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MILIA

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# Social and Economic Aspects of Education in Modern Society

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#### MANAGEMENT AND MARKETING

## UNDERSTANDING THE EXPECTATIONS OF YOUNG EMPLOYEES TOWARDS LEADERSHIP IN ORGANIZATIONS

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Abstract. The presented research explores the expectations of young employees to leadership and reveals their attitude towards leaders in organizations. The study elaborates on leadership styles, traits, and behaviors the new generation anticipates from the leaders. Additionally, the research analyzes the similarities and differences of male and female leaders in young workers' views. The research was based on a quantitative approach, and a survey method was used to gather primary data in Georgia. The study results emphasize the preferences of young employees towards leaders, which can be used by organizations to develop leadership styles accordingly, and attract and retain employees as a consequence.

Keywords. Leadership, Employee, Job satisfaction, Male leaders, Female leaders, Georgia.

**Introduction.** Leadership is a widely discussed topic in theory and practice. Effective leaders contribute to organizational success and financial performance. Leaders are influencing employee wellbeing and job satisfaction, which in turn positively stimulate labor productivity.

Research on leadership in Georgia does not yet paint a clear picture of the leaders' skills, traits, behaviors as well as gender differences the young generation of employees prefers. This study has been carried out to examine the expectations and attitudes of young employees to leadership in organizations in Georgia. This paper elaborates on leadership differences in male and female leaders in young workers' views and analyzes the skills and behaviors successful leaders must possess.

In this research, two general research questions are considered. Firstly, what expectations have the new generation who is entering the job market towards leaders and organizational leadership? To address this question, we studied the traits, skills, and behaviors a leader is expected to have. Second, do the young employees consider the difference in gender of a leader? To address this question, we consider whether they prefer male or female leaders in their organizations.

In the next sections, the theoretical background is presented with a review of the relevant literature. Then, research methods are explained and study results are provided, following the discussion and conclusions. Finally, future studies in this field are also discussed.

Literature Review. Leadership is still an extensively debated topic with various definitions, approaches, views, and methods (Leitão et al., 2021), as it has direct and indirect results to organizations and employees.

Traditionally, a leadership description centers behaviors and traits of leaders (Donkor & Sekyere, 2020). Bendell and Little (2015) define Leadership as a behavior to help people to achieve something significant, and the act of leadership involves an assumption about values and change theories. Individual traits, situational factors, and behavioral factors are equally important for a leader (Förster & Duchek, 2017).

The researchers confirm that leadership behavior and skills determine the trust of followers, and leadership depends on characteristics of a leader such as honesty, courage, commitment, and integrity (Chankova & Vasilev, 2020).

Furthermore, scholars argue that leadership styles influence organizational citizenship behavior, and while democratic leaders stimulate organizational citizenship behavior, autocratic leadership with its task-oriented nature cannot contribute to it (Malik et al., 2016).

The previous research has found out the relationship between innovation and performance, and that enhanced innovation increases performance (Leitão et al., 2021).

Given that leaders support employees and create favorable conditions, they promote innovation in organizations by developing human capital (Leitão et al., 2021). Especially, transformational leaders contribute to innovativeness, as they are flexible, open-minded, with strategic thinking, they motivate people and explore new ideas, which results in improved team performance and business profit (Leitão et al., 2021). The studies confirm that a leader's engagement in transformational behavior decreases employee stress and burnout (Diebig et al., 2017).

Moreover, leaders have an effect on the reputation and trust of a firm, which in turn affects the recruitment effectiveness, job satisfaction of employees, organizational commitment, and financial performance of an organization (Sajfert et al., 2017).

Provided that leadership impacts a corporate culture that as a result influences a firm's performance, leaders with the appropriate style and behavior can shape organizations' success (Kusdi, 2020). Leaders ensure that employees or team members have the same values, views, and perspectives, which induces corporate performance (Kusdi, 2020).

Leaders need social skills to interact with group members, to deal with people with responsibility (Galli, 2021). Communication composed of listening and speaking is one of the essential elements of leadership (Galli, 2021). Leaders devote their working hours to with interacting their teams through new communication technologies (Galli, 2021). But employees prefer face-to-face communication to the Internet tools or mobile phones (Kulshreshtha & Sharma, 2021).

Despite the favorable culture of men leaders and barriers, female leaders are rising in many countries, and organizations, as they are more collaborative, participative, and democratic in their leadership styles (Eagly, 2020).

**Research Methods.** The research was based on a quantitative approach, and a survey method was used to gather primary data in Georgia. The questionnaire included closed-ended questions such as dichotomous questions, multiple-choice questions, and 5-point Likert rating scale questions. The survey was conducted through the Internet. The questionnaire was distributed through Google Forms to the young people aged 18-25 years old, who have jobs and are entering the job market as new employees. In total, 84 young people participated in the survey. The results were analyzed through descriptive statistics in MS Excel and SPSS.

**Research Results.** The research found out the qualities and characteristics young employees expect from leaders (Figure 1). They prefer leaders who are ready to help (12%), and are agreeable (11%). Besides, they consider leaders to be a good example (11%) and communicate effectively (10%). Additionally, leaders should recognize the achievements of their employees (11%), create corporate culture (10%), and represent organizational vision and objectives (10%). They also make decisions (9%), set standards (8%), and achieve results (8%).



Fig. 1. What qualities and characteristics must a leader have in an organization? (Select all that apply). Note: The respondents could choose several answers from Multi-select Multiple Choice Questions. Multi-Select Multiple Choice Question, Does not add up to 100%

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Moreover, the vast majority of survey participants (n=71) believe that leaders should always support employees during job performance (Figure 2). None of them assume that leaders do not help workers, and only 12 of them think that leaders should sometimes assist employees.



Fig. 2. How often, do you think, an employee should get help from a leader during the work process?

The young employees respondent to the statements concerning their attitude towards male and female leaders, their education, traits, effectiveness, and how they perceive themselves as leaders (Figure 3). The respondents agree and strongly agree that a leader's sex does not play any role and neither men nor women are better leaders. Instead, innate traits, leadership skills, and education are most important for successful leaders. In addition, the respondents agree with the statements that they are leaders by positions (n=34), or they are still leaders in their organizations despite their official positions (n=29).



Fig. 3. Statements regarding Respondents Perception of Leaders Please indicate how strongly you agree or disagree with all the following statements which apply to you by selecting a number 1 - strongly disagree, 2 – disagree, 3- neutral, 4- agree and 5 -strongly agree. N=84

The young employees consider that female leaders can be successful if they have appropriate power and relevant positions in their organizations since they need support from the management (Figure 4). Besides, women leaders should possess leadership skills and characteristics, but also proper education. The respondents disagree with the statement that a woman cannot be a good leader, and disagree or strongly disagree with the statement that a woman doesn't need to be a leader.



#### Fig. 4. Statements Regarding Female Leaders (n=84)Please indicate how much you agree or disagree with the following statements

The survey was also interested in the reflection of the young employees concerning male leaders (Figure 5). The vast majority of the respondents disagree that all men are leaders (n=55) and that men do not need to learn leadership (n=54). On the contrary, they disagree that the strong point of a man is to be a leader (n=43), and that men have more chances to become leaders (n=42). The young employees do not believe that society recognizes only men as leaders in Georgia (strongly disagree n=14, and disagree n=26). However, 24 of them agree and 8 strongly agree that culture helps men to be leaders.



