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A B S T R A C T

of the dissertation submitted for the degree of Doctor of Philosophy

**FORMATION AND UTILIZATION OF HUMAN
RESOURCES POTENTIAL IN INDUSTRIAL ENTERPRISES
IN AZERBAIJAN**

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GENERAL CHARACTERISTICS OF THE WORK

Relevance and development level of the research: In recent years, geopolitical wars and conflicts on the global stage, along with turmoil in the financial-banking system due to the COVID-19 pandemic, and the tightening of financial policy, have somewhat weakened economic activity. However, in our country, the driving force of economic activity in recent years has been the non-oil sector.

In today's era, the value attributed to human labor is steadily increasing. This is due to the high level of integration of scientific and technological progress into the economic cycle, as well as global standards regarding human rights. Since the formation of economic relations, human labor has remained a crucial and constant element of the production process. Naturally, over time, labor has undergone changes both quantitatively and qualitatively, necessitating new approaches to labor management.

The experience of advanced countries demonstrates that in market-driven economies, the effective utilization of labor potential is crucial, particularly for industrialized nations. Determining the demand for specialists, personnel, and labor in the industrial sector is essential for various reasons. From the perspective of human resources, it relates to effective employment and the creation of new jobs; from the labor market's perspective, it concerns meeting necessary labor demands; and from the state's perspective, it involves the effective regulation of economic processes. This benefits all three parties. Therefore, in developed countries, labor demand is widely used to determine macroeconomic and labor market policy targets.

As quality standards for industrial products rise and sustainability alongside competitiveness remain paramount, investing in human capital and cultivating future industrial talent become essential. To put it simple, quality human resources in industry guarantee quality product output.

However, having a developed human resource base does not guarantee success in domestic or global markets. Global experience shows that industrial enterprises' market success heavily depends on how effectively they utilize their workforce and the results of their personnel policies.

It should be noted that industrial human resources are part of the country's overall labor potential, which undergoes both quantitative and qualitative changes. These changes are primarily driven by labor demand and demographic factors. Developed countries actively support the formation and development of human resources, implementing regulatory measures in this area.

Thus, forming, developing, improving, and determining new standards for human resources in the industrial sector requires efficient use of this potential. Market conditions demand the development of a professional and skilled workforce system. All these factors underscore the necessity of identifying the principles governing human resource development in industry, examining current trends, and analyzing their components. Advanced countries conduct various studies to effectively use human resources in industry. Under new economic conditions, preparing flexible and capable professionals is among the most important aspects of forming and utilizing human resources in the industrial sector.

Efficient use of labor and determining demand for specialists not only in industry but across the economy holds significant scientific and practical value for our independent state. Like developed countries, rapid changes in the quantity and quality of human resources, demand levels, and demographics require government involvement and support in effectively managing and utilizing labor potential.

Recent years have seen positive results in the socio-economic development policies implemented within targeted programs in Azerbaijan. As a result, the economy has entered a phase of dynamic development, changing the priorities of social development policies. Previously, the government's social policy focused on job creation and poverty reduction. Today, it focuses on decent employment, improving labor force quality and competitiveness, providing quality education based on labor market demands, and more. In short, Azerbaijan's social development has entered a new qualitative stage aimed at sustainable human development.

Under modern economic conditions, maintaining balance between job creation in the industrial sector and human resource

development requires improved vocational and professional training and accurate assessment of labor demand. Therefore, the development and utilization of human resources in the industry should align with current industrial challenges and needs.

These factors underscore the high relevance of this research topic for Azerbaijan's economy.

Under market conditions, forming and effectively using human resources in industrial enterprises, determining demand for such resources, and analyzing labor market needs have become highly relevant issues over the last 34–40 years. Azerbaijani researchers such as T.A. Guliyev, A.G. Alirzayev, R.K. Isgandarov, S.M. Muradov, R.Sh. Muradov, T.N. Aliyev, A.U. Ibrahimov, Y.H. Hasanli, A.M. Imranov, T.A. Huseynov, A.M. Mustafayev, M.A. Akhundov, P.M. Safarov, S.S. Mehbaliev, A.A. Ismayilzade, and others have studied these issues.

Russian-speaking researchers like T.B. Belzarova, L.T. Snitko, K.G. Krechetkinov, O.V. Bepalova, G.V. Pelexanova, N.R. Balniskaya, B.G. Shekin, V.Y. Vsyakin, I.V. Vatyakova, B.L. Eremina, M.V. Karavayeva, P.I. Kapelyushnikov, K.S. Btyakov, K.A. Urazova, M.M. Glazov, B.A. Chiganov, I.P. Firova, K.A. Kravchenko, P.V. Zhuravlev, D.A. Nazipova, I.K. Kornev, I.S. Maksimov, O.N. Istomina, S.A. Kartashov, N.K. Mausnov, V.Y. Afanasyev, B.I. Katayeva, A.L. Lukyanova have also contributed significantly.

English-language authors such as S. David, D. Torrington, L. Hall, S. Taylor, A.A. Thompson, A.D. Strickland, N.P. Hanis, R. Mapp, D. Megginson, G. Schmid, M.R. Markovic, M.A. Omolaja, and D. Clutterbuck have addressed these topics in their scientific work.

While acknowledging the value of existing research, it should be noted that the formation and utilization of human resources in Azerbaijan's industrial sector has not previously been studied as a distinct or comprehensive topic.

This confirms the relevance of the issue and justifies the selection of the research topic, including its objectives and tasks.

