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Universities in the global knowledge economy: the eclectic paradigm*

DENYS ILNYTSKYY[1]

ABSTRACT. As institutions of knowledge generation and diffusion, in the course of their activities universities should take into account not only the level of an organization or a country but also that of individual knowledge transformation, whereby creating favorable conditions for developing creativity of both graduates and academic staff who form the basis of the intellectual capital of the university and the country. While functioning in the global competitive climate, the national intellectual capital is a factor of socio-economic development and international competitive status of individual countries. During decades the concept of university has been evolving toward determining the operation mode of a university as that of an institution providing mass education, carrying out fundamental and applied researches as well as largely participating in local, national and global development. However, the university operation paradigm remains eclectic. Equal relationships between universities, government and industry in a knowledge-based society are well-defined by the concept of triple helix innovation systems engaging NGOs. World-class universities tend ever more to incorporate the feature of an entrepreneurial university actively competing in the global academic domain.
KEYWORDS. University, intellectual capital, knowledge economy, global competition, academic domain, creativity, innovation system, socio-economic development, eclectic paradigm.

Introduction

In the early XX century the volume of knowledge accumulated by the society as well as that of information in all forms would double every 30 years, while in the 1970s the periodicity was reduced to 7 years and in 2001 it was expected that in a decade the doubling will be taking place every 11 hours[2]. Unfortunately, the overwhelming amount of information should be characterized as information noise. However, it can become a source of emergence and creation of real knowledge the mankind can benefit from, and therefore knowledge is also called the capital. Increase in

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* This article was translated from its original in Ukrainian.

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[2] *Bontis N.* CKO Wanted – Evangelical Skills Necessary: A review of the Chief Knowledge Officer position // Knowledge and Process Management, Volume 8, Number 1. – 2001. – p. 30.

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knowledge volume growth rate as well as aggravation of socio-economic challenges resulted in the academic circles introducing the concept of lifelong learning based on 4 pillars[3], namely: Learning to Know; Learning to Do; Learning to Live Together; Learning to Be.

Globalization processes and global competition, ICT development and deepening social division of labor have led to transformation of ideas about the role and place of universities in modern economic system with the said ideas in most countries tending to determine universities as essential entities of economic relations. The most considerable changes took place over the last two decades and still keep occurring. Obviously, those were preconditioned by a large number of works by theoretical scientists, including Machlup F.[4], Schumpeter J.[5], Stiglitz J.[6] and others.

The relevance of this study is also due to a quite limited number of articles in the domestic scientific literature on the selected topic. Certain publications are dedicated to defining the role of the modern university in terms of the knowledge economy and European integration[7]. Others – to study and analysis of the higher education global experience[8] or to generalization of approaches to knowledge economy as an innovation system and defining the role of human capital[9]. It should be acknowledged that some domestic scholars have deeply studied the selected topic, including Bazylevych V.[10], Heiets V.[11], Kaleniuk I.[12], Kolot A.[13], Lukianenko D.[14], Poruchnyk A.[15], whose works benefit from in-

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[3] *Chiţiba C.A.* Lifelong learning challenges and opportunities for traditional universities // Procedia - Social and Behavioral Sciences, No. 46. — Elsevier. — 2012. — pp. 1943-1947.

[4] *Machlup F.* The Production and Distribution of Knowledge in the United States. Princeton: Princeton University Press, 1962. — 460 p.

[5] *Schumpeter J.A.* The Process of Creative Destruction. From Capitalism, Socialism and Democracy. New York: Harper, 1975. (Original publication 1942). – 437 p.

[6] *Greenwald B.C., Stiglitz J.E.* Externalities in Economies with Imperfect Information and Incomplete Markets. Quarterly Journal of Economics, No. 90. – May 1986. – pp. 229–264.

[7] *Semiv L., Semiv R.* University education in transition to the knowledge economy // Socio-humanistic problems, No. 3, 2008. – pp. 72-81. [In Ukrainian].

[8] *Konstantynyuk N.I.* Basic principles of improving the competitiveness of higher education in Ukraine in the emerging global economy // Sustainable economic development, No. 3[20]. – 2013. – pp. 26-28. [In Ukrainian].

