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# DEVELOPMENT OF INTELLECTUAL CAPITAL IN THE ERA OF AUTOMATION AND ARTIFICIAL INTELLIGENCE

**The article analyses the rapid development of intellectual capital and its impact on the creation of new opportunities in all spheres of social and economic development. The human factor remains key, because even in an automated environment, the role of highly qualified workers remains indispensable. Fundamental changes in the labour market, such as automation, robotics and the introduction of artificial intelligence, are transforming companies and changing employee expectations. HR departments face new challenges that require innovative solutions in the fight for talent. The pace of these changes is accelerating as competition intensifies. The development of intellectual capital is influenced by several dynamic factors, including technological progress, demographic changes, resource scarcity and climate change, changes in the economic and social environment, and rapid urbanization. Technological innovations, automation and artificial intelligence are significantly transforming the labour market, increasing productivity and living standards. However, they also pose a threat to social stability due to the uneven distribution of economic benefits. The article analyses four potential scenarios for the development of the labour market and intellectual capital: a red world, a blue world, a green world, and a yellow world. Each scenario offers different approaches to innovation, corporations, public consciousness and social security. These scenarios illustrate how intellectual capital, technology and people can interact in the future to achieve economic and social progress.**

***Keywords:*** Intellectual capital; labour market; technological progress; AI.

**Formulation of the problem.** Intellectual capital is rapidly evolving, creating new opportunities across all spheres of socio-economic development. At its core, it always involves people. Today, even automated environments cannot function without human participation, especially highly skilled workers. Fundamental changes are occurring in the labour market. Automation, robotics, and artificial intelligence are transforming companies beyond recognition. Similarly, company expectations of employees are drastically changing. These shifts present new challenges for HR departments, pushing them towards unexpected solutions and requiring them to operate under unprecedented risks. The pace of these changes, along with the intensity of competition for talent, is increasing. Meanwhile, the meanings of «talent» and «valuable employee» are often elusive: skills valued five years ago may no longer be in demand today; the exact list of tomorrow's necessary skills, knowledge, and roles is unknown.

**Analysis of recent research and publications.** Current research on intellectual capital underscores its pivotal role in the evolving socio-economic landscape. PwC's «Workforce of the Future» report [1] outlines four scenarios for future labor markets, emphasizing the impact of automation, AI, and demographic shifts. The study explores how these factors reshape company structures, employee expectations, and HR strategies, highlighting the increasing competition for talent and the need for continuous skill development in an automated world. A study by Mansoor, Jahan, and Riaz [2] examined the relationship between green intellectual capital and environmental performance, emphasizing the mediating role of green human resource management. This research underscores the importance of green human and relational capital in enhancing corporate environmental performance, suggesting that organizations focus on preserving and enhancing employee knowledge related to sustainability. The World Intellectual Property Report 2024 [3] explores the intersection of human innovation, economic diversification, and industrial policy. It emphasizes the need for countries to develop local innovation capabilities to sustain economic growth, documenting how various nations have leveraged innovation to diversify their economies and enhance technological capabilities (WIPO). Albertini et al. [4] examining how CEOs use discretionary accounting narratives to highlight the value creation from intellectual capital. This research details components of intellectual capital, including human, digital, customer, and environmental capital, and their roles in corporate value creation.

**Formulating the article goals.** The purpose of the article is to analyse and highlight the critical role of intellectual capital in the rapidly evolving socio-economic landscape. According to the purpose, the following tasks are proposed:

– identify key factors influencing the development of intellectual capital

– assess the impact of intellectual capital on corporate and environmental performance, particularly the role of green intellectual capital.

– outline potential future labour market scenarios and strategies for companies and employees to adapt.

**Outline of the main research material.** The development of intellectual capital is formed as a result of the complex influence of a number of variable factors. When it comes to the influence of numerous factors, a simple linear calculation will not do. Global trends are a powerful force that changes society, and with it the working environment. Changes in the balance of power in the economy entail a redistribution of power, material wealth, competitive advantages and opportunities throughout the world; breakthrough innovations, bold ideas, new business models and resource scarcity affect all areas of life. Globally, it is necessary to highlight 5 factors that will shape the future of intellectual capital (table 1).