Fig. 5. Statements Regarding Male Leaders (n=84)

**Conclusions.** The study results emphasize the preferences of young employees towards leaders, which can be used by organizations to develop leadership styles accordingly, and attract and retain employees as a consequence. The conducted research has revealed that young people prefer supportive leaders that are ready to help when employees perform their jobs. Besides, the young employees entering the job market consider leaders' skills and behavior as important and believe that men and women leaders can be equally successful.

Future causal research needs to be carried out to examine the leadership style and behavior of male and female leaders in various organizations with larger samples of employees, which will be analyzed through complex statistical tools.

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#### LEGAL AND POLITICAL SCIENCE

## CONCEPTUAL REVIEW OF THE UNITED STATES CRITICAL INFRASTRUCTURE ARCHITECTURE: POLICY, LAW AND ADMINISTRATION

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Abstract. The United States' Critical Infrastructure System (CIs) represents an umbrella concept grouping all those resources that are essential for national economic, financial, and social system. These critical infrastructures are vital and without them, or with any damages to them, would cripple the nation, states, and/or local communities and tribes. Based on a systematic review approach (methodology), this paper aims to review the United States' Critical Infrastructure Protection System (USCIPS) at tree aspects. In section one, the policy pillars of USCIPS are outlined based on studding Presidential Policy Directive 21 (PPD-21) and National Infrastructure Protection Plan (NIPP). Section two discusses the interdependent nature of the sixteen critical infrastructure sectors and identified the further designation of life-line sectors. Final sector introduces USCIPS stakeholders, collaboration and partnership across between the private sector and public sector stakeholders. **Keywords**: US Critical Infrastructure; Critical Infrastructure Protection.

**Introduction.** In a modern variable security environment, there are growing concerns and debates regarding CI concept and protection of these CIs, especially, how to effectively protect them given their vital positions in social and economic developments. These concerns have been highlighted with the increased emphasis on improved efficiency, performance and productivity, and this implies that CIs now rarely exist or function in isolation. Rather, they are becoming more tightly coupled into a system of (inter)dependent infrastructures.

In this case the United States is no exception regardless of its economic or military or other strength. The United States` CI provides the essential services that underpin American society. Proactive and coordinated efforts are necessary to strengthen and maintain secure, functioning, and resilient critical infrastructure – including assets, networks, and systems – that are vital to public confidence and the Nation's safety, prosperity, and well-being.

#### **Critical Infrastructure Policy.**

Since mid-1990s, by issuing the Executive Order (EO) 13010 CI Protection, the US government has begun to formalise efforts to develop a comprehensive national policy for CI. Mentioned order stated that "certain national infrastructures so vital that their incapacity or destruction would have a debilitating impact on the defense or economic security of the United States [1].

Through 2007 the focus was on the identification and cataloging of the nation's CI assets. From 2007 to 2013 the focus turned to the identification and prioritisation of lifeline sectors and the overall interdependency of the critical infrastructure system as a whole.

Today Presidential Policy Directive 21 (PPD-21), which supersedes Homeland Security Presidential Directive 7 [2], establishes national policy on CI security and resilience. The directive declares that: a) "The Nation's CI is diverse and complex. It includes distributed networks, varied organisational structures and operating models (including multinational ownership), interdependent functions and systems in both the physical space and cyberspace, and governance constructs that involve multi-level authorities, responsibilities, and regulations. CI owners and operators are uniquely positioned to manage risks to their individual operations and assets, and to determine effective strategies to make them more secure and resilient"; b) CI must be secure and able to withstand and rapidly recover from all hazards. Achieving this will require integration with the national preparedness system across prevention, protection, mitigation, response, and recovery" [3].

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The term "critical infrastructure" has the definition given to that term in section 1016(e) of the USA PATRIOT Act of 2001 (42 U.S.C. 5195c(e)) - the term "critical infrastructure" means systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters" [4].

NIPP provides the coordinated approach that is used to establish national priorities, goals, and requirements for protecting and ensuring the continuity of CI and key resources (CIKR) protection so that federal resources are applied in the most effective and efficient manner to reduce vulnerability, deter threats, and minimize the consequences of attacks and other incidents. It establishes the overarching concepts relevant to all CIKR sectors identified under the authority of Homeland Security Presidential Directive 7, and addresses the physical, cyber, and human considerations required for effective implementation of protective programs and resiliency strategies [5].

The NIPP specifies the key initiatives, milestones, and metrics required to achieve the Nation's CIKR protection mission. It sets forth a comprehensive risk management framework (Fig.1) and clearly defined roles and responsibilities for the Department of Homeland Security, Federal Sector-Specific Agencies (SSAs), and other Federal, State, local, tribal, territorial, and private sector partners. The cornerstone of the NIPP is its risk management framework establishing the processes for combining consequence, vulnerability, and threat information to produce a comprehensive, systematic, and rational assessment of national or sector risk [6].



Continuous improvement to enhance protection of CIKR

Fig. 1. Risk Management Framework

#### **Critical Infrastructure Sectors**

Each Critical Infrastructure Sector (CIS) is crucial to the economic prosperity and continuity of the United States – a direct attack on or disruption of certain elements of CI could disrupt essential functions at the national level and across multiple CIS.

Cybersecurity and Infrastructure Security screens 16 critical infrastructure sectors whose assets, systems, and networks, whether physical or virtual, are considered so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof: 1. The Chemical Sector; 2. The Commercial Facilities Sector; 3. The Communications Sector; 4. The Critical Manufacturing Sector; 5. The Dams Sector; 6. The Defense Industrial Base Sector; 7. The Emergency Services Sector; 8. The U.S. energy infrastructure; 9. The Financial Services Sector; 10. The Food and Agriculture Sector; 11. The Government Facilities Sector; 12. The Healthcare and Public Health Sector; 13. The Information Technology Sector; 14. The Nuclear Reactors, Materials, and Waste Sector; 15. The Transportation Systems Sector; 16. The Water and Wastewater Systems Sector [7].

The Chemical Sector is an integral component of the U.S. economy that manufactures, stores, uses, and transports potentially dangerous chemicals upon which a wide range of other critical infrastructure sectors rely. Securing these chemicals against growing and evolving threats requires vigilance from both the private and public sector. Based on the end product produced, the sector can be divided into five main segments, each of which has distinct characteristics, growth dynamics, markets, new developments, and issues: Basic chemicals; Specialty chemicals; Agricultural chemicals; Pharmaceuticals; Consumer products.

The Commercial Facilities Sector includes a diverse range of sites that draw large crowds of people for shopping, business, entertainment, or lodging. The Commercial Facilities Sector consists of eight subsectors: Entertainment and Media; Gaming; Lodging; Outdoor Events; Public Assembly;

Real Estate; Retail; Sports Leagues. Facilities within the sector operate on the principle of open public access, meaning that the general public can move freely without the deterrent of highly visible security barriers. The majority of these facilities are privately owned and operated, with minimal interaction with the federal government and other regulatory entities.

The Communications Sector as a component of the U.S. economy, underlies the operations of all businesses, public safety organisations, and government. Presidential Policy Directive 21 identifies the Communications Sector as critical because it provides an "enabling function" across all critical infrastructure sectors. This sector is closely linked to other sectors, including The Energy Sector; The Information Technology Sector; The Financial Services Sector; The Emergency Services Sector; The Transportation Systems Sector.