[9] *Yakovenko L.I.* The innovative nature of the knowledge economy // Poltava State Agrarian Academy Bulletin. Economy, No. 2. — 2010. — pp.141-145. [In Ukrainian].

[10] *Bazylevych V.D.* Intellectual Property: textbook / V.D. Bazylevych. – ed. 3, amended and updated. – K. ; Znannya, 2014. – 671 p. [In Ukrainian].

[11] Ukraine in terms of the knowledge economy / [Heyets V.M., Aleksandrova V.P., Bazhal Y.M.] ; under editorship by NAU academician V.M. Heyets. – K.: Osnova, 2006. – 592 p. [In Ukrainian].

[12] *Kaleniuk I.S., Kuklin O.V.* Higher education development and knowledge economy / I.S. Kaleniuk, O.V. Kuklin – Kyiv: Znannya, 2012. – 340 p. [In Ukrainian].

[13] *Kolot A.M.* Innovative labor and intellectual capital in the system of the knowledge economy factors / A.M. Kolot // Theory of Economics. – 2007. – No. 2. – pp. 3-13. [In Ukrainian].

[14] *Lukianenko D.G.* Implementation of the knowledge economy paradigm in national economic development strategy / D.G. Lukianenko, O.S. Doroshenko // International Economic Policy. – No. 19. – 2013.– pp. 5-26. [In Ukrainian].

troduction of new views.

Objective of the article is to substantiate the role and place of universities in their interaction with other economic entities in terms of knowledge generation and application based on synthesis of contemporary theoretical views and best international practices that can be implemented in the course of ensuring international competitive advantages of the domestic economy.

Institutional knowledge generation

Knowledge implies a justified true belief gained by a person through interaction with the world[16]. It is also determined as actual skilled action and/or as the potential to assess the situation so as to allow the skilled action. Therefore, knowledge should be seen primarily as action and continuous movement[17] from tacit knowledge to explicit knowledge (Fig. 1). Explicit knowledge is gained through the mind, being therefore objective, rational and recorded on a medium, and that is why libraries and museums at universities are so valued. Tacit knowledge is based on actions, procedures, compulsorism, ideals, values and emotions, therefore being subjective and relying on practice, experience and momentness, and that is why human-centrism is dominant at the universities. However, explicit knowledge is always based on tacit knowledge, and they make two inextricably linked opposites obtained mainly through social practice[18].

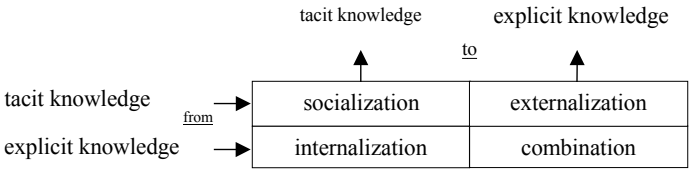

Fig. 1. Knowledge transformation methods

Source: after Nonaka I. A dynamic theory of organizational knowledge creation // Organization science, vol. 5, No. 1, Feb. 1994, P.14-37.

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[15] *Lukianenko D.G.* Innovation resource of Ukraine's economic development: intellectual mission of universities / D.G. Lukianenko, A.M. Poruchnyk // Vyshcha Shkola – K., 2011. – No. 12. – pp. 74-86. [In Ukrainian].

[16] *Nonaka I., von Krogh G.* Tacit Knowledge and Knowledge Conversion: Controversy and Advancement in Organizational Knowledge Creation Theory // Perspective: Organization Science, Vol. 20, No. 3, May–June 2009, pp. 635–652.

[17] Due to globalization, its scale reaches the whole world and the global economy.

[18] *Tsoukas H.* Do we really understand tacit knowledge? M. Easterby-Smith, M. Lyles, eds. The Blackwell Handbook of Organizational Learning and Knowledge Management. – Blackwell, Oxford, UK. – 2003. – pp.410–427.

In the organization (university) the knowledge is not only a resource or an end product, but implies above all the process of gaining, namely the process of[19] converting or transforming tacit knowledge into explicit knowledge. It can also be called the process of depersonalization or externalization of knowledge that may subsequently become public or private property. Capability of managing knowledge in an organization is based on the knowledge institutional evolution cycle (Fig. 2).

