting standards | theoretical, methodological and practical knowledge about public sector accounting and accounting for non-profit organizations;<br>accounting principles and reporting standards in the public and non-profit sector and the legal framework;<br>accounting framework and financial reporting of public sector entities and non-profit organisations;<br>financial statements of public sector entities and non-profit organizations;<br>the role of supervision (internal and external) | 60 |
| | Management Accounting and Internal Auditing | Financial Reporting for Non-profit Organizations / Elective course | Accounting for budgetary and non-profit organizations<br>General accounting in the public sector<br>International framework of PSA (IPSAS, EPSAS)<br>Institutional and professional framework of accounting in Croatia<br>Dual reporting system<br>Budget reports and financial reports<br>Accounting information for internal users, performance measurement and cost management<br>Internal controls in the public sector<br>Auditing in public sector | theoretical, methodological, and regulatory framework of accounting and financial reporting of public sector entities;<br>comparison of public sector accounting between countries and the application of IPSAS;<br>accounting and financial reporting in the public sector in management processes at the macro and micro level and supervision (internal and external) in the public sector | 20 |
| | Economics and Business Economics | Financial Reporting for Non-profit Organizations/Elective course | Accounting for budgetary and non-profit organizations<br>General accounting in the public sector<br>International framework of PSA (IPSAS, EPSAS) | financial reporting of public sector entities;<br>financial reporting in the public sector of EU countries, other developed countries and countries in transition and the application of IPSAS; | 30 |

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|---|---|---|---|---|---|
| | | | Institutional and professional framework of accounting in Croatia<br>Dual reporting system<br>Budget reports and financial reports<br>Accounting information for internal users, performance measurement and cost management<br>Internal controls in the public sector<br>Auditing in public sector | main financial statements and their application in managing and supervising of public sector entities | |
| University of Split<br>Faculty of Economics, Business and Tourism | Business Studies - Accounting and Auditing | Accounting for Non-profit Organizations / Compulsory course | Accounting for budgetary and non-profit organizations<br>Types of organization<br>Institutional and professional framework of accounting<br>Budget classifications<br>Chart of accounts and accounting rules, financial statements, and annual reports<br>Application of the chart of accounts | accounting system of non-profit institutions and other accounting systems;<br>application of accrual principles for non-profit institutions;<br>static and dynamic monitoring of business transactions in the assets, liabilities, own resources, revenue (receipts) and expenditures (expenses);<br>designing an accounting information from financial statements of non-profit institutions | 60 |
| University of Rijeka – Faculty of Economics and Business | Business Economics – Accounting | Accounting for Budgetary and Non-profit Organizations/ Elective course | Accounting for budgetary and non-profit organizations<br>General accounting in the public sector<br>International framework of PSA (IPSAS, EPSAS)<br>Institutional and professional framework of accounting in Croatia<br>Dual reporting system<br>Budget reports and financial reports<br>Accounting information for internal users with emphasis on performance measurement and cost management<br>Croatian taxation regulation and their effects on budgetary and non-profit organizations. | institutional and functional aspects of the public sector and budget system and its elements;<br>the role of accounting and the differences between accounting concepts and their impact on the quality of financial statements;<br>accounting classifications and basic accounting procedures in the public sector entities;<br>financial statements of public sector entities, performance indicators and the financial position of these entities;<br>the role of the main financial statements in the management and supervision of public sector entities | 12 |
| | Business Economics – Controlling | Financial Management and Controlling in Public Sector/ Elective course | Budget system: elements and processes<br>System of financial management in the public sector (budget planning and monitoring of budget execution)<br>Internal and external supervision and control in the public sector<br>Accounting information system as accounting support to management<br>Liquidity and asset management system | financial management and control in the public sector;<br>critical analysis and improvement of established systems of financial management and control in specific cases;<br>critical evaluation and problem solving for effective management in the public sector;<br>raising the level of fiscal responsibility and transparency of public sector entities | 15 |

| | | | | | |
|---|---|---|---|---|---|
| | | | Measuring and monitoring performance in the public sector<br>Fiscal responsibility - requirements, assumptions and effects | | |
| | Business Economics - Public Sector Management | Management Accounting in Public Sector<br>/ Elective course | New Public Management<br>Accounting and reporting in the public sector<br>Liquidity and asset management system<br>Measuring and monitoring performance in the public sector<br>Fiscal responsibility<br>Auditing in public sector | methods and concepts of management and cost accounting;<br>instruments of cost and management accounting in public sector entities;<br>internal reporting framework that is appropriate to the specifics of public sector units and relevant for making specific decisions | 15 |
| | Business Economics - Public Sector Management | Accounting for Budgetary and Non-profit Organizations<br>/ Elective course | Accounting for budgetary and non-profit organizations<br>General accounting in the public sector<br>International framework of PSA (IPSAS, EPSAS)<br>Institutional and professional framework of accounting in Croatia<br>Dual reporting system<br>Budget reports and financial reports<br>Accounting information for internal users with emphasis on performance measurement and cost management<br>Croatian taxation regulation and their effects on budgetary and non-profit organizations | institutional and functional aspects of the public sector and budget system and its elements;<br>the role of accounting and the differences between accounting concepts and their impact on the quality of financial statements;<br>accounting classifications and basic accounting procedures in the public sector entities;<br>financial statements of public sector entities, performance indicators and the financial position of these entities;<br>the role of the main financial statements in the management and supervision of public sector entities | 12 |

***1 – University, *2 – Study Programme, *3 – Course / Type, *4 – Topics, *5 – Competences, *6 – Number of pedagogical hours**

## Appendix 3: The results of the Mann-Whitney (U) test

| | High school level | | | More than high school | | |
|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD |
| Consultations with colleagues from my profession or from other related institutions | | | | | | |
| BiH (U = 146.5; p = 0.773) | 5 | 4.40 | 0.548 | 63 | 4.41 | 0.733 |
| CRO (U = 585.5; p = 0.741) | 24 | 4.33 | 0.868 | 51 | 4.27 | 0.850 |
| SLO* (U = 48.0; p = 0.028) | 9 | 4.78 | 0.667 | 20 | 4.00 | 0.973 |
| Self-study of literature and legal frameworks | | | | | | |
| BiH (U = 117.0; p = 0.761) | 4 | 4.00 | 0.816 | 64 | 4.09 | 0.886 |
| CRO (U = 57.0; p = 0.646) | 24 | 4.33 | 0.761 | 51 | 4.35 | 0.913 |
| SLO (U = 63.5; p = 0.118) | 9 | 4.67 | 0.707 | 21 | 4.05 | 1.071 |
| Forwarding questions to, and reading the explanations of, competent authorities (e.g. the Ministry of Finance) | | | | | | |
| BiH (U = 138.0; p = 0.596) | 5 | 3.40 | 1.342 | 64 | 3.72 | 1.000 |
| CRO (U = 568.5; p = 0.608) | 24 | 3.75 | 1.113 | 51 | 3.61 | 1.060 |
| SLO (U = 83.0; p = 0.581) | 9 | 4.22 | 0.833 | 21 | 4.00 | 0.949 |
| Attending seminars and other forms of education | | | | | | |
| BiH (U = 69.5; p = 0.097) | 4 | 3.75 | 0.500 | 64 | 4.31 | 0.833 |
| CRO (U = 612.0; p = 1.000) | 24 | 3.63 | 1.013 | 51 | 3.63 | 0.871 |
| SLO* (U = 52.5; p = 0.043) | 9 | 4.00 | 1.118 | 21 | 3.19 | 0.750 |
| Contracting professional consultants | | | | | | |
| BiH (U = 93.0; p = 0.341) | 4 | 3.00 | 0.816 | 64 | 3.50 | 1.008 |
| CRO (U = 593.5; p = 0.827) | 24 | 3.21 | 0.977 | 51 | 3.29 | 1.101 |
| SLO (U = 94.0; p = 0.976) | 9 | 1.56 | 1.333 | 21 | 1.38 | 0.740 |
| Application to university (master's or specialisation degree) | | | | | | |
| BiH (U = 124.0; p = 0.902) | 4 | 3.00 | 0.000 | 64 | 3.16 | 0.859 |
| CRO (U = 580.0; p = 0.519) | 24 | 2.13 | 0.448 | 51 | 2.20 | 0.566 |
| SLO (U = 71.0; p = 0.493) | 8 | 1.63 | 1.408 | 20 | 1.25 | 0.716 |