Table 1

Factors Shaping the Future of Intellectual Capital

| Factor | Positive Impact | Negative Impact |
|---|---|---|
| **Technological Progress** | Increased productivity and efficiency | Threats to social stability |
| | Improved quality of life and longevity | Potential political and economic tensions |
| | Enhanced personal self-realization opportunities | Uneven distribution of economic benefits |
| **Demographic Shifts** | Increased focus on lifelong learning and skill development | Increased pressure on businesses, social institutions, and economies |
| | Potential for older workers to contribute valuable experience and knowledge | Higher pension and healthcare costs |
| | Opportunities for automation to address labour shortages | Risk of social instability due to labour shortages and automation |

Continuation of the table 1

| | | |
|---|---|---|
| **Resource Scarcity and Climate Change** | Creation of new jobs in alternative energy and sustainable technologies | Increased resource competition and potential conflicts |
| | Innovations in waste recycling and secondary resource utilization | Economic disruptions due to resource scarcity |
| | Enhanced focus on sustainability and environmental protection | Negative impacts of extreme weather and rising sea levels on communities and infrastructure |
| **Rapid Urbanization** | Economic growth driven by urban centres | Strain on urban infrastructure and resources |
| | Increased innovation and technological advancements in cities | Increased environmental pollution and challenges in waste management |
| | Opportunities for developing robust intellectual capital ecosystems | Potential rise in social inequality and housing shortages |

In addition, intellectual capital develops interdependently from four factors (table 2).

Table 2

Factors Shaping the Future of Intellectual Capital

| Factor | Charactertics |
|---|---|
| **Fragmentation** | Large companies are losing their dominant role as the size of the firm becomes less important to consumers, and scale increasingly becomes a burden for businesses. Social media groups and communities of like-minded individuals are experiencing a new boom, with most of them unable to imagine their lives without digital platforms |
| **Integration** | Companies are becoming larger and more influential. Multinational corporations (MNCs) have greater influence than individual countries. Large brands are entering all new areas of business |
| **Individualism** | The focus shifts to individual needs and an unlimited number of options to satisfy each consumer's demands |

Continuation of the table 2

| | |
|---|---|
| **Collectivism** | The common good is more important than personal interests. Collective responsibility for ecology, social welfare, and the principle of fairness prevail over individual interests |

Over the past five years, the significant impact of digital technologies and artificial intelligence on the labour market has become evident. Digital technologies are at the core of the production and supply chain, playing a crucial role in commercialization processes and office automation. However, while enhancing market prosperity, they gradually gain full control over the economy. Despite this, the spread of digital systems increases the threat of cyberattacks and large-scale manipulation in the digital environment. The way government organizations and private individuals manage information (through digital assistants, virtual interlocutors, and computer learning) becomes a decisive factor in the formation and development of intellectual capital.

Therefore, it is quite logical to highlight the pattern of artificial intelligence development:

1. Assisted Intelligence is widely used today, helping people and organizations solve everyday tasks. A simple example is the GPS navigation program.
2. Augmented Intelligence is becoming increasingly widespread, assisting people and organizations in performing tasks they cannot complete independently. For example, a ride-sharing system could not exist without the combination of various programs.
3. Autonomous Intelligence is a technology of the future, involving machines that will operate independently. An example is unmanned vehicles, especially in the military field.

The idea is forming that artificial intelligence can create a world where machines can help humans utilize unlimited possibilities by processing, analysing, and evaluating massive amounts of information, allowing people to engage in highly intellectual activities, creativity, and decision-making.

Therefore, considering these global trends, four development scenarios emerge: Yellow World: (Human at the Centre); Red World (Innovation Focus); Green World (Corporate Responsibility); Blue World (Corporate Dominance).

The first scenario is called the *Red World*, which is based on innovation. It forms a dynamic market of highly specialized professionals and entrepreneurs competing for the attention of individual consumers

and their influential groups. New products and business models emerge much faster than regulatory institutions can react. Businesses focused on a personalized approach to consumer's capture new niches. Flexibility and speed are paramount, leading to the rise of small individual enterprises and start-ups. Digital technologies connect employees with employers, capital with innovators, and consumers with suppliers.

In this competitive environment, large companies begin to decentralize, creating their own internal markets and networks, dismantling old hierarchical structures, and encouraging employees to generate new ideas. For personnel, specialization is key; careers are built on a combination of skills, experience, and contacts rather than employer or company requirements. Organizations with a few valuable employees focus on technology, supply chains, and intellectual property, rather than labour-intensive processes and physical assets.