Research Objectives and Tasks. The objective is to determine the prospects for forming and using human resources in

industrial enterprises in Azerbaijan, considering modern characteristics, by summarizing theoretical and practical perspectives and developing scientifically grounded proposals and recommendations.

The research sets out the following tasks:

- To investigate the theoretical foundations of forming human resources in industrial enterprises;
- To identify development principles and criteria for human resources in industry;
- To study international experience in this field;
- To examine the current situation of human resources in Azerbaijan's industrial sector;
- To assess efficiency indicators of human resource utilization using appropriate methodological approaches;
- To identify problems and propose solutions related to human resources in industry;
- To offer proposals for improving the formation and use of industrial human resources in Azerbaijan.

Research Object and Subject. The object of the study is human resources in Azerbaijan's industrial enterprises. The subject is the theoretical, methodological, and practical issues in forming and efficiently using this potential.

The study utilizes Azerbaijani laws, presidential decrees and orders, Cabinet decisions, and other legal and regulatory documents.

Methods used include system analysis, economic-mathematical tools, logical generalization, statistical analysis, and synthesis.

Information Base. Data sources include the State Statistical Committee of Azerbaijan, UNIDO, the International Labour Organization, scientific journals, websites, and other printed and electronic publications.

Main Provisions Defended:

- Theoretical foundations of human resource formation and opportunities for applying international experience;
- Justification of difficulties and problems in efficient use of industrial human resources in Azerbaijan;

- Calculation of labor diversification indices;
- Justification for the need to develop statistical accounting based on international classifications for effective labor utilization.

Scientific Novelty:

- Revealing conceptual approaches to forming industrial human resources and identifying international applications;
- Evaluation of current Practices in Resource Deployment;
- Calculation and interpretation of diversification indices for industrial production and workforce;
- Application of Ogive and Entropy indices to measure workforce distribution across 30 sectors;
- Evaluation of Herfindahl-Hirschman Index for market competitiveness;
- Development of policy proposals for improving human resource management in industry.

Theoretical and Practical Significance. Findings contribute to regulating the formation and use of human resources in industry. The proposals may enhance competitiveness and be useful for government programs and projects, optimizing budget use for labor development.

Dissemination and Application of Results. Findings and proposals have been presented at national and international conferences and published in scientific seminars.

Published Materials. Six articles and five conference papers have been published in Azerbaijan and abroad.

Volume and Structure. The dissertation consists of an introduction, three chapters, conclusion, references, and appendices, totaling 295508 characters. The breakdown: Introduction – 16471 characters; Chapter I – 93463; Chapter II – 92604; Chapter III – 48454; Conclusion – 10955. It includes 9 diagrams, 35 tables, 9 graphs, and 2 charts. Excluding these elements and the list of references, the main body of the work consists of 217,685 characters.

Introduction

CHAPTER I. SCIENTIFIC-THEORETICAL FOUNDATIONS AND PRINCIPLES OF FORMING HUMAN RESOURCE POTENTIAL

1.1. Theoretical foundations of forming human resource potential in industrial enterprises

1.2. Principles and criteria for the development of human resource potential in industrial enterprises

1.3. International experience in the formation and development of human resource potential in industrial enterprises

CHAPTER II. ANALYSIS AND EVALUATION OF THE CURRENT STATE OF FORMATION AND UTILIZATION OF HUMAN RESOURCE POTENTIAL IN AZERBAIJAN'S INDUSTRIAL ENTERPRISES

2.1. Analysis and evaluation of the current state of human resource potential in industrial enterprises

2.2. Analysis of the efficient utilization of human resource potential in industrial enterprises

2.3. Existing pressing issues in the utilization of human resource potential in industrial enterprises

2.4. Econometric evaluation of the dependency between industrial output volume and the number of wage employees in the industry in Azerbaijan

CHAPTER III. WAYS TO INCREASE THE EFFICIENCY OF UTILIZATION OF HUMAN RESOURCE POTENTIAL IN AZERBAIJAN'S INDUSTRY

3.1. Directions for improving human resource potential in industrial enterprises

3.2. Enhancing the efficiency of human resource policy for improving human resource potential in the industry

Conclusion and Recommendations

List of References

MAIN CONTENT OF THE DISSERTATION

In the introduction of the dissertation, the relevance of the topic is substantiated, the level of study of the problem is described, the purpose and objectives of the research, as well as its object and subject, are specified. Furthermore, the scientific novelty, practical significance, and approbation of the study are discussed.

In the first chapter of the dissertation titled *"Scientific-Theoretical Foundations and Principles of Forming Human Resource Potential"*, the theoretical foundations of forming human resource potential in industrial enterprises are examined, the principles and criteria for the development of human resource potential in industrial enterprises are presented, and international experience in the formation and development of human resource potential in modern industrial enterprises is analyzed.

The chapter begins by emphasizing that in the modern era, the primary goal of industrial enterprises is to increase their income by producing competitive products and services in both international and domestic markets. One of the key conditions for achieving this goal is having a high-quality human resource potential. The experience of leading industrial companies shows that success is fundamentally rooted in the possession of quality human resources. Skilled personnel ensure the penetration of innovative processes into all areas and structures of production, contributing to the desired level of economic progress. It is not coincidental that today, only 25% of the value of a successful global company is attributed to tangible assets, while the remaining 75% comprises intangible assets. As American economist P. Krugman notes, the qualification level, energy, and determination of the workforce is a country's second advantage in natural socio-economic development. Therefore, the saying "personnel decides everything" is not accidental.