## Appendix 4: The results of the Kruskal-Wallis ($X^2$) test

| | 40 years or under | | | Between 41 and 50 years | | | Over 50 years | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | N | M | SD |
| Consultations with colleagues from my profession or from other related institutions | | | | | | | | | |
| BiH ($\chi2$ = 1.785; df = 2; p = 0.410) | 25 | 4.44 | 0.768 | 22 | 4.27 | 0.703 | 21 | 4.52 | 0.680 |
| CRO ($\chi2$ = 0.732; df = 2; p = 0.694) | 24 | 4.17 | 0.917 | 26 | 4.35 | 0.797 | 25 | 4.36 | 0.860 |
| SLO ($\chi2$ = 3.393; df = 2; p = 0.183) | 8 | 4.63 | 0.744 | 9 | 3.78 | 1.093 | 12 | 4.33 | 0.888 |
| Self-study of literature and legal frameworks | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BiH (χ2 = 0.842; df = 2; p = 0.656) | 26 | 3.96 | 0.916 | 22 | 4.18 | 0.795 | 20 | 4.15 | 0.933 |
| CRO (χ2 = 4.155; df = 2; p = 0.125) | 24 | 4.08 | 0.974 | 26 | 4.62 | 0.637 | 25 | 4.32 | 0.900 |
| SLO (χ2 = 5.298; df = 2; p = 0.071) | 8 | 4.75 | 0.463 | 9 | 3.56 | 1.236 | 13 | 4.38 | 0.870 |
| Forwarding questions to. and reading the explanations of. competent authorities (e.g. the Ministry of Finance) | | | | | | | | | |
| BiH (χ2 = 2.033; df = 2; p = 0.362) | 26 | 3.73 | 0.874 | 22 | 3.45 | 1.143 | 21 | 3.90 | 1.044 |
| CRO* (χ2 = 9.346; df = 2; p = 0.009) | 24 | 3.13 | 0.947 | 26 | 4.04 | 0.916 | 25 | 3.76 | 1.165 |
| SLO (χ2 = 4.470; df = 2; p = 0.107) | 8 | 4.63 | 0.518 | 9 | 3.67 | 1.118 | 13 | 4.00 | 0.816 |
| Attending seminars and other forms of education | | | | | | | | | |
| BiH* (χ2 = 9.079; df = 2; p = 0.011) | 26 | 3.92 | 0.845 | 22 | 4.41 | 0.854 | 20 | 4.60 | 0.598 |
| CRO (χ2 = 2.232; df = 2; p = 0.328) | 24 | 3.42 | 0.881 | 26 | 3.73 | 0.827 | 25 | 3.72 | 1.021 |
| SLO (χ2 = 1.216; df = 2; p = 0.544) | 8 | 3.75 | 0.886 | 9 | 3.33 | 1.118 | 13 | 3.31 | 0.855 |
| Contracting professional consultants | | | | | | | | | |
| BiH (χ2 = 3.754; df = 2; p = 0.153) | 26 | 3.62 | 0.898 | 22 | 3.14 | 1.037 | 20 | 3.65 | 1.040 |
| CRO (χ2 = 1.140; df = 2; p = 0.566) | 24 | 3.08 | 1.018 | 26 | 3.31 | 1.050 | 25 | 3.40 | 1.118 |
| SLO (χ2 = 1.195; df = 2; p = 0.550) | 8 | 1.25 | 0.463 | 9 | 1.22 | 0.667 | 13 | 1.69 | 1.251 |
| Application to university (master's or specialisation degree) | | | | | | | | | |
| BiH (χ2 = 2.368; df = 2; p = 0.306) | 26 | 3.00 | 0.894 | 22 | 3.18 | 0.733 | 20 | 3.30 | 0.865 |
| CRO (χ2 = 2.730; df = 2; p = 0.255) | 24 | 2.13 | 0.338 | 26 | 2.31 | 0.736 | 25 | 2.08 | 0.400 |
| SLO (χ2 = 1.072; df = 2; p = 0.585) | 8 | 1.38 | 1.061 | 9 | 1.11 | 0.333 | 11 | 1.55 | 1.214 |

# A BIBLIOMETRIC ANALYSIS OF PUBLICATION PRODUCTIVITY IN THE FIELD OF OPEN AI: OUTCOMES OF SciVal ANALYTICS

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## Abstract

In recent years, the field of open AI has gained increasing significance with a growing number of scientific publications and research projects in this domain. The aim of this paper is to present a bibliometric overview of open AI research, aiming to provide a comprehensive analysis of the top countries, institutions, authors, journals, and keywords in the field. Through our bibliometric analysis, we have identified the leading contributors and research trends within open AI. This analysis serves as a valuable resource for researchers, policymakers, and stakeholders, offering insights into the current state and emerging trends in open AI research. It also aids in the identification of potential future research fields and areas of interest.

## Key Words

Bibliometric analysis; SciVal analytics; open AI.

## INTRODUCTION

Thanks to its ground-breaking work in the field of artificial intelligence (AI), open AI is now more important than ever. Researchers and academics are becoming more and more interested in the study of AI. One key driver of this rise in interest is the significant impact that AI technologies have on a variety of industries and fields, including healthcare, finance, transportation, and more. Scientists are motivated to discover more about AI's capabilities since it has the potential to alter the course of human history.

The significance of open AI as a concept has increased the necessity of providing accessible, transparent, and helpful artificial intelligence. The organisation OpenAI, which has been at the forefront of promoting open AI concepts, has further enhanced its significance. Through several efforts, OpenAI has considerably raised the importance of open AI and played a crucial role in the advancement of the AI field. OpenAI has increased awareness of the value of open AI and its potential social impact by publicly revealing its goals and guiding principles. OpenAI has made a substantial contribution to the creation of ChatGPT and other AI model designs. An application of OpenAI's research and technology achievements is the AI language model ChatGPT. By offering a platform for human-like text generation and interaction, it exemplifies the power of open AI.

The strategy taken by OpenAI is collaborative and open, which has greatly contributed to its rise in relevance. OpenAI has developed a thriving community of researchers who actively contribute to the advancement of AI by encouraging a culture of collaboration and knowledge sharing. As a result of the organization's focus on open-source software, datasets, and research findings, researchers from all over the world can build upon previous work, hastening the rate of innovation in the sector. Researchers from all backgrounds and fields have been drawn to this open and cooperative atmosphere, encouraging multidisciplinary study and the interchange of ideas.

Additionally, OpenAI's contribution to addressing ethical issues and supporting ethical AI practises has increased its relevance. Concerns like ethics, bias, transparency, and fairness have grown in importance as AI technology develops. In these debates, OpenAI has been at the fore, pushing for ethical AI creation and application. Researchers now have a road map for carrying out AI research in a way that benefits society as a whole thanks to the organization's focus on safety research, regulatory standards, and ethical frameworks. Researchers that are motivated not only by technological achievements but also by the desire to develop AI systems that are safe, just, and helpful for humanity have backed this dedication to ethical AI.

Numerous scholarly publications have previously been written on the subject of artificial intelligence, which is becoming increasingly important. The amount of study in this field is constantly growing, which is a reflection of the quick developments and extensive uses of AI in a variety of fields. Researchers are actively interested in sharing knowledge and exchanging ideas as they become more conscious of the importance of this sector.

The significance of AI and the expanding corpus of research make it crucial to do a bibliographic study. This type of study enables a thorough assessment and evaluation of the available literature, allowing researchers to spot patterns, gaps, and potential research areas. Researchers can discover promising study directions, identify emerging research themes, and get insightful knowledge regarding the state of the field by methodically analysing the published works on AI.

A bibliographic analysis also offers a strong platform for expanding on already-known information and encouraging research collaboration. It allows the identification of significant contributors and thought leaders, fosters the sharing of ideas and best practices and aids in creating a shared understanding of the body of work already in existence. Researchers may make sure that their work is in line with the most recent advancements and significant advances in the topic by reviewing the breadth and depth of the literature.

The following bibliographic analysis will allow us to navigate the huge landscape of existing literature, keep up with the most recent developments, and direct the course of AI research in the future. With this analysis, the researchers can cooperatively drive innovation, tackle pressing issues, and realise the full potential of artificial intelligence in a variety of disciplines by building on the current body of knowledge.

## MATERIALS AND METHODS

We used the logical framework suggested by Donthu et al. (2021) for conducting the bibliometric performance analysis. This framework provides detailed instructions and a systematic structure for conducting bibliometric analysis. A similar logical framework was used in our study to ensure a thorough and organised analysis of the subject issue.

The first stage of our bibliometric analysis involved defining the objectives and constraints of the study. This necessitated carefully specifying the parameters and study emphasis to ensure that the analysis was in line with our goals. By establishing these criteria, we were able to narrow down the relevant literature and concentrate on the specific open AI subjects that interested us.

In the next stage, we applied techniques and strategies that were particularly selected for the goal and scope of our investigation. This involved considering many factors, such as the type of data that was accessible, the questions we were attempting to address, and the level of detail we desired in our research. Furthermore, one of the most important aspects of our investigation was gathering and analysing the data required for the bibliometric analysis. To ensure thorough coverage of the topic area, this meant painstakingly assembling essential information from dependable databases. We carefully picked and structured the data to support accurate analysis and interpretation.

Finally, the quantitative analysis stage offered insightful information on the open AI research ecosystem and trends. We were able to locate

important conclusions in the analysed data that not only aided in a greater comprehension of the subject but also served as a basis for further research and well-informed decisions.

According to the most frequently used factors which are presented in Table 1, productivity and scientific impact was determined (Avanesova & Shamliyan, 2018; Craig et al., 2021; Purkayastha et al., 2019). Microsoft Excel program was used to create the analysis (see also Cucari et al., 2023).

**Table 1.** The performance parameters

| Indicator | Measured entity characteristics | Definition |
|---|---|---|
| Scholarly output | Productivity | The number of indexed in Scopus publications |
| Citations | Scientific impact | The number of citations received by an entity's publications |
| Field-weighted citation impact | Scientific impact | The number of citations received by an entity's publications compared with the average number of citations received by all other similar publications in the data universe |
| International collaboration | Collaboration between international coauthors | The number of internationally co-authored publications |

Our bibliometric study was conducted in a methodical and organised manner using accepted frameworks and procedures. We were able to properly identify the purpose and scope of our study, choose the best techniques, obtain pertinent data, and draw insightful conclusions from the quantitative analysis by following this logical framework. This meticulous approach strengthens the validity and dependability of our conclusions, guaranteeing that our work makes a significant contribution to the body of knowledge on open AI.

## RESULTS

For the bibliometric analysis, we chose the platform SciVal due to its high-quality data and comprehensive coverage of both technical and social science fields, as well as books, book chapters, and conference proceedings (Baas et al, 2020). Elsevier's SciVal is a web-based analytics platform for gathering, contrasting, and evaluating bibliometric data, including summarizing research on specific scientific subjects and fields (Dresbeck, 2015).

We used the default ASJC (All Scopus Journal Categories) classification to describe the open AI literature. In this section, we provide an overview of the scientific productivity and impact of the research output of the observed scientific topic.

In the previous six years, preceding the writing of this paper (2017–2022), this research area consisted of 555 publications, with the increasing interest of researchers, since the scholarly output increased from 7 publications in 2017 to 184 in 2022 (see also Figure 1). The number of papers, featuring researchers' international collaboration, equals 92 for the entire period, increasing from 3 in 2017 to 30 in 2022.

