ORIGINAL SCIENTIFIC PAPER

THE ROLE OF EDUCATION IN ENHANCING INNOVATION IN BANKS

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ABSTRACT

The modern banking sector faces dynamic changes driven by globalization, technological advancements, and the increasing demands of financial service users. In this context, education plays a pivotal role in fostering innovation, which represents a critical prerequisite for achieving competitive advantage. Education enables employees to adopt new work methods, effectively solve business challenges, and actively participate in the development of new products and services. This paper examines the impact of education on innovation through parameters such as the application of contemporary work methods, recognition and reward for innovative solutions, and the promotion of employees' professional development. The research was conducted on a sample of 667 employees from four banks with branches in Belgrade, employing descriptive statistics, contingency tables, and the chi-square test. The primary hypothesis posits that education positively influences the innovativeness and competitiveness of banking institutions, while the auxiliary hypothesis highlights the impact of employees' socio-economic characteristics on innovative activities. The findings indicate that modern training programs and continuous professional development significantly contribute to the adoption and implementation of innovations, thereby enhancing banks' competitiveness through the continuous improvement of products and services. This study emphasizes the importance of integrating education and innovation into the development strategies of the banking sector.

Keywords: *professional development, continuous education, creativity, technological advancement, banking sector*

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INTRODUCTION

Banks play a crucial role in the development of national economies, facilitating the flow of financial resources, ensuring economic stability, and supporting innovation. Their role extends beyond traditional financial functions, as they face challenges in the modern global environment such as dynamic market changes, high service quality demands, and shorter product lifecycles. The increasing demands of customers, rapid digitalization of services, and progressively shorter product/service lifecycles necessitate the continuous improvement of existing, and the development of new, banking services [1]. Innovations serve as the primary mechanism for enhancing existing products and services and creating new ones to meet the growing needs of the market [2]. Education plays a central role in fostering innovation in the banking sector. Continuous education and employee training enable the acquisition of new knowledge and skills, as well as the enhancement of their capacity to solve complex problems and develop creative solutions [3]. According to Gethe and Hulage [4], employee education significantly contributes to innovation through the application of modern work methods and the improvement of technological solutions. National economic competitiveness, as highlighted by Sahlberg and Oldroyd [5], is closely linked to intellectual and creative capital, which drives knowledge and innovation. In this regard, continuous education contributes to the development of unique solutions, which, according to Williams [6], represent the foundation for sustainable competitive advantage. The specific characteristics of the banking sector in Serbia further underscore the importance of education in fostering innovation. Banks in Serbia, facing the need to adapt to the local market, encounter challenges such as limited resources for digitalization and technical infrastructure, alongside increasing customer expectations for modern services. Continuous employee education is essential for implementing technological solutions that enable competitiveness both locally and regionally. Education plays a crucial role in developing employee competencies necessary for the successful introduction of digital services and other innovative approaches in banking operations.

Furthermore, banks must ensure that their employees are adequately trained to implement innovations. According to Chesbrough and Bogers [7], competitive advantage lies in an organization's ability to integrate internal knowledge with external resources to create value for customers. The growing interest in innovation, as noted by Amoako et al. [8], stems from its critical role in achieving and maintaining competitive advantage in conditions of intense competition. This is particularly important in the banking sector, where innovations not only enhance efficiency but also enable the development of new business models. This study assumes that education plays a crucial role in fostering innovation in the banking sector. By analyzing previous research, the focus is placed on the importance of continuous employee education as a tool for improving banking products and services, thereby contributing to the long-term sustainability and competitive advantage of banks in the Republic of Serbia.

THEORETICAL APPROACHES TO RESEARCH

The complexity of modern organizations, the vast amount of heterogeneous information, external environmental factors, as well as economic, political, and social uncertainty, necessitate the understanding of changes, focusing on them, and educating employees to successfully adapt to dynamic demands [9]. The competitive advantage of modern organizations is based on their ability to connect creative ideas with practical solutions in the form of new products, services, or processes through innovation [10]. Innovation, viewed as a mental process that leads to the creation of a new product, service, or process, highlights the importance of education as a key driver of this process. According to Abou-Moghli et al. [11], innovation involves the analysis and combination of concepts, as well as the creation of a new way of thinking that was previously unavailable. The development of new technologies and products requires organizations to invest in the education of their employees to stimulate creativity and flexibility [4].