The commercial value of education becomes crucial; specific skills and experience are considered more valuable than a university degree. Employees understand that the most in-demand skills command higher rewards. Most employees frequently change jobs and stay with a company only for the duration of a project. Technologies, innovations, and people are inseparable, with enterprise management relying on outsourcing and automation. Large organizations are in constant competition for valuable employees and intellectual property, using professional recruiters and artificial intelligence to attract the right specialists. Digital technologies facilitate connections between workers and employers, skills, and demand.

Old methods of assessing and analysing labour activity are rare. A small number of key employees with exceptional management skills receive the highest rewards. Like-minded employees stick together, using technology as a platform for innovation development. Innovations are created in high-risk environments. Overall, technologies, innovations, and people are inseparable in the Red World.

The second scenario is the *Blue World*, characterized by the rise of corporations. Large corporations take the stage, with consumer choice being paramount. A career in a corporation determines one's financial standing and social status. For multinational corporations (MNCs), cooperation with state governments on unprecedented "borderless" tax regimes for their employees is possible. However, the labour market is limited. Employers strive to retain the most valuable employees through rewards, but the practice of hiring temporary qualified employees as needed is also employed. Human capabilities, automation, analytics, and innovations are maximized to increase productivity. Human capabilities

are enhanced through various techniques, physical and medicinal interventions using various drugs and equipment. Employee productivity and health are continuously evaluated, monitored, and analysed. A new elite class of employees with super abilities emerges.

Employees with specialized skills are engaged on civil-law and fixed-term contracts. A real battle is waged for the most valuable employees, with the most qualified hiring personal agents to negotiate terms and manage their careers. Employers start hunting for "brains" at the earliest stages, establishing contacts with schools and hiring promising young talent. Employees at all levels actively manage their careers, honing their skills as soon as and whenever possible, including using methods to enhance human capabilities. Society is divided between those who have made a career in a corporation and those left behind in terms of financial benefits, healthcare offerings, and various bonuses.

The value of human capital, especially for employees in higher positions, is high. Organizations are forced to develop models and systems that allow employees and their agents to negotiate the price of human capital depending on individual investment strategies. Organizations begin to consider the enhancement of employees in the workplace.

Societal awareness gains a powerful impetus for development. Employees and consumers demonstrate loyalty to organizations that adhere to high moral standards of behaviour. Corporate responsibility becomes a mandatory condition for operation. Companies are presented as open structures for cooperation. Their primary goal is to respond to public opinion, the growing scarcity of natural resources, and stringent international legislation, forcing companies to strictly adhere to ethical and environmental standards. This trend shifts the focus to public consciousness, ecological responsibility, diversification, human rights, and fairness in the broadest sense, as well as recognizing the broad impact of business, which is not limited to the financial sphere.

In the *Green World* eemployees have the opportunity to work in a friendly, almost familial environment with flexible schedules and engage in socially significant projects. They are confident that the employer will fairly compensate their work, provide fair working conditions, and ensure opportunities for development, in return expecting loyalty to the corporate values and culture of the company. Employees share the high ethical principles of the companies, strictly adhering to standards. Their activities are evaluated based on a range of indicators, not just professional aspects. For example, analyses are conducted on how effectively they travel and use resources. The success of companies

directly depends on people, their behaviour, and their roles in society. There is full support for virtual social networks between employees of the organization and its clients for seamless communication. Personnel decisions are strictly regulated by controlling bodies, from quotas on diversification based on racial and gender grounds to mandatory well-being support (e.g., sleep clinics, digital diets, or limits on layoffs during economic downturns). Competition for valuable employees remains fierce. Financial incentives still play an important role. The compensation and benefits package is a tool for attracting and retaining employees.

Employees and employers in the *Yellow World* seek higher meaning in what they do, as it is a joint effort. The focus of public policy is on the fair distribution of benefits, resources, and privileges. This trend is accompanied by increased government intervention in business affairs. Employees successfully self-actualize, having the freedom of action up to autonomy, working in organizations with business reputations built on social and ethical aspects. Most companies adhere to the concept of "good work" and decent work; there is a departure from traditional "employer-employee" relationships. The active use of automation continues for performing functions inaccessible or dangerous for humans. For example, so-called invisible technologies, automating office work based on artificial intelligence, are widely used. Business leaders are responsible for managing and leading people. Employers resort to outsourcing organizations and automation to address personnel management issues. Professional communities help workers develop professionally, providing educational training, consulting, and other services. Digital platforms create a flexible environment, connecting employees with employers, qualifications with demand for them. Labour is not just an activity for achieving corporate goals; it is a socially enriched function of individuals aimed at achieving the common good.