Throughout the six-year observed period, 5279 citations in all, including self-citations, were made. Due to the multidisciplinary nature of the open AI research domain and the varying citation patterns among scientific disciplines, the citation data must be normalized (Podlubny, 2005). Elsevier SciVal prefers to employ a straightforward normalized citation metric that shows the number of citations in relation to a value of 1.0, which corresponds to the worldwide normalized average for all scientific areas as indexed by Scopus. In comparison to the global average, scores below 1.0 indicate a lesser level of scientific effect, while those above 1.0 indicate a higher level. This metric, known as the Field-Weighted Citation influence (FWCI), makes it simple to compare the influence of research across several scientific disciplines (Purkayastha et al., 2019). The average FWCI metric value for the observed scientific topic is 2.07 (for the entire 2017–2022 period), greatly decreasing from 7.99 in 2017 to 1.59 in 2022. This suggests that older articles had a greater impact on today's research, even though the field remains highly attractive to researchers.

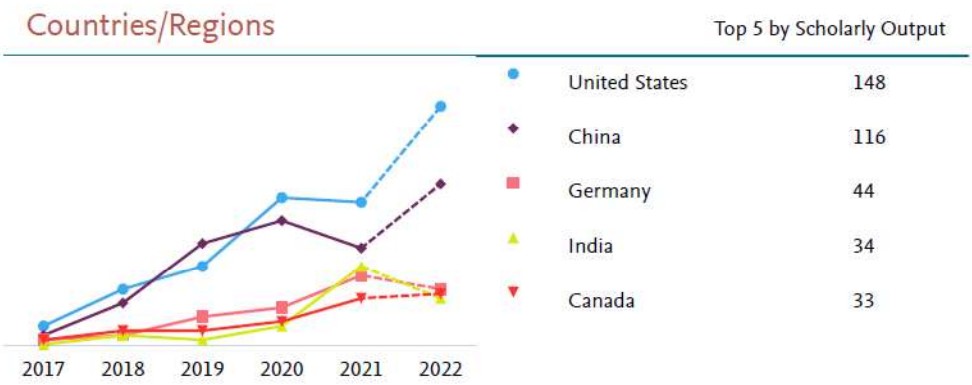
The top 10 countries, according to the scholarly output in the field, for the 2017–2022 period, are presented in Table 2. Furthermore, Figure 1 represents the increasing interest in the observed field by the top 5 countries.

**Table 2.** Scholarly output and research impact for the observed topic in the top 10 countries (2017–2022)

| Country/Region | Scholarly Output | FWCI | Citation Count |
|---|---|---|---|
| United States | 148 | 4.16 | 2769 |
| China | 116 | 1.47 | 774 |
| Germany | 44 | 2.66 | 346 |
| India | 34 | 0.73 | 40 |
| Canada | 33 | 3.75 | 1080 |
| United Kingdom | 31 | 2.75 | 378 |
| South Korea | 19 | 0.77 | 62 |
| Japan | 17 | 1.24 | 79 |
| Italy | 14 | 1.52 | 53 |
| Netherlands | 14 | 3.45 | 784 |

*Source:* SciVal (March 2023).

**Figure 1.** Scholarly output by the years for the observed topic in the top 5 countries




*Source:* SciVal (March 2023).

Most of 10 the most productive and influential universities and other research institutions in the field are located in China (5 or all) and the U.S. (3 of all), one in Canada, and one in France (see Table 3).

**Table 3.** Top 10 global research institutions in the observed field, per scholarly output and impact (2017–2022)

| Institution | Country/ Region | Scholarly Output | FWCI | Citation Count |
|---|---|---|---|---|
| Chinese Academy of Sciences | China | 18 | 1.12 | 59 |
| University of Science and Technology of China | China | 11 | 0.94 | 53 |
| Alphabet Inc. | U.S. | 9 | 15.53 | 883 |
| University of Chinese Academy of Sciences | China | 9 | 1.43 | 30 |
| University of Toronto | Canada | 9 | 5.66 | 256 |
| CNRS | France | 8 | 2.86 | 40 |
| Stanford University | U.S. | 8 | 1.31 | 52 |
| University of California at Berkeley | U.S. | 8 | 6.35 | 207 |
| Tsinghua University | China | 7 | 0.82 | 36 |
| Zhejiang University | China | 7 | 1.86 | 61 |

*Source:* Elsevier SciVal (March 2023).

The top 10 individual researchers, ranked per their scientific output and impact in the observed field, and the values of their bibliometric performance indicators, are presented in Table 4.

**Table 4.** Top 10 researchers in the observed field, ranked per scholarly output and impact (2017–2022)

| Author | Affiliation | Country/ Region | Scholarly Output | FWCI | Citation Count |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Cao, Lei | Logistical Engineering University China | China | 7 | 0.66 | 46 |
| Chen, Xiliang | Logistical Engineering University China | China | 7 | 0.66 | 46 |
| Xu, Zhixiong | Army Academy of Border and Coastal Defense | China | 7 | 0.66 | 46 |
| Kozłowski, Norbert | Wrocław University of Science and Technology | Poland | 6 | 1.23 | 25 |
| Li, Houqiang | University of Science and Technology of China | China | 6 | 0.69 | 15 |
| Unold, Olgierd | Wrocław University of Science and Technology | Poland | 6 | 1.23 | 25 |
| Li, Chenxi | Logistical Engineering University China | China | 5 | 0.90 | 45 |
| Zhou, Wengang | University of Science and Technology of China | China | 5 | 0.83 | 15 |
| Nagy, Zoltan | University of Texas at Austin | U.S. | 4 | 7.00 | 55 |
| Banerjee, Abhijit | Maulana Abul Kalam Azad University of Technology | India | 3 | 0.39 | 4 |

*Source:* SciVal (March 2023).

The top 10 journals, publishing the analyzed research, are listed in Table 5.

**Table 5.** Top 10 Scopus sources in the observed field, ranked per scholarly output (2017–2022)

| Scopus Source | Scholarly Output | FWCI | Citation Count |
|---|---|---|---|
| Lecture Notes in Computer Science | 26 | 0.91 | 48 |
| Advances in Neural Information Processing Systems | 14 | 12.85 | 1079 |
| ACM International Conference Proceedings Series | 13 | 2.83 | 42 |
| IEEE Access | 13 | 0.98 | 100 |
| Communications in Computer and Information Science | 9 | 0.91 | 9 |
| IEEE Transactions on Neural Networks and Learning Systems | 9 | 0.94 | 56 |
| Proceedings of the International Joint Conference on Neural Networks | 8 | 0.28 | 10 |
| CEUR Workshop Proceedings | 7 | 0.34 | 4 |
| IEE Conference on Computational Intelligence and Games, CIG | 7 | 1.25 | 87 |
| IJCAI International Joint Conference on Artificial Intelligence | 7 | 0.62 | 22 |

*Source:* SciVal (March 2023).

Lastly, the table below shows the top 10 keywords and in how many scholarly outputs these top keywords were used over the observed years.

**Table 6.** Top 10 key phrases in the observed field (2017–2022)

| Keywords | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | All |
|---|---|---|---|---|---|---|---|
| Reinforcement Learning | 6 | 32 | 50 | 78 | 103 | 116 | 385 |
| Deep Learning | 0 | 11 | 16 | 33 | 36 | 56 | 152 |
| Reinforcement Learning (machine learning) | 0 | 17 | 14 | 27 | 33 | 45 | 136 |
| Artificial Intelligence | 1 | 14 | 14 | 18 | 28 | 42 | 117 |
| Critics | 2 | 6 | 7 | 13 | 19 | 18 | 65 |
| Q Learning | 1 | 6 | 11 | 12 | 19 | 15 | 64 |
| Language Model | 0 | 0 | 6 | 12 | 11 | 19 | 48 |
| Multi-agent Systems | 0 | 2 | 3 | 1 | 12 | 19 | 47 |
| Optimization Policy | 1 | 4 | 5 | 5 | 8 | 11 | 34 |
| Natural Language Processing Systems | 0 | 0 | 1 | 8 | 7 | 14 | 30 |

*Source:* SciVal (March 2023).

## DISCUSSION

According to the metrics used, this section presents the results of the bibliometric analysis in the observed field.

For a variety of reasons, there is undoubtedly now a lot more writing and interest on the topic of open AI than there was in the past. Let us mention the three most obvious:

- The field of AI is expanding and evolving swiftly. As new applications of AI emerge and current technology develops, it is necessary to do ongoing research and have ongoing discussions to stay abreast of these advancements. Open AI is driving these breakthroughs, and many researchers are interested in examining the results.
- OpenAI has established itself as one of the leading organizations in the AI industry. Academics, researchers, and industry professionals have shown a great deal of interest in and consideration for their concentration on developing cutting-edge AI technology, such as their GPT models. As a result, OpenAI has made several contributions to the field of artificial intelligence, and a sizable body of literature has been written about it.
- OpenAI has assumed a leading position in distributing its findings to a wider audience. They have published several papers, supplied open-source code, and made their models available for use by others to build upon. This level of openness and collaboration has encouraged other academics to engage with OpenAI's work and grow the body of research on the topic.

Furthermore, below we list some of the potential reasons for the high number of publications and interest in the field of open AI in the United States and China:

- **Research and Development Powerhouses**: China and the U.S. are both renowned as being among the world's leaders in technical innovation, with a particular emphasis on AI research and development. They are home to a large number of respected academic institutions, research centres, and tech businesses that actively improve AI. These nations' substantial expenditures in AI talent and infrastructure have sparked a thriving research scene and promoted an innovative mindset.
- **Technical Rivalry**: China and the U.S. have been vying with each other to develop the most advanced AI applications. Increased research activity and a rising interest in open AI concepts have been sparked by this competition. The promotion of AI research and development has also been aided by government initiatives and policies in both nations, which has stoked interest in and publications about open AI.
- **Market Size and Economic Potential**: The world's two largest economies, U.S. and China, have significant market potential for AI-driven technologies. A strong ecosystem of research, development, and commercialization has resulted from the economic promise that has drawn resources and investments into the field of AI. Leading IT companies and startups are present in both nations, which increases public interest in and production of publications about open AI.