Innovations encompass all activities aimed at introducing new or significantly improved products, services, methods, and work models that enable organizations to adapt to contemporary market challenges. They include not only technological advancements but also innovative approaches in business processes, management strategies, and communication with the market. The Oslo Manual provides a framework for "identifying innovations in four main categories: products/services, processes, organization, and marketing, thus enabling a comprehensive analysis of innovation activities in the European business environment" [12]. The innovation

process includes incremental and radical innovations, which differ in the degree of change they bring. Incremental innovations focus on "improving existing products, processes, or services by adapting and optimizing available resources, allowing organizations to achieve better performance and gradually respond to changes in the market environment" [13]. Conversely, radical innovations "involve the creation of revolutionary solutions that introduce entirely new concepts, technologies, or business models, bringing fundamental changes both within the organization and across the broader market" [14]. Incremental innovations often stem from previous radical innovations, with education playing a central role in their adoption and implementation. Activities related to incremental innovations include continuous learning, acquiring new skills, and applying educational programs to improve existing products and services. On the other hand, in managing radical innovations, "educational programs can assist organizations in identifying new markets, technologies, and resources, creating a foundation for further development and competitive advantage" [15]. In this context, education represents a "key driver, as it equips employees with the specific knowledge and skills necessary for implementing both types of innovation" [16]. Continuous education enables employees to recognize the benefits of innovations, optimally utilize available resources, and adapt to the demands of the modern market, while simultaneously developing the capabilities to effectively solve complex problems and adjust to dynamic changes in the business environment.

One of the modern models of innovation management is the open innovation model, which involves "the combination of internal and external ideas and resources to develop new technologies and implement innovations" [17]. In banking, this model becomes critical for adapting to the growing demands of digitalization and competition from fintech companies. The flow of knowledge between companies, as well as knowledge mobility, has been further accelerated through the application of information technologies, enabling faster integration of innovations. West and Gallagher [18] emphasize that "open innovation allows for systematic exploration and integration of external sources into organizational innovation". In the context of banking, the application of this model requires employee expertise, which is cultivated through continuous education. Programs such as innovation incubators, like the Rise initiative by Barclays Bank [19], serve as examples of successful implementation of open innovation, where education plays a pivotal role in the adoption of new technologies. Open innovations not only enhance services and products but also positively impact the financial performance of companies [20]. The success of this model depends on the readiness of organizations to invest in knowledge development and collaborate with external partners, which is critical for the future of the banking sector.

Employee education plays a pivotal role in enhancing innovation in the banking sector, where changes and digitalization drive innovation and development. Continuous professional development enables employees to acquire the skills and knowledge necessary to adapt to new market demands and implement innovative solutions. Research shows that training programs aimed at developing innovative capacities in banks contribute to increased employee productivity and efficiency, facilitating successful adaptation to rapid technological changes [21]. For example, banks implementing digital transformation programs, such as training on the use of artificial intelligence (AI)-based platforms, report faster adoption of new technologies among employees, reducing resistance to change and fostering innovation. The application of AI in banking significantly improves decision-making, reduces operational costs, and increases profitability. However, the success of AI implementation and integration into banking processes depends on employee education, which enables responsible and ethical use of these technologies to enhance business operations and drive innovation [22]. For instance, AI technologies supporting credit risk management decisions require employees to understand the basic principles of artificial intelligence as well as the ethical implications of its application. Education is essential for developing employees' capacities to address challenges and adapt to innovations. According to research by Dutta, Lanvin, and Wunsch-Vincent [23], continuous professional education plays a critical role in developing innovative capacities, particularly in sectors with high digitalization rates, such as banking. Managers play a significant role in fostering these capacities. Du, Leten, and Vanhaverbeke [24] state that "open innovations are most effective when managers actively integrate externally acquired knowledge with the organization's internal resources, which requires ongoing education and development of employee competencies". In this context, successful managers often implement mentoring programs and encourage collaboration among teams to facilitate the effective acquisition of new knowledge by employees. The digital transformation of the banking sector places a particular emphasis on employee education. Research indicates that investment in digital skills enables more efficient implementation of technologies such as artificial intelligence and automation, thereby increasing innovation and competitiveness in banks [25].