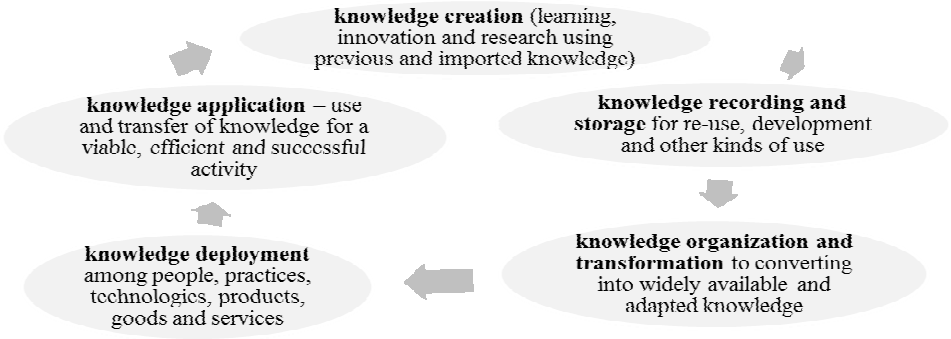

Fig. 2. Knowledge institutional evolution cycle

Source: *after Wiig K.M. Comprehensive knowledge management. Working Paper. KRI. No. 1999-4, Revision 1. – Knowledge Research Institute. – 9 p.*

For a university it is crucial to simultaneously identify individual level of knowledge evolution in order to carry out conscious activity with respect to each of the subjects (Fig. 3). Unlike other depersonificated factors of production, knowledge typically tends to being of individualized nature[20]. Personality is a key driving force in the creation and exploitation of knowledge in the organization, the quality of which depends mainly on two factors[21] – diversity of personal experience and the experience of

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[19] The processes of socialization and combination, internalization and externalization of knowledge are becoming internationalized through ICT development, deepening of international division of labor, mobility of students, teachers and researchers, as well as internationalization of economic relations in general, including in the field of higher education and research.

[20] Protection of intellectual property as a copyright is based upon this

[21] *Nonaka I.* A dynamic theory of organizational knowledge creation // Organization science, vol. 5, No. 1, Feb. 1994, pp.14-37.

knowledge. Therefore, much attention should be paid to preserving legacy of previous generations, often regarded as heritage [22].

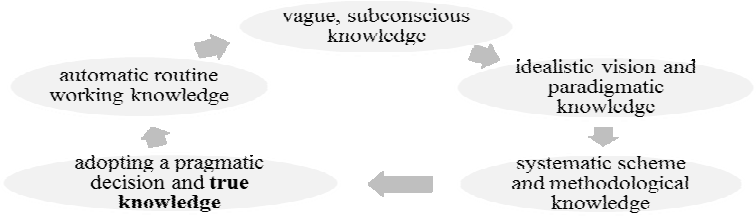

Fig. 3. Knowledge individual evolution cycle

Source: after Wiig K.M. Comprehensive knowledge management. Working Paper. KRI. No. 1999-4, Revision 1. — Knowledge Research Institute. — 9 p.

Methodologically, the emergence of new knowledge as argued by MacCormac[23], Leatherdale[24] and others, begins with tacit knowledge in the form of metaphors, analogies, eventually turning into a model. Tacit knowledge is converted into explicit knowledge first through recognition of the contradictions in the form of metaphors and afterwards – through their solving by virtue of analogy. Therefore, metaphor, analogy and model are components of the scientific inquiry process and should be actively used in educational activities.

The process of knowledge generation occurs under certain conditions and, as a cycle, comprises the following stages: increasing individual knowledge, exchange of tacit knowledge, conceptualization and crystallization, substantiation, dissemination of knowledge in the network of individuals (Fig. 4). Accurate identification of the mentioned stages and conditions at universities should be seen as the key to generating new knowledge based on the knowledge accumulated by previous generations.

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[22] *Cominelli F., Greffe X.* Intangible cultural heritage: Safeguarding for creativity // City, Culture and Society, No. 3. — Elseveier. — 2012. — pp. 245–250.