The significantly lower representation and fewer publications on the subject of open AI from European nations and academic institutions are caused by several factors:

- **Research and Funding Disparities**: Disparities in research funding may exist despite the fact that Europe has renowned universities and research centres when compared to the U.S. and China. The number and size of research initiatives can be affected by the amount of funding available for AI research, which can lead to fewer publications in the area of open AI.
- **Regulatory Environment**: The General Data Protection Regulation (GDPR) and other strict data protection and privacy laws have been adopted in Europe. While user privacy and data security are given top priority by these policies, they can also present difficulties and additional obstacles for researchers working with the vast datasets required for AI research. Some academics might be deterred from pursuing open AI projects or publicising their results due to the difficult regulatory environment.
- **Collaboration and the Academic-Industry Gap**: Europe faces certain difficulties in bridging the academic and industrial gaps. To encourage applied research and the commercialization of AI technology, there may be a need for closer collaboration between academic institutions, research organisations, and businesses.

Increased publications and interest in open AI can be attributed to a more solid industry-academia partnership.

- **Resource Allocation and Priorities**: European institutions and countries may place a different emphasis on certain aspects of AI research than others, such as ethics, justice, and transparency. Although these factors are significant, they might take some time and energy away from open AI research and publications.
- **Cultural Factors**: Academic customs and traditions are examples of cultural elements that may have an impact on publication rates. The overall publishing output on open AI may be impacted by regional variations in research methodologies, publication standards, and academic incentives.

Here, let us point out that there are outstanding academics, organisations, and projects that are supporting open AI research in Europe. Through several initiatives, partnerships, and financing schemes, efforts are being made to increase the visibility of EU countries and research institutions and their contributions to the field of open AI.

Finally, it is not surprising to find numerous significant study clusters when analysing the frequency of keywords in open AI research. The primary clusters found consist of:

- **Machine Learning**, which is a fundamental component of open AI as it encompasses a broad range of algorithms and techniques.
- **Deep Learning**, which has gained widespread acceptance in open AI research due to its capacity to manage enormous datasets and produce cutting-edge performance in numerous fields.
- **Reinforcement Learning**, which is essential to open AI research because it makes it possible to create autonomous agents that can learn and decide in challenging situations.
- **Criticism** in open AI research, which is not surprising. It is crucial to critically assess the ethical implications, potential biases, transparency, and fairness of AI technologies as they are progressively incorporated into society. Research on the ethical, social, and legal implications of AI may fall under this cluster. It may also explore potential hazards and ensure that AI systems are developed and deployed responsibly.

We learn more about the focal areas and trends in the field by identifying these important clusters in open AI research. These clusters represent the ongoing attempts to improve AI methods, create moral frameworks, and deal with the difficulties and constraints brought on by AI technologies.

## CONCLUSION

The purpose of this study was to assess the overall research output in the open AI subject. Our analysis of academic outputs' bibliometric data offers important new perspectives on the state of open AI research. We have determined the top countries, institutions, journals, authors, and keywords in the subject by analysing publication patterns and trends. This analysis

provides a thorough overview of the key researchers and current research agendas in the open AI sector.

The geographic distribution of open AI research can be better understood by understanding the top countries, indicating the dominance of particular areas and the amount of research effort in various parts of the world. The leading academic and research institutions that are at the forefront of open AI research can be learned about by looking at the top institutions. By influencing and producing research, these institutions have a big impact on the field.

The top ten writers uncovered by our analysis are significant contributors to the body of open AI literature. Their efforts and knowledge have made a tremendous impact on the field's development and advancement. We can determine the top publishing venues in the area of open AI by analysing the top journals. These periodicals provide as forums for sharing research findings and advancing academic discourse. Last but not least, knowing the top keywords helps one grasp the main themes and areas of open AI research. The primary ideas, approaches, and subject areas that researchers in the field are concentrating on are reflected in these keywords.

It is crucial to acknowledge the limits of our study in the following sections:

- **Data Limitations**: The scholarly outputs that are present in the chosen dataset are the basis for our investigation. There may be gaps in our findings as a result of the exclusion of some pertinent papers.
- **Language Bias**: Because our analysis was limited to English-language publications, there may have been a bias against other languages' research.
- **Methodological Considerations**: Bibliometric analyses offer quantitative information on research output, but they might not adequately reflect the value or significance of a single publication. Additionally, the results could be affected by the criteria and thresholds used to choose the top nations, organisations, authors, journals, and keywords.
- **Landscape Change**: Open AI is a vibrant and quickly developing field. Our analysis gives a brief overview of the state of the field, but subsequent advances could change the picture. To capture the changing trends and contributions in open AI research, ongoing monitoring and sporadic updates are required.

Future studies in this field might examine the following topics:

- **Cross-Language Analysis**: A multilingual analysis of open AI research could offer a more thorough knowledge of the worldwide contributions and aid in overcoming linguistic prejudices.
- **Collaboration Networks**: Analysing the networks of cooperation across nations, organisations, and authors may reveal trends in knowledge exchange and cross-disciplinary cooperation in the open AI community.
- Citation Analysis: A citation analysis can shed light on the impact and reach of open AI research by analysing citation patterns and impact

measures. It can be used to find key publications, authors, and organisations advancing the topic.

- **Subfield Analysis**: Deeper insights into specialised fields of study and future trends can be gained by further examining subfields within open AI, such as ethics, fairness, interpretability, or particular application domains.
- **Comparing financing and policies**: Comparing financing and policies can provide light on how funding goals and regulatory frameworks affect the growth of open AI research. This is done by examining the connections between funding, regulations, and research outputs across various nations and institutions.

The significance of open AI in the current AI environment originates from its ground-breaking research, collaborative style, and dedication to moral AI. Researchers from all over the world have been drawn to the organization's work, which has encouraged them to learn more about AI research and further it. Open AI continues to be a crucial catalyst for creativity, teamwork, and the responsible development of artificial intelligence as AI technologies continue to change our future.

It is possible to anticipate an exponential increase in the number of research projects and publications on the subject of open AI. Due to developments in machine learning, deep learning, natural language processing, and other related fields, the field of artificial intelligence is developing at an impressive rate. Given the profound effects and industry-changing potential of AI, it continues to be one of the most alluring and in-demand study fields today.

A rich environment for research and creativity is created by the rapid advancement of AI technology and its growing integration into a variety of industries, including healthcare, banking, transportation, and entertainment. Researchers are attracted to this area of study because there are so many opportunities to tackle difficult problems and come up with fresh answers. AI research is interdisciplinary, incorporating computer science, mathematics, statistics, and cognitive science, which adds to its appeal and promotes cooperation among specialists from many fields.

Further, AI is a subject of tremendous significance and public attention due to the societal consequences it has, such as ethical issues, privacy problems, and the effect on employment. There is an increasing need for in-depth research as AI technologies improve and spread to assure responsible development, moral deployment, and knowledgeable policymaking.

These elements make it clear that open AI research interest will keep rising. The academic community, business leaders, and governments are aware of the value of funding AI research to take advantage of its potential advantages and reduce its possible perils. Researchers are expected to add to the growing body of knowledge as the subject develops and grows by investigating new areas, creating cutting-edge models and algorithms, and taking on the difficulties that lie ahead.

Open AI is positioned as a highly desirable study subject due to the convergence of rapid technological breakthroughs, widespread applicability, and societal effect. As academics work to realise its full potential, address

new problems, and pave the path for a future driven by intelligent systems, it is anticipated to continue to experience a spike in research papers and publications.

## REFERENCES

Avanesova, A. A., & Shamliyan, T. A. (2018). Comparative trends in research performance of the Russian universities. Scientometrics, 116(3), 2019–2052.

Baas, J., Schotten, M., Plume, A., Cote, G., & Karimi, R. (2020). Scopus as a curated, high-quality bibliometric data source for academic research in quantitative science studies. Quantitative Science Studies, 1(1), 377–386. https://doi.org/10.1162/qss_a_00019

Craig, B. M., Cosh, S. M., & Luck, C. C. (2021). Research productivity, quality, and impact metrics of Australian psychology academics. Australian Journal of Psychology, 73(2), 144–156.

Cucari, N., Tutore, I., Montera, R., & Profita, S. (2023). A bibliometric performance analysis of publication productivity in the corporate social responsibility field: Outcomes of SciVal analytics. Corporate Social Responsibility and Environmental Management, 30(1), 1–16. https://doi.org/10.1002/csr.2346

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. Journal of Business Research, 133, 285– 296.

Dresbeck, R. (2015). SciVal. Journal of the Medical Library Association: JMLA, 103(3), 164–166. https://doi.org/10.3163%2F1536-5050.103.3.018

Podlubny, I. (2005). Comparison of scientific impact expressed by the number of citations in different fields of science. Scientometrics, 64(1), 95–99. https://doi.org/10.1007/s11192-005-0240-0

Purkayastha, A., Palmaro, E., Falk-Krzesinski, H. J., & Baas, J. (2019). Comparison of two article-level, field-independent citation metrics: Field-Weighted Citation Impact (FWCI) and Relative Citation Ratio (RCR). Journal of Informetrics, 13(2), 635–642. https://doi.org/10.1016/j.joi.2019.03.012

# INVESTIGATING THE ROLE OF TRUSTWORTHINESS IN VIRTUAL ORGANIZATIONS: AN EMPIRICAL STUDY IN RIDE-HAILING PLATFORMS

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## Abstract

This study investigated the factors influencing dimensions of trustworthiness in virtual organizations. The research model examined the relationships between trustworthiness dimensions (ability, benevolence, and integrity), user participation, information and communication technology (ICT), and shared values and goals. An online survey was conducted among online transportation users in Greater Bandung to test the model. The findings revealed positive relationships between ICT and both benevolence and integrity, and between shared values and goals and all trustworthiness constructs. Interestingly, participation only had a significant relationship with integrity. The study contributed to the literature by proposing a novel model that examines the impact of these factors on trustworthiness in virtual organizations.

## Key Words

Information and communication technology; shared values and goals; trustworthiness; structural equation modelling (SEM).