Industrial enterprises strive to maximize their profits by producing competitive products in global and local markets. Achieving this strategic goal is primarily based on a high-quality and efficient human resource potential.

Firstly, efficiency is defined as the final output of production

in relation to the costs incurred to achieve that result, characterizing the return of each monetary unit. In general, production efficiency requires the effective use of all economic factors and the consistent reduction of expenses.

Global experience confirms that evaluating the workforce based on factors such as attitude toward work, experience, competence, etc., is essential for both management and mobilization purposes. In this context, the evaluation of personnel and staff is crucial. Studies identify five key elements of staff evaluation: work experience, education level, level of professional training, physical attributes, and personal qualities of the personnel.

The structure of an enterprise's human resource potential necessitates its evaluation. Methodologically, the assessment of human resource potential can be conducted using several approaches. Four main methods are particularly noteworthy:

1. Quantitative indicators-based assessment, which focuses solely on measurable indicators (e.g., number of labor resources, working hours, etc.);
2. Comprehensive assessment, which evaluates both quantitative and qualitative indicators within a systemic framework;
3. Integral indicators-based assessment, which evaluates cumulative indicators of quantitative and qualitative components through integral indicators;
4. Value-based assessment, which determines various operations in monetary terms.

The rapid progress of scientific and technological advancement and the development of high-tech industries highlight the increasing importance of intellectual and potential values of individuals. From this perspective, when studying the theoretical foundations of human resource potential in industrial enterprises, it is evident that foreign scholars focus on two main factors:

- The formation of human resources;
- The utilization of human resources.

Typically, the formation of human resource potential in society implies the preparation of the unemployed population for labor activity. In other words, the formation of human resources refers to the

development of the actual potential of human labor, knowledge, and skills that encompass every individual in society. At the same time, various demographic, professional, social, psychophysiological, ideological, political, ethical, and other characteristics must be considered in forming human resource potential. The key lies in balancing the professional attributes of employees with the demands of a dynamically developing socio-economic environment. In modern conditions, the utilization of human resource potential involves the realization of labor and professional abilities of each worker, labor collective, and society as a whole. Effective utilization, in turn, requires accurate identification and implementation of each employee's abilities, which encourages professional growth and ultimately benefits society.

Since identifying the development principles and criteria for human resource potential in industrial enterprises is directly linked to the human factor, one must first consider the base elements such as health and psychological state, as well as the quantitative and qualitative components of the workforce. Therefore, it is advisable to approach human resource potential from this perspective. In general, any proposed principles and criteria for the development of human resource potential are effective only if they contribute to the enhancement of human resource development in the enterprise and lead to the following outcomes:

- Integration of human resource development processes into a quality management system;
- Recognition of human resource management as a priority area for investment;
- Expansion of the boundaries of human resource management;
- Establishment of functional linkages between human resource processes and other enterprise processes.

The scientific concept of human resource management was fully formed in the 1980s. This concept enriched management practices with progressive methods and began to evaluate personnel as a core resource and social value in an innovation-driven technological environment. It recognized employees not merely as labor power but

as participants in a three-fold interaction:

- As a labor function,
- As a component of social relations,
- As a personality.

In Japan, the main determinant of an enterprise's reputation is not its share price or profitability, but rather its legal status, market share, philosophy and culture of corporate governance, and stock exchange membership. These factors ensure access to potential financial resources and attract high-potential personnel. Japanese experience demonstrates that the main goal in developing human resource potential is not to achieve quick profits or high economic results, but to build a strong corporate image, which eventually leads to economic benefits.

In the U.S., personnel are managed according to a "manager-employee" model. The features of the American enterprise management system can be summarized as follows:

- Employees are considered the main source of productivity growth;
- Employees are granted certain powers;
- Selection criteria include education, practical experience, psychological compatibility, and teamwork ability, with special attention given to specific professional specializations such as managers, engineers, and scientists.

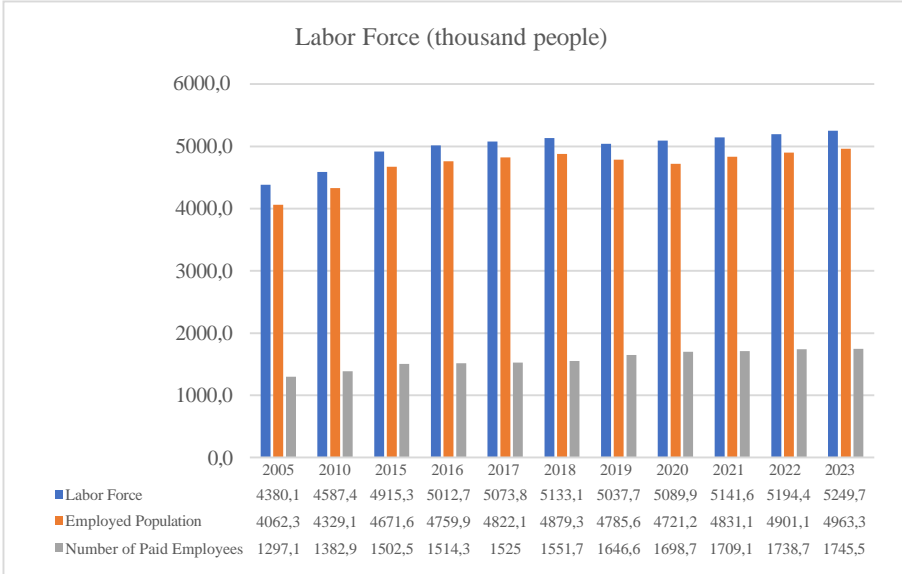
In U.S. industrial enterprises, the human resources department is a major unit. Typically, one of the company's vice presidents is responsible for human resources.