The Critical Manufacturing Sector focuses on the identification, assessment, prioritisation, and protection of nationally significant manufacturing industries within the sector that may be susceptible to manmade and natural disasters. Primary Metals Manufacturing Iron and Steel Mills and Ferro Alloy Manufacturing Alumina and Aluminum Production and Processing Nonferrous Metal Production and Processing Machinery Manufacturing Engine and Turbine Manufacturing Power Transmission Equipment Manufacturing Earth Moving, Mining, Agricultural, and Construction Equipment Manufacturing Transformer Manufacturing Generator Manufacturing Transportation Equipment Manufacturing Vehicles and Commercial Ships Manufacturing Aerospace Products and Parts Manufacturing Locomotives, Railroad and Transit Cars, and Rail Track Equipment Manufacturing Products made by these manufacturing industries are essential to many other critical infrastructure sectors.

The Dams Sector delivers critical water retention and control services in the United States, including hydroelectric power generation, municipal and industrial water supplies, agricultural irrigation, sediment and flood control, river navigation for inland bulk shipping, industrial waste management, and recreation. Its key services support multiple critical infrastructure sectors and industries. Dams Sector assets irrigate at least 10 percent of U.S. cropland, help protect more than 43 percent of the U.S. population from flooding, and generate about 60 percent of electricity in the Pacific Northwest. There are more than 90,000 dams in the United States — approximately 65 percent are privately owned and approximately 80 percent are regulated by state dams safety offices. The Dams Sector has interdependencies with a wide range of other sectors, including: Communications; Energy, Food and Agriculture; Transportation Systems; Water.

The Defense Industrial Base Sector is the worldwide industrial complex that enables research and development, as well as design, production, delivery, and maintenance of military weapons systems, subsystems, and components or parts, to meet U.S. military requirements. The Defense Industrial Base partnership consists of Department of Defense components, more than 100,000 Defense Industrial Base companies and their subcontractors who perform under contract to the Department of Defense, companies providing incidental materials and services to the Department of Defense, and government-owned/contractor-operated and government-owned/government-operated facilities. The sector provides products and services that are essential to mobilize, deploy, and sustain military operations. The Defense Industrial Base Sector does not include the commercial infrastructure of providers of services such as power, communications, transportation, or utilities that the Department of Defense uses to meet military operational requirements. These commercial infrastructure assets are addressed by other Sector-Specific Agencies.

The Emergency Services Sector (ESS) is a community of millions of highly-skilled, trained personnel, along with the physical and cyber resources that provide a wide range of prevention, preparedness, response, and recovery services during both day-to-day operations and incident response. The ESS includes geographically distributed facilities and equipment in both paid and volunteer capacities organised primarily at the federal, state, local, tribal, and territorial levels of government, such as city police departments and fire stations, county sheriff's offices, Department of Defense police and fire departments, and town public works departments. The ESS also includes private sector resources, such as industrial fire departments, private security organisations, and private emergency medical services providers. Five distinct disciplines compose the ESS, encompassing a wide range of emergency response functions and roles. The ESS also provides specialised emergency services through individual personnel and teams.

The Energy Sector describes the infrastructure that provides energy resources underpinning all sectors of critical infrastructure. Presidential Policy Directive 21 identifies the Energy Sector as uniquely critical because it provides an "enabling function" across all critical infrastructure sectors. More than 80 percent of the country's energy infrastructure is owned by the private sector, supplying fuels to the transportation industry, electricity to households and businesses, and other sources of energy that are integral to growth and production across the nation. The energy infrastructure is divided into three interrelated segments: Electricity; Oil, and Natural gas.

The Financial Services Sector represents a vital component of nation's critical infrastructure. Large-scale power outages, recent natural disasters, and an increase in the number and sophistication of cyber attacks demonstrate the wide range of potential risks facing the sector. The Financial Services Sector includes thousands of depository institutions, providers of investment products, insurance companies, other credit and financing organisations, and the providers of the critical financial utilities and services that support these functions. Financial institutions vary widely in size and presence, ranging from some of the world's largest global companies with thousands of employees and many billions of dollars in assets, to community banks and credit unions with a small number of employees serving individual communities.

The Food and Agriculture Sector is almost entirely under private ownership and is composed of an estimated 2.1 million farms, 935,000 restaurants, and more than 200,000 registered food manufacturing, processing, and storage facilities. This sector accounts for roughly one-fifth of the nation's economic activity. The Food and Agriculture Sector has critical dependencies with many sectors, but particularly with the following: Water and Wastewater Systems, for clean irrigation and processed water; Transportation Systems, for movement of products and livestock; Energy, to power the equipment needed for agriculture production and food processing; Chemical, for fertilizers and pesticides used in the production of crops.

The Government Facilities Sector includes a wide variety of buildings, located in the United States and overseas, that are owned or leased by federal, state, local, and tribal governments. In addition to physical structures, the sector includes cyber elements that contribute to the protection of sector assets (e.g., access control systems and closed-circuit television systems) as well as individuals who perform essential functions or possess tactical, operational, or strategic knowledge.

The Healthcare and Public Health Sector protects all sectors of the economy from hazards such as terrorism, infectious disease outbreaks, and natural disasters. Because the vast majority of the sector's assets are privately owned and operated, collaboration and information sharing between the public and private sectors is essential to increasing resilience of the nation's Healthcare and Public Health critical infrastructure. Operating in all U.S. states, territories, and tribal areas, the sector plays a significant role in response and recovery across all other sectors in the event of a natural or manmade disaster.

The Information Technology Sector is central to the nation's security, economy, and public health and safety as businesses, governments, academia, and private citizens are increasingly dependent upon Information Technology Sector functions. The sector's complex and dynamic environment makes identifying threats and assessing vulnerabilities difficult and requires that these tasks be addressed in a collaborative and creative fashion. Information Technology Sector functions are operated by a combination of entities—often owners and operators and their respective associations—that maintain and reconstitute the network, including the Internet. Although information technology infrastructure has a certain level of inherent resilience, its interdependent and interconnected structure presents challenges as well as opportunities for coordinating public and private sector preparedness and protection activities.

The Nuclear Reactors, Materials, and Waste Sector includes nuclear power generation, medical isotopes and nuclear and radiological research. It also oversees the movement of radiologic cargo in coordination with the transportation sector.

The Transportation Systems Sector moves people and goods. It includes aviation, highway and motorway, maritime, mass transit and passenger rail, pipeline systems, freight rail and postal and shipping.

The Water and Wastewater Systems Sector is responsible for the nation's clean water supply. It also is critical in the management of sewage and wastewater treatment.

**Critical Infrastructure Stakeholders.** Presidential Policy Directive 21 (PPD-21) directive refines and clarifies the critical infrastructure-related functions, roles, and responsibilities across the Federal Government, as well as enhances overall coordination and collaboration.

The Federal Government has a responsibility to strengthen the security and resilience of its own critical infrastructure, for the continuity of national essential functions, and to organise itself to partner effectively with and add value to the security and resilience efforts of critical infrastructure owners and operators.