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## INTRODUCTION

Virtual Organizations (VOs) are dynamic ecosystems of legally independent organizations that strategically collaborate to deliver a cohesive set of services, seamlessly presenting themselves as a unified entity to the market (Jägers et al., 1998). This fluid network of diverse organizations can adapt and reconfigure its composition based on the evolving demands of the services or functions it provides (Camarinha-Matos et al., 2006). VOs hold the potential to transcend their transient nature, evolving into enduring partnerships characterized by long-term commitment, consistent service offerings, and a stable structure (Kasper-Fuehrer & Ashkanasy, 2003). However, unlocking the full potential of an inter-organizational VO hinges on the establishment of robust trust between member companies within the interconnected network, fostering collaborative success (Panteli & Sockalingam, 2005).

Trustworthiness blossoms from confidence in a partner's reliability and integrity. This notion, explored by Morgan and Hunt (1994), expands upon the three dimensions identified by Mayer et al. (1995): ability, integrity, and benevolence. Ability (ABI) encompasses the skills and expertise an individual possesses, though these strengths may vary across different fields (Bews & Rossouw, 2002). Benevolence (BEN), on the other hand, reflects the perceived sincerity of the partner's desire to benefit the other party, exceeding any self-serving motives (Cazier, 2003). Finally, integrity (INT) captures the trustor's belief in the partner's adherence to principles that align with their own values and standards (Lauer & Deng, 2007). By understanding these dimensions, we gain a deeper understanding of the foundation upon which trust is built.

Mukherjee et al. (2012) highlighted two key factors influencing trust in virtual organizations: information and communication technology (ICT) and shared values and goals (SVG). Effective communication through ICT platforms plays a crucial role in establishing trust. It allows individuals to assess an organization's trustworthiness across various dimensions. Beyond just hardware and software, ICT encompasses communication tools that facilitate information transmission (Bloom et al., 2014). These technologies significantly impact daily operations by enabling rapid and reliable information exchange and fostering connections between individuals (Tan & Wang, 2010; Wasko & Faraj, 2000). Notably, user-friendly communication technology fosters trust in decision-making processes (Kraemer & King, 1988). Therefore, ensuring good usability, which refers to the ease of use and efficiency in completing tasks, is crucial (Preece, 2001). On the other hand, Shared Value Graph (SVG) refers to the level of mutual understanding and agreement between exchange partners regarding the significance of their transactional motives, goals, and objectives. This shared understanding contributes to the establishment of trust between partners (Young-Ybarra & Wiersema, 1999). The existence of a strong SVG between organizations increases the perceived trustworthiness of a virtual organization (VO) (Mukherjee et al., 2012). While SVG is essential for any form of strategic partnership, it is particularly crucial in the context of virtual

organizations (Kasper-Fuehrer & Ashkanasy, 2003). Notably, shared values serve as the primary source of integration, coordination, and control within virtual organizations (Amah & Ahiauzu, 2014).

The rapid development of technology, particularly in the service provider sector, has fundamentally reshaped how we interact in a globalized world. This is especially evident in online transportation services, a prime example of virtual organizations (VOs) where trust is paramount. Building on existing research by Mukherjee et al. (2012), this study sought to move beyond enablers of trustworthiness in VOs. It aimed to bridge the critical gap between theory and practice by empirically testing the proposed framework and developing a more comprehensive model that considers user participation, internet-based communication technology, and shared values. By employing a real-world case study of an online ride-hailing app, this research was intended to significantly impact the field by providing concrete evidence to solidify the foundation of trust in VOs. By providing concrete evidence, this study was expected to strengthen existing theories and to significantly impact our understanding of trust dynamics in the dynamic world of virtual collaboration (Maass et al., 2018).

## HYPOTHESIS DEVELOPMENT

This study investigated a model framework exploring the relationships between Information and Communication Technology (ICT), Shared Values and Goals (SVG), trustworthiness dimensions (Ability, Benevolence, Integrity – ABI, BEN, INT), and user participation (PAR) within the context of virtual organizations (VOs). Drawing upon the concepts of VOs established by Mukherjee et al. (2012), Mayer et al. (1995) and Porumbescu et al. (2019), the study formulated hypotheses and employs an online survey to test the validity of the proposed framework.

### ICT implementation and dimensions of trustworthiness

Trustworthiness, defined as the extent to which something or someone can be relied upon (Filieri, 2016), encompasses three key dimensions: ability, benevolence, and integrity (Mayer et al., 1995). It plays a critical role in Information and Communication Technology (ICT), impacting technology, information processing, and user interactions. ICT can significantly influence trustworthiness in several ways. For instance, bank customers rely on the security and reliability of the bank's ICT infrastructure against cyberattacks and disruptions. Frequent downtime, technical glitches, or service interruptions can negatively impact trust and confidence in the technology. Similarly, online transactions, particularly financial ones, require trust in platforms offering secure payment gateways and buyer/seller protection mechanisms. These mechanisms are essential for fostering trust in digital trade. Based on these dimensions of trust, we proposed three hypotheses:

**H1:** The stronger ICT governance, the greater influence.
**H2:** Good ICT governance is perceived as more benevolent.
**H3:** Good ICT governance is perceived as more integrity.

### Shared values and goals and dimensions of trustworthiness

Shared values and goals act as a cornerstone for building trust across diverse contexts, from personal relationships to professional settings and communities (Yu et al., 2015a). They fundamentally strengthen trustworthiness by fostering alignment, understanding, consistency, collaboration, ethical conduct, open communication, resilience, and a long-term perspective (Rud, 2009). Shared values and goals signal common intentions and motivations, which fosters better understanding, encourages cooperation, and facilitates collaboration (Chaney & Martin, 2017). Open and transparent communication, further bolstered by shared values and goals, strengthens trustworthiness as well. In line with this reasoning, we developed three hypotheses exploring the relationship between shared values and goals and various dimensions of trust.

**H4:** Shared values and goals increase organizational ability.
**H5:** Shared values and goals promote inter-organizational benevolence.
**H6:** Shared values and goals strengthen perceived organizational integrity.

### Trustworthiness and user participation

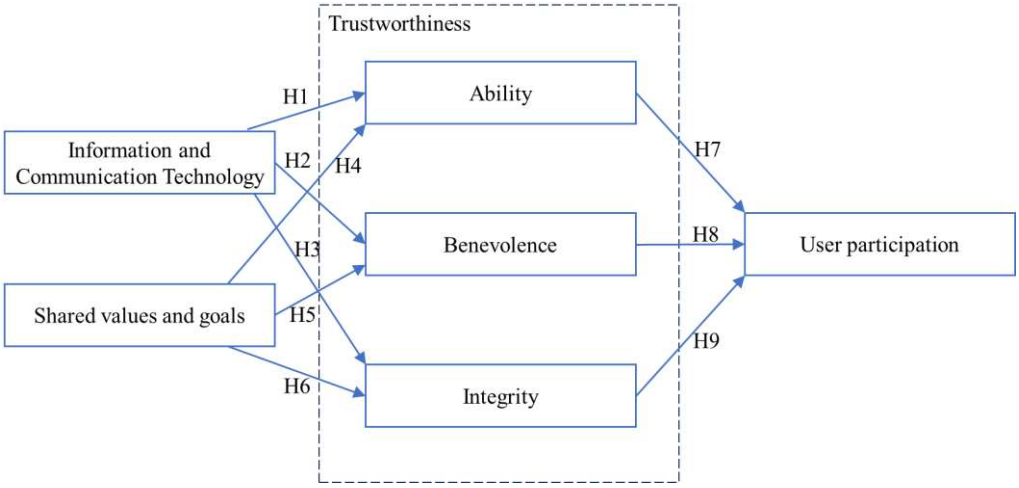
Building upon the established connection between user participation and trustworthiness, this research delves deeper by exploring the specific aspects of organizational behavior that foster user engagement. Trustworthiness serves as a critical cornerstone for thriving online communities, platforms, and business interactions (Benlian & Hess, 2011). It forms the bedrock for establishing a strong user base and cultivating a positive user experience (Cornacchia et al., 2021). When users trust a system, website, or organization, they are more likely to actively participate, engage, and contribute, fostering a vibrant and dynamic ecosystem. This trust is built upon transparent communication and actions (Yue et al., 2019), secure handling of user information, privacy, and financial transactions (Mashatan et al., 2022), and positive reviews and testimonials from other users (Utz et al., 2012). To further explore this relationship, we proposed three hypotheses that examine the impact of specific organizational traits on user participation:

**H7:** Ability boosts user participation.
**H8:** Benevolence increases user participation.
**H9:** Stronger integrity leads to higher user participation.

## CONCEPTUAL FRAMEWORK

This research utilized a conceptual framework, visualized in Figure 1, to organize and structure the key ideas and concepts relevant to the study. This framework served as the foundation for the hypotheses tested, which are also presented in Figure 1.

**Figure 1.** Conceptual framework of the model




To measure the variables in our hypotheses, we designed a comprehensive survey questionnaire. Leveraging relevant literature from sections 2.1 and 2.2, we developed clear, unbiased, and closed-ended questions to gather specific insights into participants' experiences. To ensure the questionnaire's efficacy, we conducted a pilot test with 30 customers, evaluating individual questions and the overall flow. We employed an online platform for efficient data collection. The operational definitions of our research constructs are provided in Table 1.