The second chapter of the dissertation is titled "*Analysis and Evaluation of the Current State of Formation and Utilization of Human Resource Potential in Azerbaijan's Industrial Enterprises.*" This section provides a comprehensive analysis and evaluation of the current use of human resource potential in industrial enterprises, studies the specific features of effective utilization, and consistently investigates the existing pressing issues related to the use of human resource potential in industrial enterprises.

When referring to human resource potential in industrial enterprises, it is more reasonable, in our opinion, to approach it from

two aspects: first, in terms of personnel, and second, in terms of human resource reserves or potential. In general, when discussing personnel, one must consider the number of employed individuals, economically active and employed populations, and the number of wage workers in the country. From this perspective, let us examine the following dynamics:

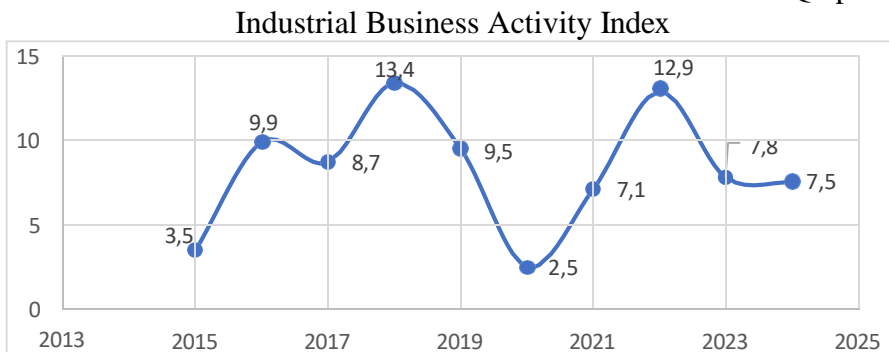
Diagram 1



Analyses indicate that in 2023, the number of economically active population increased by 55,000 people or 1.05% compared to 2022, the number of employed population rose by 62,000 people or 1.25%, and the number of wage earners grew by 7,000 people or 0.4%.

For an extended period, indices such as consumer and business confidence have been utilized globally to assess economic activity from both consumer and business perspectives. Recognizing their importance, the Central Bank of Azerbaijan has been calculating business activity indices for the real sector of the economy since 2015. In this context, examining the business activity index within the country's industrial sector is particularly insightful.

Graph 1.



Mənbə: <https://www.cbar.az/page-41/macroeconomic-indicators#page-2>

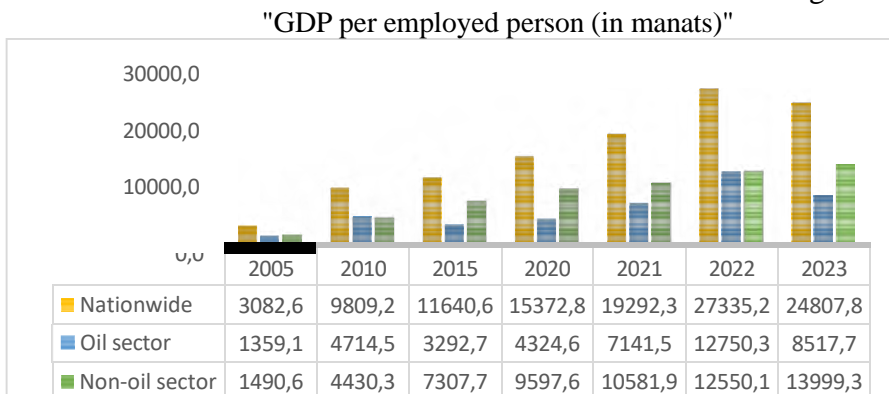
Compiled by the author based on available data.

Note: The annual figures are based on the arithmetic average of monthly indicators.

One of the key indicators characterizing the productivity of the employed population in the country is the GDP per employed person and the non-oil GDP per employed person.

As illustrated in Diagram 2, until 2022, the dynamics of the GDP produced in the country followed a growth trend. However, in comparison to 2022, the total GDP produced in 2023 decreased by a factor of 1.1, reaching 24,807.8 manats per employed person. In contrast, non-oil GDP increased by a factor of 1.1, amounting to 13,999.3 manats per employed person.

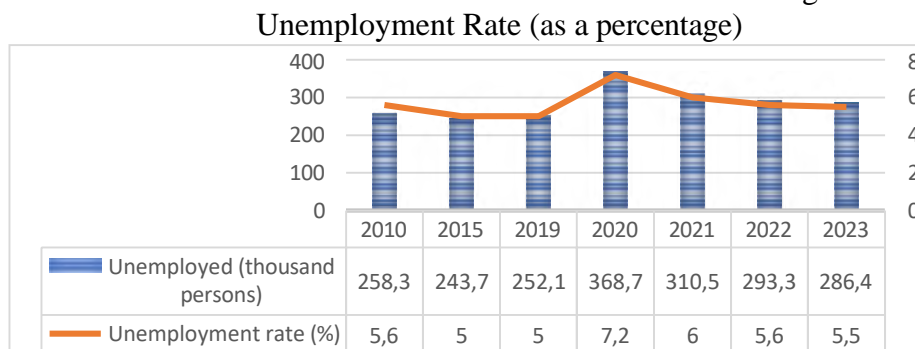
Diagram 2



<https://stat.gov.az/source/labour/> və https://stat.gov.az/source/system_nat_accounts/

In the first chapter, it was demonstrated that an unemployment rate exceeding 15% in any country leads not only to material losses but also to various undesirable social consequences. At the same time, the level of unemployment fosters competition in the labor market and contributes to the formation of an efficient human resource potential. From this perspective, it is of particular interest to examine the level of unemployment in Azerbaijan.