The Cybersecurity and Infrastructure Security Agency (CISA), which was established on November 16, 2018 when President Donald Trump signed into law the Cybersecurity and Infrastructure Security Agency Act of 2018, is a standalone United States federal agency, an operational component under Department of Homeland Security oversight [8]. Its activities are a continuation of the National Protection and Programs Directorate (NPPD). CISA leads the nation's effort to understand and manage cyber and physical risk to the USA critical infrastructure - CISA is the Nation's risk advisor, working with partners to defend against today's threats and collaborating to build more secure and resilient infrastructure for the future.

CISA subcomponents include the: Cybersecurity Division; Infrastructure Security Division; Emergency Communications Division; National Risk Management Center; Integrated Operations Division; Stakeholder; ngagement Division; National Emergency Technology Guard (inactive, but can be activated by the director of CISA) [9].

As the nation's risk advisor, CISA mission is to ensure the security and resiliency of CI. However, in today's digitizing world, as organisations are increasingly integrating cyber systems into their operations, they are also facing more diverse, sophisticated threats — cyber, physical, technological, or natural — that may have cross-sector impacts. The evolving risk landscape necessitates an evolved response.

Housed with CISA, the National Risk Management Center (NRMC) helps fulfill the Agency's risk advisor role by leveraging sector and stakeholder expertise to identify the most significant risks to the nation, and to coordinate risk reduction activities to ensure critical infrastructure is secure and resilient both now and into the future. NRMC brings the private sector, government agencies, and other key stakeholders together to identify, analyse, prioritise, and manage the most significant risks to critical infrastructure.

The NRMC's dynamic, cross-sector risk management process transforms private-public engagement into collective action by defragmenting how the government and industry develop response and security plans, risk-reduction activities, and share information. The interconnectedness of the sectors and sophistication of threats and hazards means that the consequences of an attack or imminent threat do not impact only one sector. The NRMC creates an environment where government and industry can collaborate and share expertise to enhance critical infrastructure resiliency within and across sectors.

Separating CI into 16 sectors facilitates the assignment of sectoral responsibilities within government and to private industry stakeholders. Presidential Policy Directive 21 (PPD 21) articulates the primary responsibilities of the US Federal Government's role in strengthening the security and resilience of US Critical Infrastructure against physical and cyber threats. PPD 21 emphasizes the need for partnership with private sector and international stakeholders and recognises the interdependent nature of the critical infrastructure system as a whole. The federal government facilitates regulatory compliance through regular communication, inspection programs, licensing requirements and financial penalties for non-compliance.

SSAs (Tab.1) are identified to provide a lead resource for the organisation of multi-agency and stakeholder efforts to secure key sector assets. SSAs in coordination with the Secretary of Homeland Security prioritise critical infrastructure based on threat and vulnerability analysis, collaborate with sector specific critical infrastructure owners and operators, carry out incident management, provide technical support and assistance and help mitigate incidents. SSAs are also responsible for regular reporting to the Department of Homeland Security the overall state of preparedness within their assigned sectors and to identify areas of concern. SSA are charged with considering Critical Infrastructure Protection from and "All-Hazards" approach that includes natural disasters, industrial accidents, acts of terror, pandemics, cyber incidents, sabotage, and destructive criminal activities that target critical infrastructure [10].

Critical Infrastructure sectors	Sector-Specific Agencies
The Chemical Sector	The Department of Homeland Security
The Commercial Facilities Sector	The Department of Homeland Security
The Communications Sector	The Department of Homeland Security
The Critical Manufacturing Sector	The Department of Homeland Security
The Dams Sector	The Department of Homeland Security
The Defense Industrial Base Sector	The U.S. Department of Defense
The Emergency Services Sector (ESS)	The Department of Homeland Security
The U.S. Energy Infrastructure	The Department of Energy
The Financial Services Sector	The Department of the Treasury
The Food and Agriculture Sector	The Department of Agriculture
The Government Facilities Sector	The Department of Homeland Security and the
	General Services Administration
The Healthcare and Public Health Sector	The Department of Health and Human Services
The Nuclear Reactors, Materials, and Waste	The Department of Homeland Security
Sector	
The Information Technology Sector	The Department of Homeland Security
The Transportation Systems Sector	The Department of Homeland Security and the
	Department of Transportation
The Water and Wastewater Systems Sector	The Environmental Protection Agency

Table 1. Sector-Specific Agencies

The critical infrastructure protection is a shared responsibility between private sector owners and governmental agencies at the Federal, State, Local, Tribal and territorial levels (Fig. 2). The United States Government Accountability Office estimates that 85 % of the nation's critical infrastructure is owned by the private sector [10].



Fig. 2. The United States' Plan's Approach to Building and Sustaining Unity of Effort [11]

**Conclusions.** As study shows CIPP continues to be a high priority and yet a persistent challenge to the United States. CIPP must continue to evolve to meet the dynamic nature of maturing societies, the changing needs of its people and the development of new and yet to be seen technologies to ensure a resilient and reliable CI architecture.

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## СПОСОБИ ВПЛИВУ НА ФОРМУВАННЯ ПОЛІТИКИ З БОКУ НЕУРЯДОВОГО СЕКТОРУ

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Abstract. The issue of interaction of the non-governmental sector with state and local authorities always remains relevant, primarily due to changes in the dynamics and trends of this process. Today in Ukraine there is a wide range of interaction tools that can be used by both civil society organizations and individual citizens to communicate with the authorities. However, a characteristic feature of the non-governmental sector is not only the requirement of accountability on the part of the state, but also participation in the formation of a political course and roadmap in a given area. In this study, we analyzed how the third sector currently uses legally regulated methods of communication with the authorities to participate in policy-making and change.

Keywords: non-governmental sector, policy, executive agencies, advocacy activities, policymakers

Вступ. На сьогодні неурядовий сектор України можна визначити як сформований суспільно-політичний інститут. Активне мережування та розбудова коаліцій НУО, у тому числі й міждержавних та міжрегіональних партнерств, в останні роки сигналізує про формування сектору у цілісність. Збільшення ініціатив, які продукуються та підтримуються союзами НУО також набирає масштабів. Цілі діяльності сектору зміщуються від розв'язання локальних суспільних проблем до реформування цілих галузей життєдіяльності. Такі індикатори дають змогу розглядати функції неурядового сектору та відповідно призначення його діяльності під іншим кутом зору, де основною характеристикою результативності роботи НУО визначити безпосередньо вплив на формування політики.

Для підтвердження такого припущення дослідження потребує цикл формування політики та залученість до цього процесу сучасних українських неурядових організацій.

**Метою статті** є визначення ролі неурядового сектору у формуванні політик на сучасному етапі розвитку країни та підтвердження зміни акцентів у функціональному призначенні сектору.

**Методи дослідження.** В процесі дослідження використали логіко-семантичний метод для означення поняттєвого апарату і розведення використовуваних термінів у дослідженні. Метод-контент аналізу застосували під час аналізу відкритих даних та статистичної і інформації, яка знаходиться у відкритому доступі. Метод нормативного аналізу застосували під час вивчення законодавчих можливостей та обмежень щодо предмета дослідження.