**Table 1:** Operational definition of research constructs

| Constructs | Indicators | Sources | Code | Question |
|---|---|---|---|---|
| Information and Communication Technology | Easy to learn | Budi (2018) | $X_1$ | The application media "Online Transportation" provided is easy to use |
| | Clear and Understandable | | | |
| | Easy to use | | | |
| | Flexible | | $X_2$ | The application media "Online Transportation" provided is flexible and up to date |
| | Become Skilled | | | |
| | Controlled | | | |
| Shared Values and Goals | Coordination | Amah and Ahiauzu (2014) | $X_3$ | Activities in "Online Transportation" are clear and structured (the division of service categories is clear) |
| | Deal | | $X_4$ | The "Online Transportation" policy and the |

| Constructs | Indicators | Sources | Code | Question |
|---|---|---|---|---|
| | | | | privacy policy provided are clear and can be accounted for according to the agreement |
| | Integration | | $X_5$ | Online Transport connects users and drivers in one community |
| Ability | "Amazon.com is competent" | Gefen and Straub (2004) | $Y_1$ | Online Transportation is competent. |
| | "Amazon.com understands the market it works in" | | $Y_2$ | This Online Transportation understands customer needs |
| | "Amazon.com knows about books" | | $Y_3$ | Online Transportation It knows about the fastest route that can be taken |
| | "Amazon.com knows how to provide excellent service" | | $Y_4$ | This Online Transportation knows how to provide the best service |
| Benevolence | "I expect I can count on Amazon.com to consider how its actions affect me" | Gefen and Straub (2004) | $Y_5$ | I hope this Online Transportation can take my advice |
| | "I expect that Amazon.com puts customer's interests before their own" | | $Y_6$ | I hope this Online Transportation has good intentions for customers |
| | "I expect that Amazon.com is well meaning" | | $Y_8$ | I hope that this Online Transportation has a good meaning |
| Integrity | "Promises made by Amazon.com are likely to be reliable" | Gefen and Straub (2004) | $Y_9$ | This promise made by Online Transport is most likely reliable |
| | "I do not doubt the honesty of Amazon.com" | | $Y_{10}$ | I do not doubt the honesty of this Online Transportation |
| | "I expect that Amazon.com will keep promises they make" | | $Y_{11}$ | I hope this Online Transport will keep the promise they made |
| | "I expect that the advice given by Amazon.com is their best judgment" | | $Y_{12}$ | I hope the advice given by this Online Transport is their best judgment |
| Participation | Continuity | Wong (2017) | $Z_1$ | This Online Transportation is a platform that I will continue to use |
| | Frequency | | $Z_2$ | I often use this Online Transportation service |
| | Recommendation | | $Z_3$ | I will recommend this online transportation service to many people |

## METHODS

Our survey, conducted from December 2021 to January 2022, recruited 252 online transportation service users via a Google Forms questionnaire. All participants were informed about the research purpose. The criteria for participation included having used online transportation at least three times. Participants' ages ranged from 17 to over 60, with the majority (132) aged between 17 and 24. The remaining participants were distributed as follows: 89 were between 25 and 40 years old, 30 were between 41 and 60 years old, and 1 was over 60. In terms of gender, 186 participants were female and 66 were male. Our research did not involve drug or medical treatment trials so it was exempted from requiring formal ethics committee approval. However, the research adhered to the ethical principles outlined in the Declaration of Helsinki and was conducted under the supervision of the researchers' affiliated department.

### Structural equation modelling

This research drew upon the findings of previous researchers, utilizing a framework model that explored the intricate relationships between various constructs. This model investigated how Information and Communication Technology (ICT), alongside shared values and goals, influenced different aspects of trustworthiness (ability, benevolence, and integrity) and ultimately, user participation. To analyze this complex framework, Structural Equation Modeling (SEM) was employed. While the preliminary questionnaire data was processed using SPSS software, the main questionnaire data required a more advanced tool - AMOS 23 software. This choice was driven by the model's complexity (multilevel) and its unique capability to estimate intricate relationships between multiple constructs within the model.

### Regression analysis

To delve into the intricacies of the proposed framework, this study employed regression analysis, a powerful statistical tool. This analysis focused on two key areas: first, quantifying the influence of trustworthiness on user participation. This aimed to understand how different aspects of trustworthiness (ability, benevolence, and integrity) collectively affect the level of user engagement. Second, examining the influence of information and communication technology (ICT) and shared values and goals (SVG) on trustworthiness. This analysis explored how each of these factors individually affects each dimension of trustworthiness. To ensure reliable findings, multicollinearity tests were meticulously conducted. These tests assessed for the presence of strong correlations between independent variables within each model. Mitigating potential multicollinearity issues was crucial, as it helps prevent misleading interpretations of the results based on inflated or deflated coefficient estimates.

## RESULTS AND DISCUSSION

### Reliability and Validity Test

Prior to testing the final model, a pilot study involving 30 randomly selected participants was conducted to assess the validity and reliability of the research questionnaire's statement items. This pilot study aimed to ensure the instrument accurately measures what it intends to (validity) and produces consistent results across administrations (reliability). The pilot study revealed encouraging results. The reliability coefficient ($r_H$) exceeded 0.80, indicating very high reliability. However, the initial validity measure ($\alpha$) fell below the desired threshold of 0.05, at 0.361. As shown in Table 2, specific statement items requiring adjustments were identified based on this preliminary test. Table 3 presents the details of the validity assessment.

**Table 2:** Reliability test

| Item-Total Statistics | | | | | |
|---|---|---|---|---|---|
| Variables | Cronbach's Alpha if Item Deleted | **$r_H$ > 0.6** | Variables | Cronbach's Alpha if Item Deleted | **$r_H$ > 0.6** |
| ICT1 | 0.920 | Reliable | BENE2 | 0.920 | Reliable |
| ICT2 | 0.918 | Reliable | BENE3 | 0.921 | Reliable |
| SVG1 | 0.920 | Reliable | BENE4 | 0.917 | Reliable |
| SVG2 | 0.919 | Reliable | INTE1 | 0.916 | Reliable |
| SVG3 | 0.918 | Reliable | INTE2 | 0.917 | Reliable |
| ABILITY1 | 0.916 | Reliable | INTE3 | 0.919 | Reliable |
| ABILITY2 | 0.918 | Reliable | INTE4 | 0.917 | Reliable |
| ABILITY3 | 0.920 | Reliable | P1 | 0.917 | Reliable |
| ABILITY4 | 0.917 | Reliable | P2 | 0.919 | Reliable |
| BENE1 | 0.919 | Reliable | P3 | 0.917 | Reliable |

### Structural Equation Modelling

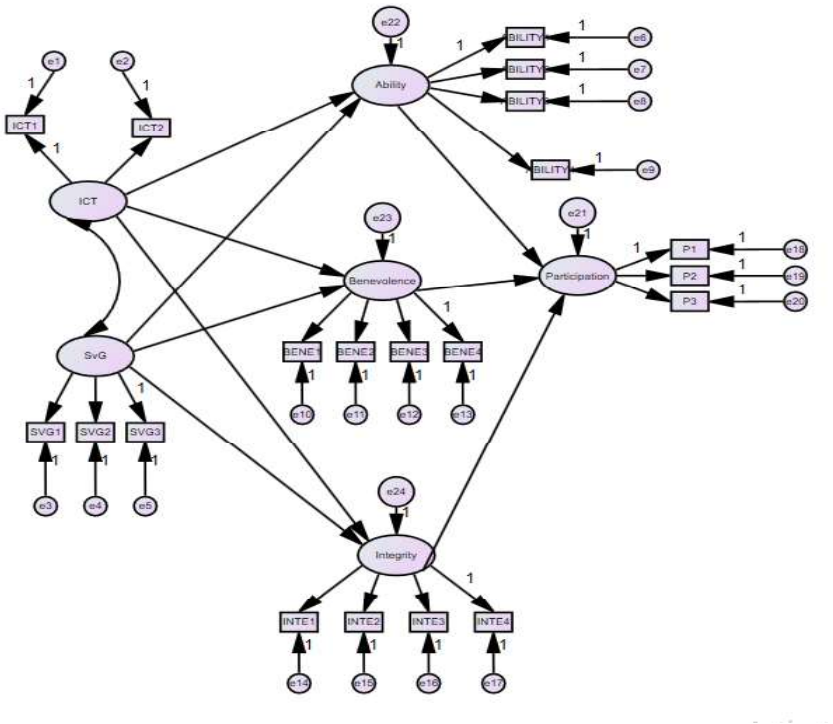
The model framework was described in the AMOS 23 software, and SPSS data from the main questionnaire was inputted into the model. The software also identified that there was a relationship between the ICT and SVG. The model framework resulting from the software computation is shown in Fig. 2.

**Table 3:** Validity test

| Correlations | | | 5% | | Correlations | | | 5% | |
|---|---|---|---|---|---|---|---|---|---|
| | | TOTAL | 0.125 | 0.05 | | | TOTAL | 0.125 | 0.05 |
| ICT1 | Pearson Correlation | .525** | Valid | | BENE2 | Pearson Correlation | .547** | Valid | |
| | Sig. (2-tailed) | 0.000 | | Valid | | Sig. (2-tailed) | 0.000 | | Valid |
| ICT2 | Pearson Correlation | .641** | Valid | | BENE3 | Pearson Correlation | .533** | Valid | |
| | Sig. (2-tailed) | 0.000 | | Valid | | Sig. (2-tailed) | 0.000 | | Valid |
| SVG1 | Pearson Correlation | .570** | Valid | | BENE4 | Pearson Correlation | .689** | Valid | |
| | Sig. (2-tailed) | 0.000 | | Valid | | Sig. (2-tailed) | 0.000 | | Valid |
| SVG2 | Pearson Correlation | .599** | Valid | | INTE1 | Pearson Correlation | .744** | Valid | |
| | Sig. (2-tailed) | 0.000 | | Valid | | Sig. (2-tailed) | 0.000 | | Valid |
| SVG3 | Pearson Correlation | .641** | Valid | | INTE2 | Pearson Correlation | .692** | Valid | |
| | Sig. (2-tailed) | 0.000 | | Valid | | Sig. (2-tailed) | 0.000 | | Valid |
| ABILITY1 | Pearson Correlation | .722** | Valid | | INTE3 | Pearson Correlation | .617** | Valid | |
| | Sig. (2-tailed) | 0.000 | | Valid | | Sig. (2-tailed) | 0.000 | | Valid |

| Correlations | | | 5% | | Correlations | | | 5% | |
|---|---|---|---|---|---|---|---|---|---|
| | | TOTAL | 0.125 | 0.05 | | | TOTAL | 0.125 | 0.05 |
| ABILITY2 | Pearson Correlation | .664** | Valid | | INTE4 | Pearson Correlation | .680** | Valid | |
| | Sig. (2-tailed) | 0.000 | | Valid | | Sig. (2-tailed) | 0.000 | | Valid |
| ABILITY3 | Pearson Correlation | .589** | Valid | | P1 | Pearson Correlation | .674** | Valid | |
| | Sig. (2-tailed) | 0.000 | | Valid | | Sig. (2-tailed) | 0.000 | | Valid |
| ABILITY4 | Pearson Correlation | .669** | Valid | | P2 | Pearson Correlation | .665** | Valid | |
| | Sig. (2-tailed) | 0.000 | | Valid | | Sig. (2-tailed) | 0.000 | | Valid |
| BENE1 | Pearson Correlation | .615** | Valid | | P3 | Pearson Correlation | .701** | Valid | |
| | Sig. (2-tailed) | 0.000 | | Valid | | Sig. (2-tailed) | 0.000 | | Valid |

**Figure 2:** Trustworthiness model framework in AMOS 23 software




To assess the validity of the research model, two key SEM tests were employed: the Measurement Model Test and the Structural Model Test. The Measurement Model Test specifically evaluated the construct validity and internal consistency of the measurement instrument. It assessed how accurately the observed variables (manifest variables) represent the underlying theoretical constructs (latent variables) and whether the chosen model aligns with established goodness-of-fit criteria. The detailed results of this test are presented in Table 4.