Diagram 3.



<https://stat.gov.az/source/labour/>

It should be noted that the rapid development of industrialization worldwide has significantly impacted numerous economic indicators. Specifically, the fact that industry accounts for more than 40% of the added value generated in the economy and of global energy consumption indicates the continuous creation of new jobs in the industrial sector.

It is well known that various methodologies are used to assess the degree of diversification among employed persons in a country's economy and specifically in the industrial sector. Two such methods are the Ogive Index and the Entropy Index, which serve as indicators of sectoral variety, diversity, and quality.

The Ogive Index is calculated using the following formula:

$$Ogive\ index = \sum_{i=0}^n \frac{(S_i - \frac{1}{N})^2}{1/N}$$

Where: N- represents the number of sectors (industrial

branches) operating in the industry; S_i - denotes the share of the i -th industrial sector in total industry employment.

The essence of the Ogive Index lies in the interpretation of its value: if the coefficient is equal to zero, this indicates that the sector being analyzed is ideally diversified. The greater the coefficient deviates from zero, the lower the level of diversification.

Another metric used to characterize specialization and diversification in industry is the Entropy Index, calculated using the following formula:

$$Entropy\ index = \sum_{i=0}^n S_iLn(\frac{1}{S_i}) = - \sum_{i=0}^n S_iLn(S_i)$$

Where: N - is the number of industrial sectors; S_i - is the share of the i -th sector in the total industry; Ln - represents the natural logarithm.

The Entropy Index is applied to measure the level of diversification in terms of income or employment within a given sector. The higher the index value, the more diversified and balanced the sector is considered to be.

Table 1.

Ogive Index Coefficients									
Ogive index	2015	2016	2017	2018	2019	2020	2021	2022	2023
	1.39	1.55	1.47	1.41	1.66	1.03	1.44	1.42	1.54

As can be observed, the results of the Ogive Index calculated for 30 sectors of the national industry during the period 2015–2023 indicate that employment diversification within the country’s industrial sector remains at a low level.

Table 2.

Entropy Index Coefficients									
Entropy index	2015	2016	2017	2018	2019	2020	2021	2022	2023
	1.13	2.86	3.96	5.65	3.58	4.73	5.69	5.41	5.25

The coefficients of the Entropy Index indicate that diversification across industrial sectors does not correspond to wages.

Observations confirm that in various developed countries, efficient utilization of human (cadre) potential in industrial enterprises, along with the rational delimitation of state regulation, yields more effective outcomes for overall economic development. Therefore, one of the commonly applied approaches in developed economies to set macroeconomic targets is the use of mathematical modeling methods. More precisely, this involves constructing models of demand and supply for human resources in industrial enterprises.

In Azerbaijan, building models of demand and supply for human resources in industrial enterprises, studying the interactions among relevant parameters, and determining the interdependence levels of various—sometimes contradictory—factors are of particular importance. The specificity of human resources is largely determined by the characteristics of the commodity they represent. The demand for labor concerns not the labor itself, but the services it provides, which depend on various quantitative and qualitative factors (e.g., the worker's level of professional training, specialization, integrity, experience, etc.).

The purchase and sale of labor services manifest in the form of paid employment under certain conditions (length of the working day, wage level, job responsibilities, etc.). When hiring a worker, the employer (whether public or private) acquires the right to utilize the labor service, not the laborer themselves, who remains the proprietor of their own labor. As in all other resource or factor markets, the demand for human resources in industry is a derived demand, determined by the demand for the goods produced using this factor.

In this regard, the following features are predetermined:

- Firstly, the long-term nature of the relationship between buyer and seller in this market;
- Secondly, the significant role of non-monetary factors (e.g., job complexity and prestige, working conditions, job security, and opportunities for professional development);
- Thirdly, the considerable influence of various institutional structures (e.g., trade unions, labor legislation, state employment and vocational training policies, employers' associations) on human resources.

The price of labor services in the industrial sector is determined by supply and demand. Initially, let us consider human resources as a segment of the labor market and analyze it under conditions of perfect competition.

In the labor market, the state and private sectors function as demand-side entities for human resources, while households serve as suppliers. In a perfectly competitive market, the number of employees hired by entrepreneurs is determined by two factors:

- The prevailing wage level;
- The monetary value of the final product.

As the number of wage workers employed in the industrial sector increases, the marginal product of labor decreases, in accordance with the law of diminishing returns. Hiring an additional unit of labor continues until the marginal product of labor (in monetary terms) equals the wage rate. Thus, the volume of labor demand is inversely proportional to the level of wages. If wages increase while other factors remain constant, the employer should reduce labor usage to maintain equilibrium.

The total labor supply in the industrial sector depends on multiple factors that determine the quantity and quality of the labor services offered. Among the most important are the total population, the number of economically active individuals, the average duration of the working day, and the level of vocational and professional training of workers.

The demand model for labor in the country's industrial sector shows a compliance rate of only 39.2%, meaning 60.8% is attributable to unaccounted-for factors an alarmingly high figure. The inadequacy of the model can be attributed to several issues: the absence of detailed labor market data as seen in developed countries; inconsistencies in indicators related to labor demand in the national industrial sector; significantly distorted employment figures in official statistics; and officially reported wage levels that diverge substantially from reality.