Employee collaboration serves as a fundamental driver of innovative solutions, while teamwork provides the framework for efficiently achieving defined objectives. Contemporary educational programs empower employees by enhancing their communication, analytical, and social skills—essential for fostering collaboration and strengthening team dynamics [26]. Teamwork aligns diverse perspectives toward shared goals, which is particularly critical in banking, where complex tasks frequently require coordination among multiple experts. According to Lekić et al., "the quality of teams significantly influences employee satisfaction, directly impacting their productivity and contributions to innovation" [27]. Training programs aimed at developing team and individual competencies help employees better understand their roles within teams and collaborate more effectively. This is particularly important in innovation management, where team members must identify and utilize their unique strengths [28]. Additionally, these programs contribute to conflict resolution, encourage creativity, and improve the overall organizational culture. While employee collaboration establishes the groundwork for innovation, teamwork transforms these efforts into effective processes that deliver tangible results. Education plays a vital role in strengthening both collaboration and teamwork, enabling banks to adapt to modern challenges and secure long-term competitiveness.

EDUCATION AND INNOVATION IN BANKING: RESEARCH DESIGN

The focus of this study is to analyze the role of education in enhancing innovation within the banking sector, with a particular emphasis on parameters such as the application of modern work methods, problem-solving, the development of new business methods, and the acceleration of banking product and service development. The aim is to examine how education and training programs foster creativity, innovation adoption, and the improvement of business processes. The research employed descriptive statistics, contingency tables, and the chi-square test. The primary hypothesis posits that education positively impacts the innovativeness and competitiveness of banks, while the auxiliary hypothesis emphasizes that employees' socio-economic characteristics further contribute to innovation. The study involved employees from four banks with branches in Belgrade. Data were collected between May and September 2019 using an anonymous survey. The survey comprised two sections: (1) socio-economic characteristics of respondents (gender, age, level of education, and years of employment), and (2) statements on innovation parameters, developed based on the methodology of Bateman, Wilson, and Bingham [29]. The original methodology, which focused on teamwork, was adapted to emphasize the impact of education on innovation. Out of 700 distributed questionnaires, 667 were fully completed, representing a high response rate of 95.29%. Similar studies provide an important context for analyzing the impact of education on innovation. YuSheng and Ibrahim [30] demonstrated that service innovations significantly contribute to customer satisfaction and loyalty in the banking sector, while Gethe and Hulage [4] emphasized the importance of modern educational programs in fostering technological solutions and innovations. Sahlberg and Oldroyd [5] highlight that intellectual capital, supported by continuous education, forms the foundation of economic competitiveness and development. These studies serve as theoretical support for the present research.

Innovations (I) were assessed as the average value of eight parameters related to education: Education encourages employees to adopt new work methods (I-1), Training facilitates active participation in the development of new projects (I-2), Professional development programs enhance the recognition and rewarding of innovative solutions (I-3), Education contributes to the rapid identification of business problems (I-4), Educational programs enable effective problem-solving (I-5), Problem-solving through training fosters professional growth and learning (I-6), Education motivates the proposal of innovative ideas in work processes (I-7), and Modern training programs support the acceptance and implementation of innovations (I-8). A five-point Likert scale was employed to evaluate these parameters (1 – strongly disagree to 5 – strongly agree). This methodological framework facilitates the analysis of the impact of education on innovation.

RESULTS AND DISCUSSION

The characteristics of respondents regarding gender, age, level of professional education, and years spent in the bank are presented in Table 1.

Table 1. Socio-economic characteristics of respondents

		2019	
		Frequency	**Percentage**
Gender	Male	295	44.23
	Female	372	55.77
	Total	667	100.00
Age	Up to 35	178	26.69
	35–55	441	66.12
	Over 55	48	7.20
	Total	667	100.00
	Mean: 43.35; Std. Dev. = 5.61; Coeff. Var. =12.94%		
Level of education*	A	83	12.44
	B	76	11.39
	C	464	69.57
	D	44	6.60
	Total	667	100.00
Years of employment	Less than 5	207	31.03
	6–15	316	47.38
	16–20	99	14.84
	Over 20	45	6.75
	Total	667	100.00
	Mean: 10.69; Std. Dev. = 4.92; Coeff. Var. = 46.02%		

* A. High school diploma. B. Professional college diploma. C. Higher educational diploma (BA). D. Postgraduate qualification (MA; PhD).

Source: Author's calculations

The results of the descriptive statistics related to the innovation parameters are presented in Table 2.