Результати. Традиційно в суспільстві побутує думка, що питання формування політик це є безпосередня функція органів влади. Якщо поглянути на питання ще вужче, вдаючись до аналізу повноважень органів влади, то зокрема формування та реалізація політики у певній галузі відводиться центральному виконавчому органу влади (частіше за все це є Міністерство) [1]. З реформуванням сфери державного управління, яка на сьогодні перебуває в процесі реалізації, слідує, що зміниться і сама структура міністерств. Всі міністерства будуватимуться за однаковим принципом – створюючи у своєму складі директорати, між якими розподіляться задачі міністерства. Метою такого диференціювання та структуризації є якраз таки намагання перетворити міністерства у повноцінні центри вироблення та реалізації політики, так звані «державні фабрики думок» [2].

Так, на сьогодні обов'язковим структурним елементом міністерств став директорат формування політики та стратегічного планування [3]. Відповідно, очікується, що такий підхід до організації роботи підвищить якість рішень, які виробляються міністерствами, а також поверне на порядок денний виконання однієї із провідних функцій ЦОВВ, а саме формування політик.

Втім, сьогодні обговорення питання формування політик є достатньо популярним серед різних груп стейкхолдерів: держави, наукових установ, неурядового сектору тощо. Зокрема, питання участі різних зацікавлених сторін у продукуванні та впровадженні політик. Аби встановити, наскільки задіяний в даному процесі неурядовий сектор та наскільки така діяльність відповідає природі його діяльності, маємо звернутись до сутності визначення «формування політики». І перш за все варто визначити контекст дослідження. Плутанина та підміна понять у сфері дослідження «політик» в нашому суспільстві обумовлена відсутністю варіацій перекладу самого поняття «політика». Звертаючись до мови оригіналу, політика має три основоположних тлумачення, кожне з яких описує та визначає різні явища. Для українських реалій такою відмінністю є лише контекст, не дивно, що останнім часом серед дослідників та неурядовців популярності набирає використання даних термінів мовою оригіналу, аби найбільш влучно описати думку.

Тож, під час дослідження діяльності органів влади та неурядового сектору, ми зустрічаємо та оперуємо найчастіше двома поняттями: politics, policy, кожне із яких українською перекладається як «політика». Втім, в оригіналі усі три терміни означають різні феномени.

politics – використовується для означення практичних політичних дій [4].

policy – програма, курс дій. У значенні «public policy» - план/курс дій уряду [5].

Так, розглядаючи діяльність міністерств, ми звертаємось передусім до формування policy. Звідси походить і термін «policymaker» – той, хто визначає, формує політику (курс та план дій) у певні галузі. Тобто для формування державної політики таким «policymaker» виступає профільне міністерство, оскільки формування плану дій в галузі та його реалізація один з обов'язків міністерств. Втім, розглядаючи процес формування політики «цикл», дефакто, можна відмітити в ньому участь кількох стейкхолдерів, у тому числі й НУО. Тобто долучаючись до процесу розробки політики та плану його реалізації, НУО приміряють на себе роль «policymakers» тою мірою, якою до такого процесу долучаються.

Законодавчо, на сьогодні, в Україні закріплена можливість неурядового сектору долучатись до формування та реалізації державної політики. Інструментів такої участі наразі у нормативній площині можна окреслити велику кількість, основними серед яких є 4: громадська експертиза; консультації з громадськістю, консультативно дорадчі органи (у т.ч. – громадські ради); громадські слухання.

Проте, практичний спектр інструментів, які використовуються організаціями з метою впливу на формування політики дещо відрізняється. Таких висновків дозволяє дійти аналіз комунікації між органами влади та організаціями громадянського суспільства. Відтак, досліджуючи результативність встановлених та врегульованих способів участі НУО у процесі прийняття рішень, ми встановили, що за рік міністерства провели близько тисячі комунікаційних інтервенцій, направлених на обговорення політик, рішень, пропозицій.

Орган	Гром. Ради й КДО	Конференції	Зустрічі	Круглі столи	Громадські слухання	Електронні консультації
Міністерства	70	39	250	16	32	642
Інші ЦОВВ	66	31	149	27	18	245
ОДА	175	66	283	55	72	618
Всього	311	136	682	98	122	1505

Таблиця 1. Заходи консультацій з громадськістю, проведені у 2020 році.

Зібрано автором на основі інформації, наведеної у звітах [6], [7], [8],[9].

Втім, інформація, розміщена у відкритому доступі для організацій громадянського суспільства та населення щодо результатів такої співпраці не дозволяє зробити висновків щодо її ефективності, оскільки містить в більшості випадків виключно статистичні дані щодо кількості заходів та учасників. Натомість для аналізу змісту комунікації та результатів залучення НУО до роботи міністерств через нормативні механізми взаємодії ми дослідили офіційні вебсайти міністерств в частині взаємодії з громадськістю на предмет повноти інформації про проведення заходів та звітування за їх результатами. Так, із прозвітованої кількості проведених консультацій з громадськістю вдалось підтвердити 60% випадків. З них лише ½ мають зведені результати консультацій та дозволяють ознайомитись із ними.

Відтак, можна говорити про ознаки формальності у використанні органами влади механізму взаємодії із громадськістю задля вироблення та узгодження політики. Натомість

існує й інший аспект такої взаємодії – це зацікавленість самого сектору у спільній роботі. Так, із 4 інструментів громадської участі, які ми розглянули, «громадська експертиза» один із найбільш показових прикладів, оскільки цей інструмент передбачає ініціативу третього сектору, а вже потім заходи з боку держави. Проте, результати аналізу показали, що використання такого способу залучення не популярне серед НУО. З 19 досліджених міністерств, більшість мала всього по 1-2 прецедентам ініціювання з боку НУО проведення громадської експертизи, втім протягом 2020 року такі ініціативи зафіксовані лише двічі.

Міністерство	Консультації (к- сть звітів)	Громадська рада (к-сть засідань на рік)	Громадська експертиза (рік останнього запиту)
Міністерство фінансів	інформація не повна	2	2017
Міністерство культури та інформаційної політики	інформація не повна	інформація відсутня	інформація відсутня
Міністерство з питань стратегічних галузей промисловості	1	інформація відсутня	інформація відсутня
Міністерство аграрної політики та продовольства/ Міністерство розвитку економіки, торгівлі та сільського господарства	інформація відсутня	інформація відсутня	2019
Міністерство енергетики	інформація не повна	2	2018
Міністерство з питань реінтеграції тимчасово окупованих територій	інформація не повна	в процесі створення	2018
Міністерство молоді та спорту	22	1	2018
Міністерство цифрової трансформації	10	5	-
Міністерство внутрішніх справ	інформація відсутня	4	2018
Міністерство захисту довкілля та природних ресурсів	4	1	2018
Міністерство закордонних справ	1	3	2019
Міністерство інфраструктури	інформація не повна	2	інформація відсутня
Міністерство оборони	інформація відсутня	2	2018
Міністерство освіти і науки	137	6	2018
Міністерство охорони здоров'я	інформація не повна	інформація відсутня	2019
Міністерство розвитку громад та територій	інформація не повна	2	2019
Міністерство соціальної політики	інформація не повна	8	2020
Міністерство у справах ветеранів	інформація не повна	2	2020
Міністерство юстиції	інформація не повна	3	інформація відсутня

Таблиця 2. Комунікаційна відкритість органів влади

\*«інформація відсутня» - на офіційному вебсайті органу відсутній відповідний інформаційний підрозділ/інформаційний підрозділ пустий/інформаційний підрозділ містить виключно інформацію про правові засади проведення.