As in Western countries, the model for labor demand in the industrial sector cannot be considered ideal or standard. Overall, although the labor demand model aligns with the retrospective reality provided by official statistics, it relies on data with high margins of

error, making it unreliable for accurately reflecting the actual situation. Consequently, building a corresponding labor supply model is not justified.

To assess the current state of human (cadre) potential in industrial enterprises, let us consider the results of the diversification coefficient calculated based on industrial output and workforce.

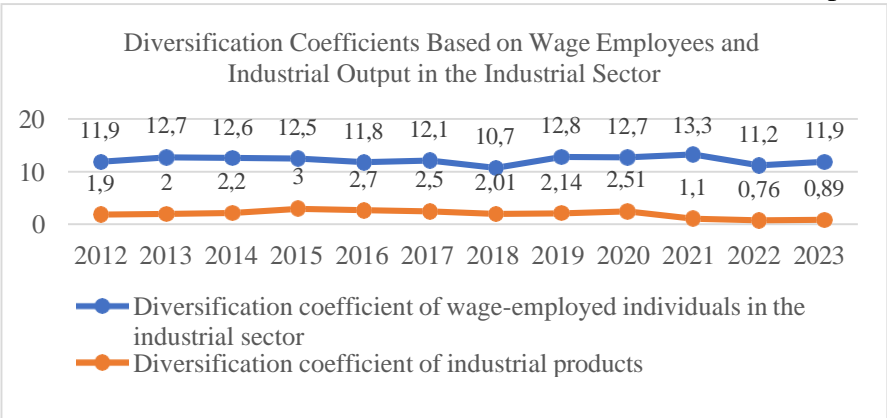
Table 3.

Diversification Coefficients Based on Wage Employees and Industrial Output in the Industrial Sector

Indicators	years	2015	2016	2017	2018	2019	2020	2021	2022	2003
Diversification coefficient of wage-employed individuals in the industrial sector	$D \square \frac{n+1}{2}$	12.5<15.5	11.8<15.5	12.1<15.5	10.7<15.5	12.8<15.5	12.7 < 15.5	13.3 < 15.5	12.2< 15.5	11.9< 15.5
Diversification coefficient of industrial products	$D \square \frac{n+1}{2}$	3.0 < 15.5	2.7 < 15.5	2.5 < 15.5	2.01 < 15.5	2.14 < 15.5	2.51 < 15.5	1.1 < 15.5	0.76< 15.5	0.89< 15.5

Research indicates that the distribution balance of the employed population across the 30 existing industrial sectors in the country is unsatisfactory. It is believed that the main reason for this is the low level of the diversification coefficient across industrial sectors. This can also be demonstrated by calculating the diversification coefficient of the products produced by each industrial sector.

Graph 2.



We believe that the main instruments for the formation of human resource (cadre) potential in industry, agriculture, and across all sectors of the economy are: the national employment classification system, the system of occupational standards, sectoral associations or professional unions, and higher education standards. The driving force behind the activation, development, and refinement of these systems must be a competitive environment. From this perspective, it is more logical to analyze human resource issues in industrial enterprises through the lens of the aforementioned factors.

In developed countries, labor markets attempt to precisely quantify the annual demand for engineers, doctors, economists, and other specialized professionals. Based on this demand, governments regulate university admission plans. This process necessitates the establishment and operation of interconnected institutional mechanisms, thereby creating a systematic and continuous link between the higher education sector and economic development.

Regrettably, such an approach is not implemented in our country. Consequently, this approach is not applied in industrial enterprises or in any sector of the economy, which poses a critical challenge for the effective use of human resource potential. Despite the importance of identifying workforce demand at the macroeconomic level — not only for industry but for the entire economy — a specific approach has yet to be established.

Another pressing issue concerning the efficient use of human resources in industrial enterprises is the absence of a comprehensive statistical information base that reflects detailed data on demand for relevant occupations and specialties. This is one of the essential factors that determines the effectiveness of workforce training.

It is worth noting that there is an international standard called ISCO-88 (International Standard Classification of Occupations), developed by the International Labour Organization (ILO, Geneva), which classifies employment across all economic sectors. Unlike the “Classification of Types of Economic Activity” methodology, ISCO-88 provides employment statistics by specific occupations and professions (including unskilled work), rather than by broad sectors like industry or commerce. As a result, developed countries often

distinguish between skilled and unskilled labor in their classifications.

In Azerbaijan, employment statistics are currently collected based on the "Classification of Types of Economic Activity" methodology. However, the State Statistics Committee has developed a national employment classification based on ISCO-88 in agreement with relevant government agencies, and certain steps have been taken in this direction. In the 2009 and 2023 population censuses, survey questionnaires included relevant questions based on the ISCO-88 methodology to gather data on occupations and professions in the labor market. Despite these steps, a fully formed statistical database based on ISCO-88 for the labor market has yet to be established. This can be observed in the labor market statistics. For example, in the statistical reports of many countries' State Statistics Committees, employment is classified under categories such as managers, professionals, service workers, and laborers — all aligned with ISCO-88. This classification is also present in the statistics of neighboring countries. However, such statistical information is not readily available in Azerbaijan.

To increase both the volume and quality of production in industry, it is not sufficient to rely solely on mechanization, automation, or other technological tools. It is equally necessary to develop the capabilities of the productive forces that operate these tools. This reveals the need for fundamental changes in the content of labor to ensure qualitative social change.