The workforce of the future forms like-minded associations based on technological platforms. These associations exist as long as the project lasts or the idea is implemented. Intangible rewards have a clear material equivalent and are a subject of negotiation in salary discussions. The concept of «going to work» changes fundamentally. A 9-to-5 work schedule from Monday to Friday becomes rare, as the boundaries between work and home are blurred. In the yellow world, the brand and reputation of a company with an orientation to ethical norms are important. Organizations are evaluated according to the principles of reliability and honesty. Preference is given to relationships with governments and non-governmental organizations that are strictly regulated.

The basic scenarios indicated above indicate options for developing the qualifications of employees and the economy as a whole. We can only guess how the economy will develop, but it is unequivocally clear that automation is actively spreading in the world and moving into digital mode. It is becoming obvious that certain workplaces will become more efficient due to the use of automated robots. This shift towards automation and digitization is reshaping industries and labour markets, necessitating continuous skill development and adaptability among workers. Organizations must invest in training and upskilling their workforce to keep pace with technological advancements. The integration of artificial intelligence and machine learning is transforming traditional roles and creating new opportunities, requiring a dynamic approach to career development. As these technologies evolve, the importance of human creativity, critical thinking, and emotional intelligence will become more pronounced, highlighting the need for a balanced synergy between human and machine capabilities. This transformative era presents both challenges and opportunities, urging businesses and policymakers to collaboratively foster an environment that supports innovation, ethical practices, and inclusive growth.

**Conclusion.** Automation and digitization are key drivers reshaping the global economy and labour markets. The integration of advanced technologies, such as artificial intelligence and machine learning, is transforming traditional roles and creating new opportunities. As these technologies evolve, the emphasis on human creativity, critical thinking, and emotional intelligence becomes more pronounced. Organizations must invest in continuous training and upskilling to ensure their workforce remains competitive and adaptable. The future of work necessitates a collaborative approach between businesses, policymakers, and educational institutions to foster an environment that supports innovation, ethical practices, and inclusive growth. Balancing technological advancement with human-centric values will be crucial in navigating the complexities of the evolving socio-economic landscape. The analysis of the four scenarios – Red World, Blue World, Green World, and Yellow World – illustrates the diverse pathways through which the future of work and intellectual capital may evolve. Each scenario presents unique opportunities and challenges, reflecting different aspects of technological advancement, societal values, and economic structures. By embracing these diverse scenarios and proactively addressing the associated challenges, we can create a sustainable, equitable, and prosperous future for all.

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# РОЗВИТОК ІНТЕЛЕКТУАЛЬНОГО КАПІТАЛУ В ЕПОХУ АВТОМАТИЗАЦІЇ ТА ШТУЧНОГО ІНТЕЛЕКТУ

**У статті проаналізовано швидкий розвиток інтелектуального капіталу та його вплив на створення нових можливостей в усіх сферах соціально-економічного розвитку. Людський фактор залишається ключовим, оскільки навіть в автоматизованому середовищі роль висококваліфікованих працівників залишається незамінною. Фундаментальні зміни на ринку праці, такі як автоматизація, роботизація та впровадження штучного інтелекту, трансформують компанії та змінюють очікування працівників. Відділи кадрів стикаються з новими викликами, які вимагають інноваційних рішень у боротьбі за таланти. Темп цих змін прискорюється разом із загостренням конкуренції. На розвиток інтелектуального капіталу впливає кілька динамічних факторів, зокрема технологічний прогрес, демографічні зміни, дефіцит ресурсів і зміна клімату, зміни економічного та соціального середовища та швидка урбанізація. Технологічні інновації, автоматизація та штучний інтелект істотно трансформують ринок праці, підвищуючи продуктивність і рівень життя. Однак вони також становлять загрозу соціальній стабільності через нерівномірний розподіл економічних благ. У статті проаналізовано чотири потенційні сценарії розвитку ринку праці та інтелектуального капіталу: червоний світ, блакитний світ, зелений світ та жовтий світ. Кожен сценарій пропонує різні підходи до інновацій, корпорацій, суспільної свідомості та соціальної безпеки. Ці сценарії ілюструють, як інтелектуальний капітал, технології та люди можуть взаємодіяти в майбутньому для досягнення економічного та соціального прогресу.**

***Ключові слова:*** інтелектуальний капітал; ринок праці; технічний прогрес; ШІ.

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