Тож, досліджуючи традиційні інструменти впливу НУО на формування політик уряду, відзначили, що їх застосування не популярне серед організацій, водночас органи влади

звітуються про такі активності, інколи формально проведені, але не агрегують інформацію щодо результативності такої співпраці. Натомість діяльність сектору у напрямку формування політики в тих чи інших галузях не зупиняється, про що свідчить збільшення кількості проєктів, які реалізуються спільно НУО та органами влади. Одним із таких прикладів є ініціатива МФ Відродження, яка підтримує спільні дослідницькі проєкти для партнерств НУО – органи влади. Інший аспект це нарощування адвокаційного потенціалу неурядового сектору та поширення практики «кабінетної адвокації», яка дозволяє організаціям брати участь у формуванні порядку денного та розробці політик, використовуючи при цьому нетрадиційні форми співпраці із державою.

Висновки. Дослідження питання форм та інструментів участі неурядового сектору в Україні на сьогодні потребує нових розширених досліджень. Результати аналізу нормативних інструментів взаємодії НУО та держави показують, що наявні способи застарівають і їм на зміну приходять інші, такі як встановлення прямого партнерства, кабінетна адвокація, адресне залучення фахових НУО до роботи над проблемами політики та вироблення курсу дій тощо. Все це дає змогу говорити про повільну трансформацію сектору та його взаємовідносин із державою, втім важливими питаннями стають правила такої співпраці та вимірювання її результативності.

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#### **COMPUTER SCIENCE**

## ABOUT DIGITAL PROCESSING OF ASTRONOMICAL IMAGES USING HISTOGRAM PROCESSING METHODS

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Abstract. Photos of extended objects are crucial for astronomers, as they contain enough detailed information about the celestial bodies that it is quite difficult to extract visually. Most of the information available for analyzing these objects begins with studying them with telescopes or satellites. Unfortunately, the quality of astronomical images is usually very poor compared to other real images, and this is due to the technical and physical features associated with the process of obtaining them. This increases the percentage of noise and makes it more difficult to directly use standard methods on the original image. Images taken from a satellite or telescope are almost always grayscale, but still contain some color information. However, an astronomical image can be obtained through a color filter. Different photodetectors also usually have different sensitivity to different colors (wavelengths). In our paper, we will present a method for processing astronomical images, using histogram processing, which can be successfully used to improve images, and post-processing. Keywords: image, histogram, processing, function, pixel.

Vision is the most advanced of our senses, so it is not surprising that visual images play a crucial role in human perception. However, unlike humans, who are able to perceive electromagnetic radiation only in the visible range, machine image processing covers almost the entire electromagnetic spectrum from gamma radiation to radio waves. Processed images can be generated by sources that are unusual for a person to associate with the observed images. These are, for example, ultrasound images; images obtained in electron microscopy or generated by a computer. Thus, digital image processing covers a wide and diverse range of applications.

An image can be defined as a two-dimensional function f(x, y), where x and y are coordinates in space (specifically, on a plane), and whose f value at any point given by a pair of coordinates (x, y)is called the intensity or gray level of the image at that point. If the values x, y, and f take a finite number of discrete values, then we are talking about a digital image. Digital image processing is the processing of digital images using digital computers (computers). Note that a digital image consists of a finite number of elements, each of which is located in a specific place and takes a certain value. These elements are called image elements or pixels.

In the entire range from image processing to machine vision, there are no clear boundaries, however, it is possible to distinguish between low-, medium-and high-level computerized processes. Low-level processes only deal with primitive operations such as preprocessing to reduce noise, increase contrast, or sharpen images. Low-level processes are characterized by the fact that there are images at the input and output. Image processing at the middle level covers such tasks as segmentation (dividing an image into areas or selecting objects on it), describing objects and compressing them into a form convenient for computer processing, as well as classification (recognition) of individual objects. Medium-level processes are characterized by images only at the input, while the output receives features and attributes extracted from these images (for example, area boundaries, contour lines, distinctive features of specific objects). Finally, high-level processing involves the "comprehension" of a set of recognized objects, as is done in image analysis, and, to the limit, the implementation of cognitive functions that are commonly associated with vision.

The processing of astronomical images has stages of digital preparation. An important aspect is the registration of the image, which can be extremely simple, as in the case when the original image is already presented in digital form. In general, the image registration stage involves some preprocessing, such as scaling. Image enhancement is among the simplest and most impressive areas of digital image processing. Essentially, the idea behind image enhancement techniques is to identify poorly discernible details, or simply emphasize the characteristics of interest in the original image. A well-known example of an improvement is to increase the contrast of an image, because the result is "it looks better". It is important to keep in mind that quality improvement is a highly subjective area in image processing.

In image restoration, where the area is also associated with an increase in the visual quality of the image, however, unlike the actual improvement, the criteria for which are subjective, image restoration is objective in the sense that image restoration methods rely on mathematical or probabilistic models of image distortion. In contrast, image enhancement is based on the subjective preferences of human perception, which are related to what exactly is considered a "good" improvement result.

For example, wavelets form the foundation for representing images with multiple degrees of resolution at the same time. Compression, as the name implies, refers to methods of reducing the amount of memory needed to store an image, or narrowing the channel bandwidth required to transmit it. Although the technology of storage devices has been significantly improved over the past decade, the same cannot be said for the bandwidth of communication lines.

Compression, as the name implies, refers to methods of reducing the amount of memory required to store an image, or narrowing the bandwidth required to transmit it. Although the technology of storage devices has been significantly improved over the past decade, the same cannot be said for the bandwidth of communication lines.

Segmentation divides the image into its component parts or objects. In general, automatic segmentation is one of the most difficult tasks of digital image processing. Unnecessarily detailed segmentation leads the process of solving the image processing problem to a complex path, if you need to identify objects individually. On the other hand, insufficiently detailed or erroneous segmentation will almost inevitably lead to errors at the final stage of processing. In general, the more accurate the segmentation, the more likely it is to succeed in recognition.

When applying these methods of image preparation and processing, it involves selecting a set of elements that will not affect the initial representation of image formation. In this connection, several aspects stand out. The first is geometric, where image formation can be viewed as a projection from 3-D to 2-D space. The disappearance of one coordinate leads to a serious loss of information about the geometry of the observed scene. However, our brain perceives the received information as three-dimensional. The second aspect determines how "bright" the object is and how the brightness in the image depends on the optical properties of the object and the imaging system. The third question is what happens to an image when we represent it using an array of discrete numbers to be processed on a computer. What interference to the image is caused by the processing processes.

The main goal of the improvement is to process the image in such a way that the result is more suitable from the point of view of a particular application. The word concrete is important here because it establishes from the very beginning that the methods discussed in this chapter are largely problem-oriented. For example, a method that is very useful for improving X-ray images will not necessarily be the best for processing images of Mars transmitted by a spacecraft. However, regardless of the methods used, image enhancement is one of the most interesting and attractive areas of image processing from the point of view of visual analysis.

Many approaches to image enhancement fall into two broad categories:

- methods of processing in the spatial domain (spatial methods)

- methods of processing in the frequency domain (frequency methods).