Today, in developed countries, the share of manual labor in industrial production has been reduced to 10–15%, which reflects significant shifts in the nature of labor under conditions of scientific and technological progress. As a result, the education and vocational training systems are faced with increasingly stringent demands. In other words, the modern requirements of technological development impose new demands on workers' qualifications and skills, necessitating the creation of a lifelong learning system.

The increasing use of various types of technology has greatly expanded opportunities for mechanization and automation, bringing about substantial qualitative changes in production technologies, organizational structures, and working conditions. However, existing

statistics fail to clarify in which sectors workforce training has taken place or where training is still needed.

Table 4.

Vocational Training of Personnel (number of individuals)

Years	2015	2016	2017	2018	2019	2020	2021	2022	2023	Dynamics of change
Those who have undergone vocational training - total	7453	4815	4502	5629	5130	3478	3713	5372	3413	-50.6%
Of which:	4029	681	1180	804	1228	640	795	601	606	-77.4%
Retrained	3888	11147	7102	3302	4356	1835	2767	3781	4836	16.9%
Increased their qualifications	11341	15962	11604	8931	9486	5313	6480	9153	8249	-25.3%
Of the total number of employees who have undergone vocational training and improved their qualifications, they received education:	4164	7324	2117	2847	1834	2595	2098	2715	2484	-39.3%
Directly	33	28	119	44	209	18	14	100	84	71.4%
At the enterprise	4002	1344	3838	1437	1975	594	997	1019	973	-42.6%
In a foreign country	218	607	441	694	646	320	479	399	316	267.4%
In educational institutions	2924	6659	5089	3909	4822	1786	2892	4920	4392	-3.8%
In advanced training institutes	440	751	488	1012	1554	423	672	548	422	-36.5%

In our opinion, such a situation requires the effective use of vocational training standards. It should be noted that vocational standards are regulated by the decision of the Cabinet of Ministers of the Republic of Azerbaijan dated April 18, 2018, within the framework of the Law “On Vocational Education.” We believe that aligning vocational training with the requirements of the country’s socio-economic development system would be appropriate. To achieve this, the creation of institutional mechanisms and corresponding professional associations would be of great importance.

We believe that vocational training should not be limited to formal, theory-heavy approaches detached from practical experience, nor should it rely solely on the opinions of a few experts. Rather, a

more comprehensive and practice-oriented framework is necessary.

Another pressing issue related to the efficient use of human resources in industrial enterprises is the scientific and technical potential that serves the development of industry. It is worth recalling that in 1991, Azerbaijan had 151 scientific organizations, including 882 laboratories, 178 design units, and 38 pilot-experimental divisions operating within industrial production associations and enterprises. These institutions employed more than 12,000 people.

At that time, 17 sectoral research institutes, their branches and departments, 7 academic institutes, and 14 project-design organizations provided services to the country's industry.

Table 5.

Distribution of Organizations Conducting Research and
Development by Sector

Years	2015	2016	2017	2018	2019	2020	2021	2022	2023	Dynamics of change
Total	141	135	137	133	132	127	134	131	134	-7.6%
public sector	91	88	89	88	88	86	90	86	88	-5.4%
enterprise sector	11	9	9	6	5	4	7	6	3	-72.7%
higher education sector	39	38	39	39	39	37	37	39	43	4.9%

During the analyzed period, the number of organizations conducting research and development decreased by 11, or 7.6%. At the same time, a noticeable decline in the share of the private sector in this area was observed.

The third chapter of the dissertation is titled “Ways to Increase the Efficiency of Using Human Resource Potential in Azerbaijan’s Industry.” This chapter identifies the directions for improving the human resource potential in industrial enterprises.

In a global context where innovative approaches are increasingly adopted, we believe the approach to addressing personnel issues in the country's industrial enterprises needs to be updated. Today, the development of the national industry is not limited to solving personnel issues alone. Addressing this issue requires not only reforms in education but also a comprehensive renewal of the

country's industrial sector. In our view, the transition of the national industry to an innovative development path is closely linked to the resolution of two key problems:

- First, the renewal of industrial production in the country and the reconstruction of its material and technical base according to modern standards;

- Second, the solution of personnel-related issues.

To address the first issue, a new industrial policy must be developed, setting clear and concrete targets. This includes restructuring the industrial sector based on its current state and development level, ensuring the creation of new industrial branches, and ultimately achieving comprehensive industrial advancement.

In terms of improving the human resource potential in industrial enterprises, the second direction involves the education system, which is regarded as the foundation of human capital development. The education system not only serves as a driving force for societal progress but also contributes to socio-cultural and economic development and personal growth. It enhances individuals' abilities to influence their environment, promotes the acquisition of new knowledge, and provides practical support for achieving sustained professional development.

Based on these considerations, we propose that the improvement of human resources for industrial enterprises within the education system be structured around three main directions:

1. Aligning the structure of higher education human capital development with the country's socio-economic development requirements;

2. Improving the structure of vocational-technical education and establishing sectoral associations in this area;

3. Establishing mechanisms and institutional systems to align human resource development with labor market demands.

To ensure alignment between the structure of human resource development in higher education and the demands of the labor market, the Ministry of Education should first revise existing educational standards based on international principles and requirements for the relevant fields. More specifically, it is essential to determine the

appropriate level and content of curricula required for the industrial sector and other branches of the economy.

The experiences of developed countries such as Germany, France, Japan, and Turkey show that dynamic national development is impossible without the training of skilled professionals capable of mastering new technologies in various fields. In these countries, and in global practice generally, 40–60% of secondary school graduates continue their education in technical and vocational schools. Unfortunately, despite a clear demand in our country, only a small proportion of graduates pursue vocational-technical education.