Table 2. Descriptive statistics of innovation parameters

Innovation parameters	N	Mean	Std. Dev.	Variance	Skewness	Kurtosis
I-1	667	3.70	0.881	0.777	-0.356	2.651
I-2	667	3.62	0.891	0.794	-0.262	2.526
I-3	667	3.47	0.938	0.880	-0.232	2.603
I-4	667	3.48	0.929	0.863	-0.211	2.567
I-5	667	3.62	0.921	0.848	-0.362	2.765
I-6	667	3.67	0.902	0.814	-0.402	2.864
I-7	667	3.64	0.923	0.852	-0.265	2.455
I-8	667	3.70	0.900	0.811	-0.524	2.886

Source: Author's calculations

Based on a total sample of 667 bank employees, the average innovation score is 3.61, with a standard deviation of 0.910 and a coefficient of variation of 25.23%. The findings indicate that the highest-rated parameters are "Education encourages employees to adopt new work methods" (I-1), with an average score of 3.70 (Std. Dev. 0.881), and "Modern training programs support the acceptance and implementation of innovations" (I-8), with an average score of 3.70 (Std. Dev. 0.900). The lowest-rated parameter was "Professional development programs enhance the recognition and rewarding of innovative solutions" (I-3), with an average score of 3.47 (Std. Dev. 0.938).

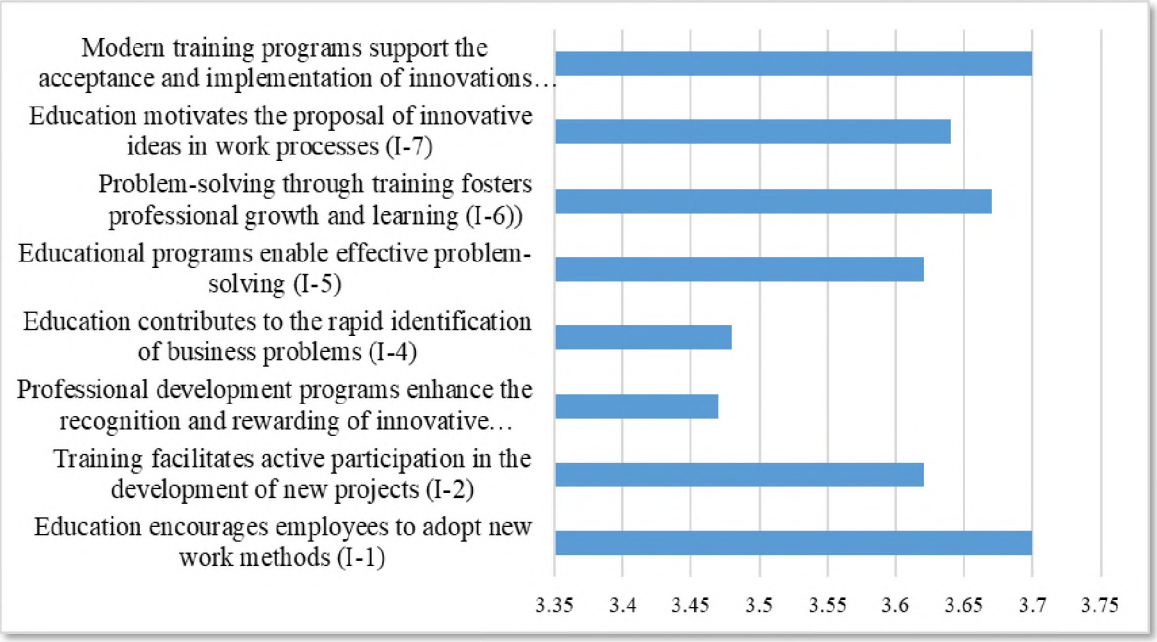

Figure 1. Average ratings of innovation parameters
Source: Author's calculations

The skewness coefficients for innovation parameters have negative values, indicating that the results are predominantly concentrated to the right of the mean, among higher scores. The range of skewness values extends from slightly negative at -0.211 (I-4 – Education contributes to the rapid identification of business problems) to distinctly negative at -0.524 (I-8 – Modern training programs support the acceptance and implementation of innovations). The data distribution is negatively skewed, ranging from mild to pronounced. The kurtosis coefficients for innovation parameters have positive values, indicating leptokurtic distributions—clustering of results around the mean. The range of kurtosis values spans from 2.454 (I-7 – Education motivates the proposal of innovative ideas in work processes), representing weaker clustering, to 2.866 (I-8 – Modern training programs support the acceptance and implementation of innovations), where clustering is most pronounced. The distribution demonstrates a significant concentration of results around the mean values.