There is no general theory of image enhancement. When an image is processed, the visual perception of the results is an indicator of how well a particular method is performing. Visual assessment of image quality is a subjective process. When the goal is to process the image for further processing by the computer, the estimation task is somewhat simpler. For example, in a character recognition problem, the best method (leaving aside other issues such as computational requirements) is the image processing method that gives more accurate recognition results. However, even in a situation where the problem allows you to set clear quality criteria, it usually takes a certain number of testing attempts until a specific approach to image improvement is selected.

Successful experience has shown the use for image processing the application of histogram processing, which can be successfully used to improve images. In addition to getting useful statistics

about the image, the information contained in the histogram is also very useful in other tasks, such as image compression and segmentation. Histograms are quite simple for both software calculation and hardware implementation, which makes them a convenient tool for real-time image processing.

A digital image histogram with brightness levels in the range [0, L-1] is called a discrete function  $h(r_k)=n_k$ , where  $r_k$  is the k-th brightness level, and  $r_k$  is the number of pixels in the image that have the brightness of  $r_k$ .

A common practice is to normalize a histogram by dividing each of its values by the total number of pixels in the image, denoted by n. Thus, the values of the normalized histogram will be  $p(r_k)=n_k/n$  for k=0,1,...,L-1. Generally speaking, p is an estimate of the probability of a pixel appearing with a brightness value of  $r_k$ . Note that the sum of all the values of the normalized histogram is equal to one.

However, note that the methods of histogram processing were global, where the construction of the transformation function is based on the analysis of the brightness content of the entire image. Although this global approach is suitable for improvement in general, there are cases where it is necessary to improve the details by analyzing small areas of the image. This is due to the fact that the number of pixels in such areas is small and cannot have a noticeable effect on the global histogram, the shape of which does not necessarily correspond to the necessary local improvement.

The solution is to develop a conversion function based on the distribution of brightness (or other characteristics) in the neighborhood of each image element. The methods of histogram processing described earlier can be easily applied to local improvement. The procedure consists in setting the shape of a square or rectangular neighborhood around the element to be processed and then moving the center of this area from the sharpener to the point. For each new position of the neighborhood, a histogram is calculated from the points included in it, and the function of converting the equalization or reducing the histogram is found. Finally, this function is used to display the brightness level of the central element of the neighborhood.

Then the center of the neighborhood is moved to the neighboring pixel and the procedure is repeated. Since only one column or row of the neighborhood changes as you move from point to point, it becomes possible to update the histogram obtained in the previous step by adding new data. This approach has obvious advantages over calculating the histogram again for all points in the neighborhood, with its offset by only one element. Another approach, sometimes used to reduce the number of calculations, is to use disjoint areas, but this method usually leads to an undesirable chessboard effect.

Histograms have many applications in image processing. The first use, as also discussed above, is image analysis. We can predict an image just by looking at its histogram. It's like looking at an X-ray of a body bone.

The second use of the histogram is for brightness purposes. Histograms have a wide application in image brightness. Not only by brightness, but also by histograms is used to adjust the contrast of the image.

Another important use of the histogram is to align the image.

Last but not least, the histogram has a wide application in threshold values. This is mainly used in computer vision.

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# MANAGEMENT OF KNOWLEDGE MODELS USING INFORMATION TECHNOLOGY

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**Abstract**. The topics of implementing methods of information technology as one of the effective and important methods are discussed for organizational and institutional management purposes. Information technology allows a new knowledge to be discovered which is an important and effective way for the management of organizational processes in order to maintain competitive edge.

In today's competitive and globalization world, the main challenge for organizations remains to be defining customer-oriented strategy where knowledge and its management is an important factor. Recently active works is being conducted for establishing and developing effective models of knowledge management where information technology plays an important role. Generally, information system is a means of collecting and creating new knowledge existing between different individuals/structures using information technology. It describes instruments of knowledge management that allows collaboration and communication between parties involved in business processes. Knowledge management includes facts, data and models of different types which exist in physical and electronic information depository.

*Keywords*: knowledge management, explicit knowledge, SECI model, knowledge assets, BI model, pyramid to wisdom & the DIKW.

**Main part.** Knowledge management is defined as a means of creating, collecting, sharing and using static knowledge in business processes. There is also an opinion that knowledge management is a process of obtaining information from competent people that is used in making decisions in organizational processes. Despite differing views, both have something in common which is utilizing knowledge existing in an organization to get competitive edge in the market. A constant flow of knowledge in an organization, using modern technology and right methods of management are constitute a checklist of things managers and investors prioritize.

In order to discover new knowledge, it must be constantly renewed. With the passage of time knowledge does not increase on its own. Like money does not increase in amount without investing and with time it loses its buying potential, so does knowledge as well. It needs constant sharing, acquisition and exchange in order new knowledge to be created. The increase of tactical knowledge is possible through its socialization. Knowledge has a life-cycle of four different phases. They are the following: socialization, internalization, externalization, and unification [1].

Socialization is a face-to-face information sharing through discussion during which knowledge is passed from one person to another. An additional benefit of this phase is an opportunity of viewing knowledge from a different angle during interaction. Externalization phase implies verbalized sharing of practical knowledge. This phase is considered the phase of creating knowledge and discovering new processes. The medium for sharing practical knowledge can be words, conversation, writing, photos, video or music which impossible to convey without using information technology. It is important for explicit concepts to be systematized using physical and electronic means. Internalization means teaching without words and conversation. In this case social values and ideas are conceived by individuals as their own. Unification is a simple form when new knowledge is created by unification of codified knowledge resources [2]. The four different phases are parts of one whole process which represents a model of creation of knowledge.

**Research methods.** The most optimal method of knowledge management and sharing is its automatic management and targeted sharing. This means that knowledge management system should be able to manage different processes at different levels. Employees should have an opportunity to fulfill their responsibility based on their successful experience. This in turn may cause new processes in knowledge which will enable the employee to determine new parts of the processes or add new sub-processes on their own. In development of work management system, organizational (institutional) memory plays an important role.

Organization memory keeps information about organization products and services. This helps in accumulating practical knowledge. The building of corporate memory is possible through nonstructural methods which does not cost an organization much money. But this type of repository often contains

unnecessary information. Therefore, it is necessary to filter data accumulated in information repository often. Information engineers have a different approach who base the creation of corporative knowledge system on expert systems. Replenishment of the information in in corporative memory should be done using hypertexts. This means describing processes that take place at different levels in an organization. For obtaining information about each process easily, hyperlinks connected to keywords will be used. Knowledge engineers will be responsible for placing information in information repository. They will place information relevant to solving a concrete problem and practical issues. When placing information in an information repository it is necessary to determine the purposefulness and credibility of the information. Explicit knowledge often masks real problems, which may hinder organizational processes. Thus, the information contained in the database will be adapted to organization stakeholders. Rösner et all consider knowledge engineering a source of motivation of replenishing organizational memory. Initially, it is necessary to fill information about the product of an organization. They show how to create explicit knowledge which will be integrated in new explicit knowledge in the future. This will develop tactical knowledge. All of these will be integrated in documents and utilize needed time with purpose during the execution of transactions in the organization in smart contacts [3] as well during the execution of different operations. Obtaining information from an information repository should be quick. For this purpose, the information should be described properly and be connected with hyperlinks. The information system should be available to the management as well as to lower rank employees. Replenishing of the institutional memory of an organization is not possible without having appropriate software support which is based on three important factors; these are: IT infrastructure which executes database management, document management and support of business processes. These factors constitute corporate memory architecture which lays the foundation for the development of artificial intelligence.