In today's context—where the nature and content of labor are evolving—the increasing mechanization and automation of production processes has led to a reduction in physically demanding labor. This shift alters the ratio between manual labor and machine-operated work. The decline in unskilled labor further influences the development of the vocational education system.

Progressive experience confirms that the vocational education system must be diversified, flexible, accessible to all social groups, and operate in close collaboration with employers.

The lack of highly qualified engineers and skilled workers, as well as their aging demographic, makes it impossible to produce goods at the best international scientific and technical standards, or to carry out design and development work effectively. To address this issue and enhance human capital in the industrial sector, it is necessary to implement several measures in the following areas:

1. Increasing the attractiveness of technical specializations in both secondary and higher education, as well as in production.
2. Enhancing the prestige and appeal of technical professions.
3. Establishing in-house institutions within enterprises that provide employees, especially young specialists, with the infrastructure (productional, legal, financial, and organizational) needed to implement their own business projects.
4. Creating corporate educational systems that offer youth the opportunity to first acquire a profession, then continue their education at secondary and higher technical institutions, eventually qualifying for engineering roles.

In our view, within the framework of the modern 'knowledge economy,' it is more appropriate to transform every industrial enterprise into a research and production center. Intellectual activity and the generation of new knowledge and information must be treated as independently valuable as industrial activity itself. Intellectual products created by specialists should be granted intellectual property status and provide economic returns.

In this direction, the implementation of a scientific certification system in enterprises—enabling employees to prepare and defend their candidate and doctoral dissertations—is advisable. Such an approach would not only ensure the necessary quantitative characteristics of human resources but also increase the prestige and quality of engineering work.

The quality of human resource potential in industrial enterprises can be evaluated using the following indicators: age, educational level, professional experience, and existing knowledge and skills. Observations confirm that the most important feature of an employee's or group's human resource quality is the level of development of individual or group intelligence. Furthermore, intelligence should be considered not only as the capacity to solve tasks, but also as the combination of social-emotional interaction skills and practical management abilities in the economic space. This requires a systemic approach.

We suggest using two criteria for developing the qualitative characteristics of workforce human capital:

1. **Technological** – increasing human capital through the use of modern technical and technological tools, which raises the degree of technical equipment, or "capital intensity," of the workforce;
2. **Socio-psychological** – developing, regulating, and enhancing the intellectual capabilities of workers through social and psychological methods.

Thus, improving the effectiveness of human resource policies aimed at enhancing the human capital of industrial enterprises in our country requires the integration of both technological and socio-psychological approaches.

Conclusion

A number of conclusions have been drawn and practical proposals have been put forward in the research on the topic. Some of them are listed below:

1. Currently, in the global arena, 70-75% of the value of any successful company is comprised of its workforce or human resources. The qualification level, energy, and determination of these employees are considered the second most important advantage in a country's natural socio-economic development.

2. It has been revealed that within the structure of human resource potential, special importance is attached to leadership, creativity, connectivity, demanding nature, the ability to work in a team, worldview, aptitude, and physical and mental health.

3. During the research, it was determined that under market economy conditions, the main development priority of Azerbaijan's production-economic complex is the comprehensive modernization of industry. This includes the structural reconstruction of sectors and fields to adapt to changing internal and external economic development conditions.

4. It is known that the employment of personnel depends on the creation of new jobs. The development of programs aimed at creating new jobs must be based primarily on a flexible information system. For the formation of such information support, the statistical accounting of job movement in economic entities with various ownership forms must be improved. At the same time, all this should be realized through continuous monitoring of the labor and social relations sphere.

5. In a market economy, it is essential to enhance people's motivation and, in this regard, to develop the competitiveness of employees, especially skilled personnel.

6. Attention should be increased toward the creation of vocational training centers in the regions, as well as the establishment of labor exchanges that ensure temporary employment for job seekers and unemployed citizens, and which operate on a continuous basis.

7. Efficient utilization of human resources is highly dependent on the diversification of the country's economic sectors. That is, in

industrial enterprises, the current state of human resource potential has been evaluated by calculating the diversification coefficient, Ogive index, and Entropy index.

8. Without highly qualified personnel, it is impossible to achieve the production of industrial goods that meet international standards and are competitive.

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1. Aliyeva Kh.H. "Correct selection of methods for managing human resource potential in enterprise development." Azerbaijan Technical University, Republican Scientific Conference dedicated to the 80th anniversary of Azerbaijan's prominent economist, Doctor of Economic Sciences, Professor, and State Prize Laureate Shamil Aliabas oglu Samedzade, on the topic "Expansion of innovation activity in the non-oil sector of Azerbaijan," Baku, March 10, 2016, pp. 255–258.

2. Aliyeva Kh.H. "Improvement of human resource potential in industrial enterprises." Republican International Scientific-Practical Conference of the Ministry of Labor and Social Protection of the Population of the Republic of Azerbaijan, Scientific-Research and Training Center on Labor and Social Problems, Baku, October 2017.

3. Aliyeva Kh.H. "Theoretical foundations of forming human resource potential in industrial enterprises." Institute of Economics of ANAS, Journal of Scientific Works, Baku, 2019, pp. 63–72.

4. Aliyeva Kh.H. "Principles and criteria for the development of human resource potential in industrial enterprises." AzMIU, Scientific-Practical Journal "Construction Economics and Management," No. 3(8), Baku, 2019, pp. 138–146.

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