[23] *MacCormac E.R.* A Cognitive Theory of Metaphor. – Cambridge, MA: MIT Press. – 1985. – 254 p.

[24] *Leatherdale W. H.* The Role of Analogy, Model, and Metaphor in Science. – Amsterdam: North-Holland. – 1974. – 276 p.

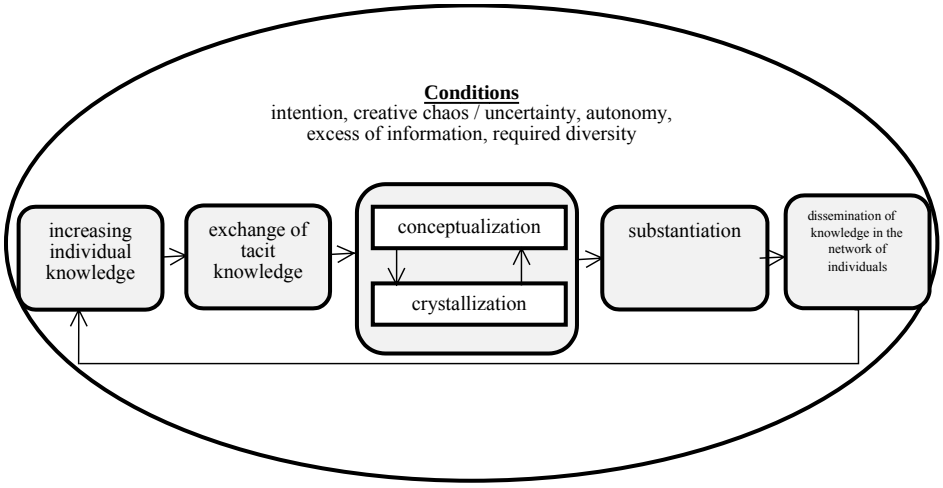

Fig. 4. The process of new knowledge generation

Source: after Nonaka I. A dynamic theory of organizational knowledge creation // Organization science, vol. 5, No. 1, Feb. 1994, P.14-37.

Institutional and individual levels of knowledge management are manifested in all subjects of economic relationship (Fig. 5). Thus, at the local, national, international and global levels preference is given primarily not to the issues of individual utility, but to the mechanisms and conditions for ensuring their preservation, generation, protection of property and effective use as resources for social and economic development in terms of combining both institutional and individual levels.

It is believed that knowledge is a resource for intellectual capital (hereinafter – IC) formation of an institution or a country. Development of IC categories commenced in the 1980s, as the common understanding of the intangible value concept was formed, which is often associated with goodwill[25]. During the 1980s the "age of information" was in the full swing with the difference between the book and market value of assets more clearly identified and early attempts to develop indicators for IC measurement taken.

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[25] *Petty R., Guthrie J.* Intellectual capital literature review: Measurement, reporting and management. // Journal of Intellectual Capital, Vol. 1 Iss: 2. – 2000. – pp. 155 – 176.

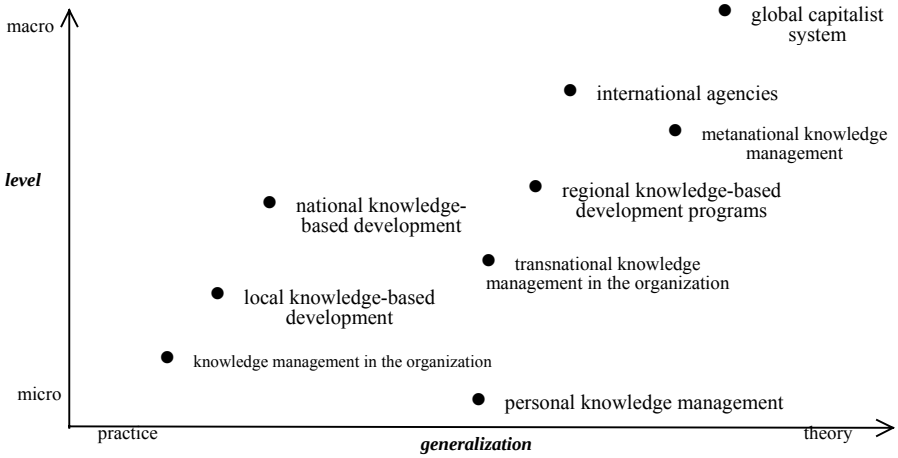

Fig. 5. Knowledge management axis system

Source: after Carrillo F. J. Capital systems: Implications for a global knowledge agenda. // Journal of Knowledge Management, No. 6(4). – 2002. – P. 379-399.