Table 3. Contingency table for variables Gender and Innovations

Gender		**Female**		**Male**		χ^2
		N	**% within gender_sum**	**N**	**% within gender_sum**	
Inovations	1	3	0.8	0	0.0	$\chi^2 = 2.959$ df 4; Asymp. Sig. (2-sided) = 0.565
	2	33	8.9	30	10.2	
	3	100	26.9	84	28.5	
	4	171	46.0	130	44.1	
	5	65	17.5	51	17.3	

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 26.91.

Source: Author's calculations

From the contingency table (Table 3), it can be observed that the majority of respondents, 46% of women and 44.1% of men, rated innovations with a score of 4, followed by a score of 3 (26.9% of women and 28.5% of men) and a score of 5 (17.5% of women and 17.3% of men). It is evident that the percentage of respondents who rated innovations with the lowest scores of 1 and 2 is negligible. To examine the relationship between respondents' gender and innovation ratings, based on the calculated Pearson chi-square statistic and the corresponding significance level (Asymp. Sig. = 0.565), it can be concluded that gender and innovation ratings are not statistically dependent variables χ^2 (4, n = 667) = 2.959, p = 0.565.

Table 4. Contingency table for variables Age and Innovations

Inovations		Age			χ^2
		<35	36-55	>55	
1	Count	1	2	0	$\chi2$ = 14,381 df 8; Asymp. Sig. (2-sided) = 0.072
	% within innovations	33.3	66.7	0	
2	Count	19	38	6	
	% within innovations	30.2	60.3	9.5	
3	Count	60	119	5	
	% within innovations	32.6	64.7	2.7	
4	Count	75	202	24	
	% within innovations	24.9	67.1	8.0	
5	Count	23	80	13	
	% within innovations	19.8	69.0	11.2	

Source: Author's calculations

The contingency table (Table 4) shows that, based on age groups, the largest number of respondents, 301, rated innovations with a score of 4, including 67.1% of respondents aged 36–55, 24.9% of those under 35, and 8.0% of those over 55. A score of 3 was given by 184 respondents, of whom 64.7% were aged 36–55, 32.6% were under 35, and 2.7% were over 55. A score of 5 was assigned by 116 respondents, of whom 69.0% were aged 36–55, 19.8% were under 35, and 11.2% were over 55. Only 66 respondents (9.9%) rated innovations with scores of 1 and 2. To examine the relationship between respondents' age and innovation ratings, based on the calculated Pearson chi-square statistic and the corresponding significance level (Asymp. Sig. = 0.072), it can be concluded that respondents' age and innovation ratings are not statistically dependent variables χ^2 (8, n = 667) = 14.381, p = 0.072.

Table 5. Contingency table for variables Level of education and Innovations

Inovations		Level of education				χ^2
		A	B	C	D	
1	Count	0	0	0	3	χ^2 = 33.663 df 12; Asymp. Sig. (2-sided) = 0.001
	% within innovations	0	0	0	100.0	
2	Count	0	14	9	40	
	% within innovations	0	22.2	14.3	63.5	
3	Count	6	33	24	121	
	% within innovations	3.3	17.9	13.0	65.8	
4	Count	23	24	32	222	
	% within innovations	7.6	8.0	10.6	73.8	
5	Count	15	12	11	78	
	% within innovations	12.9	10.3	9.5	67.2	

A. High school diploma. B. Professional college diploma. C. Higher educational diploma (BA). D. Postgraduate qualification (MA; PhD).

Source: Author's calculations

The contingency table (Table 5) shows that, based on the respondents' level of education, 45.1% of the entire sample rated innovations with a score of 4. Among these, 73.8% of respondents held a higher educational diploma (C), 10.6% had a professional college diploma (B), 8.0% had a high school diploma (A), and 7.6% had a postgraduate qualification (D). Innovations were rated with a score of 3 by 27.6% of respondents, of whom 65.8% held a higher educational diploma (C), 17.9% had a high school diploma (A), 13.0% had a professional college diploma (B), and 3.3% had a postgraduate qualification (D). A score of 5 was assigned to innovations by 17.4% of the total number of respondents, of whom 67.2% held a higher educational diploma (C), 12.9% had a postgraduate qualification (D), 10.3% had a high school diploma (A), and 9.5% had a professional college diploma (B). Only 66 respondents (9.9%) rated innovations with scores of 1 and 2. A statistically significant difference was observed between respondents regarding their level of education in relation to their evaluation of innovations in the analyzed sample. To examine the dependency between respondents' level of education and innovations, based on the calculated Pearson chi-square statistic and the corresponding significance level (Asymp. Sig. = 0.001), it can be concluded that respondents' level of education and innovations are statistically dependent variables χ^2 (12, n = 667) = 33.663, p = 0.001.