**Table 4:** Measurement model test results

| Measurement Model Test | Notation | Cut Off | Result | Source |
|---|---|---|---|---|
| Absolute Indices | $x^2$ | $x^2_H < x^2_T$ **or** $x^2_H$ saturated model < $x^2_H$ < independence model | $x^2_H$ (450.484) > $x^2_T$ (190.516) **or** 0 < 450.484 < 2521.991 | (Santoso, 2018) |
| | $x^2$/df | $x^2$/df ≤ 3 | 2.815 | (Kline, 2016) |
| | GFI | 0-1 (the closer to 1 the better) | 0.843 | (Santoso,2018) |
| | AGFI | | 0.794 | |
| | RMR | | 0.033 | |

| Measurement Model Test | Notation | Cut Off | Result | Source |
|---|---|---|---|---|
| Incremental Fit Indices | NFI | | 0.821 | |
| | CFI | | 0.875 | |
| Parcimony Fit Indices | PNFI | | 0.692 | |
| | PCFI | | 0.737 | |
| | AIC | AIC saturated model < $AIC_H$ < AIC independence model | 420 < 550.484 < 2561.991 | |
| | ECVI | ECVI saturated model < $ECVI_H$ < ECVI independence model | 1.673 < 2.193 < 10.207 | |
| | Hoelter's (N) | 75 ≤ *value* < 200 (worthy) | 104 | (Wan, 2002) |

The measurement model test (Table 4) confirmed a good fit between the hypothesized framework and the data, providing strong support for the constructs' operationalization. This paves the way for the structural model test (Table 5), which examines the relationships among the constructs themselves.

Our research in Greater Bandung provided compelling evidence that users prioritize trustworthiness (security, competence, benevolence, and integrity) when choosing ride-sharing services (hypotheses 4-6, Table 5). This aligned with previous research by Yu et al. (2015b) who highlighted shared values as a key factor in building trust. As Cho et al. (2016) suggested, trustworthiness signify an entity's reliability. When users perceive ride-sharing services as trustworthy, they become more comfortable relying on them. Interestingly, shared values and goals further strengthen trust by fostering mutual understanding of motivations. Alignment on what's important builds trust, whereas misaligned values creates friction. The research revealed a particularly strong link between Information and Communication Technologies (ICT) and both user perceptions of benevolence and integrity. Participation, however, only impacted integrity. This suggested that clear communication of values and goals through effective ICT platforms is crucial for building trust. Notably, data analysis using AMOS software uncovered a remarkable correlation (0.973) between ICT and Service Value Gap (SVG), highlighting the strong influence that ICT had on user-perceived value.

**Table 5:** Structural model test results

| Hypothesis | Acceptance | Relationship | Estimate Regression | Correlations (Close = estimates> 0,5) | |
|---|---|---|---|---|---|
| 1 | ICT vs Ability | $H_0$ | No Real Relationship | -1.012 | Very weak |
| 2 | ICT vs Benevolence | $H_1$ | There's a Real Relationship | -1.916 | Very weak |
| 3 | ICT vs Integrity | $H_1$ | There's a Real Relationship | -2.557 | Very weak |
| 4 | SVG vs Ability | $H_1$ | There's a Real Relationship | 1.837 | Close |
| 5 | SVG vs Benevolence | $H_1$ | There's a Real Relationship | 2.569 | Close |
| 6 | SVG vs Integrity | $H_1$ | There's a Real Relationship | 3.306 | Close |
| 7 | Participation vs Ability | $H_0$ | No Real Relationship | 0.215 | Weak |
| 8 | Participation vs Benevolence | $H_0$ | No Real Relationship | -0.125 | Very weak |
| 9 | Participation vs Integrity | $H_1$ | There's a Real Relationship | 0.679 | Close |

*Note:* Grey-shaded cells show rejected hypotheses.

## Regression Analysis and Collinearity Tests

Regression analysis resulted a statistically significant equation (Eq. 1) that quantify the relationships between participation, ability, benevolence, and integrity.

$$\mathrm{PAR} = -0.243 + 0.337\ \mathrm{ABI} + 0.156\ \mathrm{BEN} + 0.499\ \mathrm{INT} \quad (1)$$

An interesting finding emerged from our analysis of the equation (Eq. 1). Even with maximum Ability, Benevolence, and Integrity, Participation could only reach 4.717. Conversely, it dipped to a minimum of 0.749 when all trust factors were one. This suggested that user trust acts as a ceiling for Participation in ride-sharing services. Further strengthening this notion, the equation identified Integrity (INT) as the most influential factor on Participation compared to Ability and Benevolence. This aligned with the SEM results where only Integrity had a statistically significant relationship with Participation. In short, building trust, particularly through strong Integrity, is crucial for maximizing user engagement in ride-sharing services.

Before relying on our model's results, we conducted a thorough examination to ensure its accuracy and reliability. This involved checking for collinearity, a phenomenon where independent variables are highly correlated. We achieved this by performing individual regressions between each pair of variables from Ability (Ability), Benevolence (BEN), and Integrity (INT) in Eq. (1). Following each regression, we calculated the Variance Inflation Factor (VIF) using Eq. (2) to assess the severity of any collinearity. The results are presented in Table 6, showing minimal collinearity concerns, with VIF values all falling below the recommended threshold of 2.7. This suggests a high degree of independence between the independent variables in our model, strengthening the reliability of our findings (Büssing et al., 2013).

$$\mathrm{VIF} = \frac{1}{1 - R^2} \quad (2)$$

**Table 6.** Multicollinearity tests for PAR

| Independent variable | Inter-independent variable regression model | Multiple R | R Square | VIF |
|---|---|---|---|---|
| Ability | ABI = 0.884 + 0.195 BEN + 0.546 INT | 0.669 | 0.447 | 1.809 |
| Benevolence | BEN = 1.717 + 0.151 ABI + 0.507 INT | 0.682 | 0.465 | 1.871 |
| Integrity | INT = 0.333 + 0.411 ABI + 0.493 BEN | 0.757 | 0.573 | 2.341 |

Our regression analysis (Eq. 3-5) revealed a key insight: SVG exerted a stronger influence on all three trust dimensions (ABI, BEN and INT) compared to ICT. This aligned with the SEM results, where SVG demonstrated a more significant relationship with trust. This suggested that effectively addressing the gap between user expectations and service delivery is crucial for building trust in ride-sharing services. Further, the multicollinearity tests for Eq. 3-5 are shown in Table 7. The VIF values below

2.7 indicate very low but tolerable collinearity in the data (Büssing et al., 2013).

$$ABI = 0.911 + 0.197\ ICT + 0.537\ SVG \quad (3)$$
$$BEN = 2.035 + 0.259\ ICT + 0.299\ SVG \quad (4)$$
$$INT = 1.323 + 0.19\ ICT + 0.481\ SVG \quad (5)$$

**Table 7.** Multicollinearity tests for ABI, BEN and INT

| Independent variable | Inter-independent variable regression model | Multiple R | R Square | VIF |
|---|---|---|---|---|
| ICT | ICT = 2.293 + 0.5323 SVG | 0.596 | 0.355 | 1.552 |
| SVG | SVG = 1.158 + 0.668 ICT | 0.596 | 0.355 | 1.552 |

We also performed regression analysis between PAR as the dependent variable and ICT and SVG as independent variables, resulting an equation as written in Eq. (6). This equation indicated that the maximum value of Participation, achieved when ICT and SVG were maximum (five), was 4.475, while the minimum value (achieved when both were one) was 1.087. The collinearity between ICT and SVG had been tested for Eq. (5) in Table 7, so we did not test it again for Eq. (6).

$$PAR = 0.24 + 0.364 \cdot ICT + 0.483 \cdot SVG \quad (6)$$

## Analysis of Variance

The last statistical test we used was Analysis of Variance (ANOVA), which was conducted ANOVA to find out whether our constructs were different among gender and age. The results are shown in Table 8, which provides mean values for six constructs (ICT, SVG, ABI, BEN, INT, PAR) segmented by gender and age groups, along with an indication of whether the differences are statistically significant at the 0.05 level. For gender, no significant differences are found between males and females for any factor. For age, differences are statistically significant for ICT and SVG across the four age groups (17-24, 25-40, 41-60, >60), but not for ABI, BEN, INT, or PAR. Specifically, ICT and SVG show a notable decline in mean values with increasing age, particularly dropping to 4.000 for the >60 age group, whereas the other factors do not show significant age-related differences.