One of very important issues in the knowledge management are process-oriented models of different structure and type. Utilizing these, users have an opportunity to use recommendations and experience oriented on valid and qualified knowledge which are adapted to different strategy. The given models integrate knowledge obtained from different sources, which creates a united space of business decision management in real time from where business processes are managed considering appropriate skills, technology and experience [4].

Knowledge management models assist organizations in properly defining their work strategy to be adapted to outer factors and take account of client requirements in full. In order to purposefully utilize knowledge resources, it is important for a company to consider models of different types and adjust to an appropriate model corresponding to the specifics of the company. At first stage, to choose an effective model of knowledge management, it is necessary to determine what we know, how we know, why we know, who knows, when and from where he/she knows. After finding answers to these questions, we start determining an effective model of knowledge management. Let's consider a few models that help users to make an effective and optimal decision during the management of business processes.

**SECI model of knowledge management (Solar Energy Corporation of Indiaolar Energy Corporation of India)** is a model of knowledge creation process which ensures the formation of an effective system of knowledge management process and Knowledge Assets (the specific resources of a company that contributes to creating a valuable firm. For knowledge creation it consists of input, output and moderation factors). All three elements of Knowledge Assets are connected with other additional organic and dynamic elements. This model represents a spiral of knowledge creation which is connected to explicit and tactical knowledge (fig. 1) [6].



Tactical knowledge is mainly dependent of person's emotional and sensory experience and actions. The extent of personality is formalized in tactical knowledge.

Explicit knowledge encompasses knowledge encoding and encodes knowledge. This kind of knowledge is expressed numerically and verbally. This type of knowledge forms similar to scientific knowledge.

Conceptual model of **SECI** (Southeast European Cooperative Initiative) knowledge encompasses the process of creating four types of knowledge. They are: socialization, which is focused on interaction of tactical knowledge where the collection of knowledge is done through interaction, observation and analysis; externalization, which ensures the development of tactical knowledge where prototypes are created by unifying different elements of explicit knowledge; internalization, which uses tactical knowledge for the creation of explicit knowledge. These boost the generation of innovative ideas [2].

Knowledge life cycle or organizational knowledge encompasses the results of knowledge production. Knowledge production is carried out using knowledge life cycle model which is a comparatively new model. This model implies knowledge creation that has a structure similar to business management. Stimulation of innovative ideas is dependent of knowledge life cycle. The formation of organizational knowledge has several phases which are shown of fig. 2:



*Fig.2*.

Knowledge production. Knowledge production is influenced by factors such as group or individual knowledge. Before sharing knowledge, it is important to assess the validity of the information and specifics of organizational knowledge. Knowledge production is possible through processing knowledge inside organization as well as using knowledge from outside sources.

For knowledge integration it is necessary to integrate knowledge obtained through organizational knowledge production. This method involves the development of email, search instruments, methods of teaching and sharing within an organization. Organizational documents are actively used in this process. It is possible to introduce this model electronically as well as non-electronically. Its users are the employees of an organization.

The Capability Maturity Model describes five evolutionary steps which governs organizational processes. Initially this model was created for the development of software programs for the organization. It was used in military studies. It consists of five levels and each level is oriented towards the development of organizational processes (fig.3) [6].

The first level is chaotic, does not contain written-out processes and is not adapted to the environment;

At the second level processes repeat in order to define corrected results after implementing concrete processes;

At the third level all processes are documented. There are defined, standardized and integrated processes;

At the fourth level, the processes are managed according to pre-determined data. The management is conducted through processes identified and adapted to particular projects. The development of management processes takes place at this level.

At the fifth level the development of effective process of organization management continues. Here the piloting of new ideas and technologies take place by using feedback. The management of organizational processes happens using this model, which helps in managing the knowledge acquired in real time. In the future, it will contribute to optimizing new ideas and technologies [7].





The aim of Business Intelligence Model is information management system to make business decisions to enable knowledge management. Proper handling of business processes requires having corresponding skills, technologies and experience. Business intelligence (BI) supports the kind of system that helps the company to quickly make a decision. Using this system an organization will be able to develop a new business initiative adapted to customer requirements and needs in real time analyzing real data. BI includes system monitoring, information collection, reporting, analysis and production. It utilizes different strategies in the process of organizational management. This model can be introduced in organizations with different strategy.

BI includes: creation of system for organizational departments to work as a united team to fulfill the main vision of the organization; using high quality technologies for data management, and using different forms for organization departments working together for the purpose of business development (fig. 4).



#### Fig.4.

Johari Window model helps individuals and organizations to increase and develop knowledge on their own. It allows for making changes in working groups according to business context. It uses corporative parameters for corporative assignments. Communication between business participants is vitally important component for the success of an organization. Every manager and leader should create an environment where employees trust each other and mutually share information. Johari Window is an information processing model which can represent two matrices in two individuals. This model implies interaction between two sources of information which work for themselves and for each other. Both matrices are an interpersonal space which corresponds to the elements of information processing process characteristic of each region. Fig. 5 shows a characteristic structure of aforementioned model.





Arena square is a space where information is shared both ways. In this space, an individual works for himself. To increase his productivity, he works with other co-workers and receives information about their knowledge and experience, then uses it for personal knowledge and experience development. The more participants in this space the better the result [7].

Blindspot – this square shows information which can be unknown for certain people but is a common knowledge for other employees. This is explicit knowledge which is unknown for individuals with implicit knowledge;

Facade – square represents the knowledge of such information that is accessible only for certain employees and is inaccessible for other persons. This is company's confidential information;

Unknown square contains unlimited information. It takes part in the formation of the three frames, which is actively used in the management of input chain [8].

**Johari Window summary:** public information is available to all parties; personal information is accessible only to certain clients but it is inaccessible to design group; blind information is only accessible to design group; as for unknown information, it is not accessible to any party.

Pyramid to Wisdom & the DIKW (Data, Information, Knowladge, Wisdom) Model: Depending on different requirements, information may be formed differently. The presentation of information may depend on the type of question like What? How? Where? When? Pyramid Model is based on ultimate knowledge management model such as DIKW (data, information, knowledge, wisdom). Companies as famous as for example BMC use software based on practice-based system model. Fig. 6 shows the structure of the model [9].



Fig. 6. DIKW model

DIKW model uses data, knowledge, information and wisdom models for making organizational decisions.

**Conclusions.** The movement and proper management of knowledge enables an organization to maintain balance of intellectual capital in the form of non-material assets. Non-material assets are

the competence of employees, internal structure of an organization, patents, own models, concepts/processes, administration system, IT infrastructure, outer structure of an organization, good relations with clients and suppliers, brand, trademarks and reputation. In knowledge management, using of information technology plays an important role as it allows the companies to acquire the desired knowledge and share it with purpose in automatically managed schedule. Considering everything discussed, companies develop methodology of knowledge audit which guarantees intellectual balance being published for everyone which contributes to transparency and determining reliability criteria for partnership. The presented knowledge management models help organizations correctly define their working strategy and plan busines processes and be adapted to external factors where customer requirements will be taken into account in full.

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