The contingency table (Table 6) shows that, based on years of employment, the majority (45.1%) rated innovations with a score of 4. Among these, 50.2% of respondents had between 6 and 15 years of employment, 29.9% had less than 5 years, 12.6% had between 16 and 20 years, and 7.3% had more than 20 years of employment. Among respondents who rated innovations with a score of 3 (27.6%), 45.7% had between 6 and 15 years of employment, 34.8% had less than 5 years, 17.4% had between 16 and 20 years, and 2.2% had more than 20 years of employment. In the group of respondents who rated innovations with a score of 5 (17.4%), 41.4% had between 6 and 15 years of employment, 31.9% had less than 5 years, 16.4% had between 16 and 20 years, and 10.3% had more than 20 years of employment. It is evident that the percentage of respondents who rated innovations with the lowest scores of 1 and 2 is negligible (a total of 66, or 9.9%). Based on the calculated Pearson chi-square statistic and the corresponding significance level (Asymp. Sig. = 0.176), it can be concluded that years of employment and their innovation ratings are not statistically dependent variables χ^2 (12, n = 667) = 14.381, p = 0.176.

Table 6. Contingency table for variables Years of employment and Innovations

Inovations		Years of employment				χ^2
		< 5	6-15	16-20	> 20	
1	Count	1	2	0	0	$\chi2$ = 16.350 df 12; Asymp. Sig. (2-sided) = 0.176
	% within innovations	33.3	66.7	0	0	
2	Count	15	31	10	7	
	% within innovations	23.8	49.2	15.9	11.1	
3	Count	64	84	32	4	
	% within innovations	34.8	45.7	17.4	2.2	
4	Count	90	151	38	22	
	% within innovations	29.9	50.2	12.6	7.3	
5	Count	37	48	19	12	
	% within innovations	31.9	41.4	16.4	10.3	

Source: Author's calculations

The research findings confirm the proposed hypotheses, underscoring the importance of education as a pivotal factor in fostering innovation. High ratings for parameters such as the application of modern work methods and the facilitation of innovation adoption through training highlight the critical role of education in improving business processes. The analysis demonstrated a significant correlation between the level of education and innovation ratings, while gender and years of employment exhibited no statistically significant influence. These results position education as a fundamental tool for not only adapting to technological advancements but also for fostering the development of new business models and services, offering a robust foundation for enhancing strategies in the banking sector.

CONCLUSION

The continuous enhancement of innovations, including new products, services, processes, and technologies, forms a fundamental basis for strengthening the competitive advantage of banks. However, the research findings indicate that innovation alone is insufficient for achieving sustained competitiveness. It is essential for banks to invest in the education and professional development of employees, thereby fostering creativity and the capacity to solve complex business problems.

The research results demonstrate that employee education positively impacts their innovativeness, particularly through training programs that facilitate the application of modern work methods, efficient problem-solving, and the adoption of new technologies. Respondents gave the highest ratings to parameters related to the application of new work methods and the facilitation of innovation adoption, underscoring the importance of educational programs in adapting to changes and improving business processes. Conversely, the lowest-rated parameter—encouraging the recognition and rewarding of innovative solutions—highlights the need for further investment in motivational mechanisms and reward systems. The analysis of the relationship between respondents' socio-economic characteristics and innovations emphasizes the significant role of education as a factor influencing the perception and implementation of innovations. Highly educated employees, particularly those with postgraduate qualifications, showed a greater inclination toward developing innovative solutions, confirming that education plays a critical role

in enhancing the competitiveness of banks. In contrast, variables such as gender, age, and years of employment did not prove to be significant factors in assessing innovations.

Employee education plays a pivotal role in developing their innovative capacities, enabling banks to effectively adapt to the dynamic demands of the market. Through the synergy of education, innovation, and technological development, banks can secure lasting competitive advantages, increase client loyalty, and attract new customers. Investing in employee education represents a fundamental prerequisite for advancing innovations and ensuring the long-term sustainability of the banking sector.

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