**Table 8.** ANOVA test results (α=0.05)

| | Gender | | | Age | | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | Female | Difference | 17-24 | 25-40 | 41-60 | >60 | Difference |
| ICT | 4.432 | 4.543 | Not different | 4.598 | 4.478 | 4.267 | 4.000 | Different |
| SVG | 4.121 | 4.192 | Not different | 4.283 | 4.071 | 4.000 | 4.000 | Different |
| ABI | 4.015 | 4.048 | Not different | 4.066 | 4.020 | 3.983 | 4.000 | Not different |
| BEN | 4.462 | 4.448 | Not different | 4.475 | 4.458 | 4.342 | 4.000 | Not different |
| INT | 4.148 | 4.200 | Not different | 4.254 | 4.132 | 4.058 | 4.000 | Not different |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PAR | 3.778 | 3.944 | Not different | 3.907 | 3.910 | 3.844 | 4.000 | Not different |

## Managerial Implications

Our research identified a critical link: user participation in ride-sharing services hinges heavily on their perception of the organization's integrity. This underscores the importance of prioritizing ethical practices. To cultivate a culture of trust, organizations can implement several key strategies. Firstly, a comprehensive code of ethics, a written document outlining the company's values and principles, serves as a vital foundation. This code should be clearly communicated to all employees, and regularly reviewed and updated to reflect evolving standards. Secondly, leadership sets the tone. By consistently demonstrating ethical behavior and holding themselves accountable to the same standards as everyone else, leaders inspire trust and encourage ethical decision-making throughout the organization. Finally, fostering openness and transparency is crucial. Establishing a system for addressing ethical concerns and complaints demonstrates a commitment to fair practices and encourages employee engagement. For a truly cohesive culture of integrity, consistent enforcement of the code of ethics across all levels of the organization is paramount. Recognizing and rewarding ethical behavior further reinforces the desired values. By implementing these measures, organizations can build a strong foundation of trust, ultimately fostering user participation and loyalty.

Our research also suggested a critical path to fostering trust: cultivating shared values and goals with users. Managers can achieve this by prioritizing open communication. This includes transparently sharing the organization's values and goals, understanding those of their users, and fostering a culture of mutual respect. Celebrating successes together reinforces this positive dynamic. Additionally, collaborative efforts like sharing resources, expertise, or network can further strengthen the bond. To solidify trust, maintaining transparency and accountability throughout the process is crucial. Finally, effectively resolving conflicts constructively demonstrates a commitment to a healthy, long-term partnership with users. Additionally, our study suggested that managers can implement gender-neutral policies as no significant differences exist between males and females across the six factors. However, age-specific strategies are necessary, particularly for ICT and SVG, where scores declined with age. Older people may require additional support in technology and strategic vision. For ABI, BEN, INT, and PAR, where no significant age-related differences were found, managers can adopt uniform policies, simplifying processes and ensuring consistent treatment. Continuous improvement and monitoring are essential to maintain high operation standards in these areas. Tailoring communication and engagement strategies to meet the diverse needs of different age groups will enhance customer satisfaction and retention, creating a more inclusive and effective business environment.

## CONCLUSIONS

Our study investigated how communication technology, shared values and goals, and user participation influence trust in virtual organizations. Interestingly, well-designed communication platforms strongly linked to user perceptions of a company's benevolence and integrity, while a shared sense of goals among all stakeholders (riders, drivers, company) fosters trust across all aspects of trustworthiness: ability, benevolence, and integrity. Notably, user participation itself only impacted trust in the company's integrity. This suggested a two-pronged approach: clear communication of values through technology builds trust in benevolence and integrity, while fostering shared values strengthens overall trust. These findings paved the way for future models that explore a more comprehensive relationship between trust dimensions and user participation, ultimately leading to a clearer understanding of how to cultivate user trust in virtual organizations. Future research could delve into understanding the specific types of user participation that most effectively cultivate trust across all dimensions. It could also explore how virtual organizations can encourage and integrate user participation to reinforce shared values and trust. This clearer understanding will lead to better strategies for cultivating user trust in virtual organizations. Additionally, future studies could also collect more demographic data, such as education and profession, to provide a more comprehensive understanding of factors influencing online transportation usage.

## REFERENCES

Amah, E., & Ahiauzu, A. (2014). Shared values and organizational effectiveness: A study of the Nigerian banking industry. Journal of management development, 33(7), 694–708.

Benlian, A., & Hess, T. (2011). The signaling role of IT features in influencing trust and participation in online communities. International Journal of Electronic Commerce, 15(4), 7–56.

Bews, N. F., & Rossouw, G. J. (2002). A role for business ethics in facilitating trustworthiness. Journal of Business Ethics, 39, 377–390.

Bloom, N., Garicano, L., Sadun, R., & Van Reenen, J. (2014). The distinct effects of information technology and communication technology on firm organization. Management Science, 60(12), 2859–2885.

Budi, I. G. K. T. P. (2018). Pengaruh Teknologi Informasi Terhadap Budaya Organisasi Dan Kinerja Karyawan di STMIK STIKOM BALI. Media Aplikom, 10(2), 113–134.

Büssing, A., Walach, H., Kohls, N., Zimmermann, F., & Trousselard, M. (2013). Conscious Presence and Self Control as a measure of situational awareness in soldiers–A validation study. International journal of mental health systems, 7, 1–9.

Camarinha-Matos, L. M., Afsarmanesh, H., & Ollus, M. (2006). Virtual Organizations: systems and practices. Springer Science & Business Media.

Cazier, J. (2003). The role of value compatibility in trust production and e-commerce.

Chaney, D., & Martin, D. (2017). The role of shared values in understanding loyalty over time: A longitudinal study on music festivals. Journal of Travel Research, 56(4), 507–520.

Cho, J.-H., Hurley, P. M., & Xu, S. (2016). Metrics and measurement of trustworthy systems. MILCOM 2016-2016 IEEE Military Communications Conference,

Cornacchia, G., Narducci, F., & Ragone, A. (2021). Improving the user experience and the trustworthiness of financial services. Human-Computer Interaction–INTERACT 2021:

18th IFIP TC 13 International Conference, Bari, Italy, August 30–September 3, 2021, Proceedings, Part V 18,
Filieri, R. (2016). What makes an online consumer review trustworthy? Annals of Tourism Research, 58, 46–64.
Gefen, D., & Straub, D. W. (2004). Consumer trust in B2C e-Commerce and the importance of social presence: experiments in e-Products and e-Services. Omega, 32(6), 407–424.
Jägers, H., Jansen, W., & Steenbakkers, W. (1998). Characteristics of virtual organizations. Organizational virtualness, 65–77.
Kasper-Fuehrer, E. C., & Ashkanasy, N. M. (2003). The interorganizational virtual organization: Defining a weberian ideal. International Studies of Management & Organization, 33(4), 34–64.
Kraemer, K. L., & King, J. L. (1988). Computer-based systems for cooperative work and group decision making. ACM Computing Surveys (CSUR), 20(2), 115-146.
Lauer, T. W., & Deng, X. (2007). Building online trust through privacy practices. International Journal of Information Security, 6, 323–331.
Maass, W., Parsons, J., Purao, S., Storey, V. C., & Woo, C. (2018). Data-driven meets theory-driven research in the era of big data: Opportunities and challenges for information systems research. Journal of the Association for Information Systems, 19(12), 1.
Mashatan, A., Sangari, M. S., & Dehghani, M. (2022). How perceptions of information privacy and security impact consumer trust in crypto-payment: an empirical study. IEEE Access, 10, 69441–69454.
Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. Academy of management review, 20(3), 709-734.
Morgan, R. M., & Hunt, S. D. (1994). The commitment-trust theory of relationship marketing. Journal of marketing, 58(3), 20–38.
Mukherjee, D., Renn, R. W., Kedia, B. L., & Mukherjee, D. (2012). Development of interorganizational trust in virtual organizations: An integrative framework. European Business Review.
Panteli, N., & Sockalingam, S. (2005). Trust and conflict within virtual inter-organizational alliances: a framework for facilitating knowledge sharing. Decision support systems, 39(4), 599–617.
Porumbescu, G. A., Neshkova, M. I., & Huntoon, M. (2019). The effects of police performance on agency trustworthiness and citizen participation. Public Management Review, 21(2), 212–237.
Preece, J. (2001). Sociability and usability in online communities: Determining and measuring success. Behaviour & Information Technology, 20(5), 347–356.
Rud, O. P. (2009). Business intelligence success factors: tools for aligning your business in the global economy (Vol. 18). John Wiley & Sons.
Tan, L., & Wang, N. (2010). Future internet: The internet of things. 2010 3rd international conference on advanced computer theory and engineering (ICACTE),
Utz, S., Kerkhof, P., & Van Den Bos, J. (2012). Consumers rule: How consumer reviews influence perceived trustworthiness of online stores. Electronic Commerce Research and Applications, 11(1), 49–58.
Wasko, M. M., & Faraj, S. (2000). "It is what one does": why people participate and help others in electronic communities of practice. The journal of strategic information systems, 9(2-3), 155–173.
Wong, D. (2017). Pengaruh ability, benevolence dan integrity terhadap trust, serta implikasinya terhadap partisipasi pelanggan e-commerce: studi kasus pada pelanggan e-commerce di UBM. Jurnal Riset Manajemen Dan Bisnis (JRMB) Fakultas Ekonomi UNIAT, 2(2), 155–168.
Young-Ybarra, C., & Wiersema, M. (1999). Strategic flexibility in information technology alliances: The influence of transaction cost economics and social exchange theory. Organization science, 10(4), 439–459.
Yu, P. L., Balaji, M., & Khong, K. W. (2015a). Building trust in internet banking: a trustworthiness perspective. Industrial Management & Data Systems, 115(2), 235–252.
Yu, P. L., Balaji, M., & Khong, K. W. (2015b). Building trust in internet banking: a trustworthiness perspective. Industrial Management & Data Systems.

Yue, C. A., Men, L. R., & Ferguson, M. A. (2019). Bridging transformational leadership, transparent communication, and employee openness to change: The mediating role of trust. Public relations review, 45(3), 101779.