As a result, in the early 1990s the first initiatives as to systematic measurement and public reporting on IC accumulated by companies were implemented along with development of the balanced scorecard concept in turn leading to the theory of the new knowledge creation in the organization, drawing up of the first reports on IC by the companies, knowledge auditing and educational simulations. In the late 1990s and early 2000s the IC popularity grew due to researches, projects and academic conferences (e.g. OECD symposium on IC), articles and other publications, including within the leading international organizations.

Although there is still no commonly established definition of the "intellectual capital", most of the descriptions are formed based on IC identification with knowledge that can be converted into value [26]. This proves certain identification of IC with a resource that should be activated for achieving profits or socio-economic effects. Knowledge had been a topic for discussions yet by Plato and Aristotle, but IC researches still shortly evolved (Table 1.).

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[26] *Edvinsson L., Sullivan P.* Developing a model of managing intellectual capital // European Management Journal, Vol. 4 No. 4. – 1996. – pp. 356-364.

Table 1 **IC research evolution**

Feature	Stage		
	1	2	3
period	1980s – 1990s	1990s – 2004	2004 (2012) – …
theoretical framework	major (classical) theory	IC dynamic theory	IC aggregate theory
basic result	IC framework and structure outline	IC classification, its components, their taxonomy and grouping of IC evaluation approaches	criticism of theories and models
	emergence of new theoretical models	emergence of new theoretical models, practical application of both new and previous models	practical application of both new and previous models, emergence of new theoretical models
	terminology development	terminology development	transformational clarification of the terminology
basic object	IC importance for ensuring a sustainable competitive advantage	measurement, management, reporting; IC impact on financial results	critical study of IC practices; IC managerial aspects; financial and non-financial aspects
	corporations	corporations, SMEs, international experience	all types of entities, not just corporations
main developers	practitioners	researchers and practitioners	researchers, practitioners, politicians
researches	theoretical	mainly descriptive	growing importance of effectiveness research
practical significance	development of IC identification guidelines and standards	test verification of hypotheses; information disclosure and reporting	IC practical application, initiating experimentation with IC

Source: after Dumay J., Garanina T. Intellectual capital research: a critical examination of the third stage // Journal of Intellectual Capital, Vol. 14, Iss: 1. – Emerald. – 2013. – P. 10 – 25. and Dumay J. Grand theories as barriers to using IC concepts // Journal of Intellectual Capital, Vol. 13, No. 1. – 2012. – P. 4-15.

So one could argue that the current state of IC and knowledge research is pre-paradigmic and characterized by eclecticism (in terms of combining the most disparate components). Most researchers agree that the IC component composition envisages division into human capital, organizational capital and relationship

capital (Fig. 6).

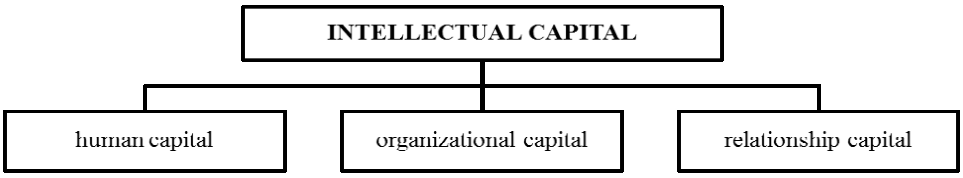

Fig. 6. IC component composition

This IC component composition is provided herein, because even in recent publications[27] it was regarded as separated from human capital (Fig. 7), although most researchers argue that IC does include the latter. Universities are traditionally regarded as institutions whose main activity implies education, research and development aimed at creating a layer of educated people in their totality forming the IC of both society and humanity and also acting as providers of IC materialized components (Fig. 8) and the education of future generations. IC can be regarded as an intellectual resource in cases when its application has not been determined yet.

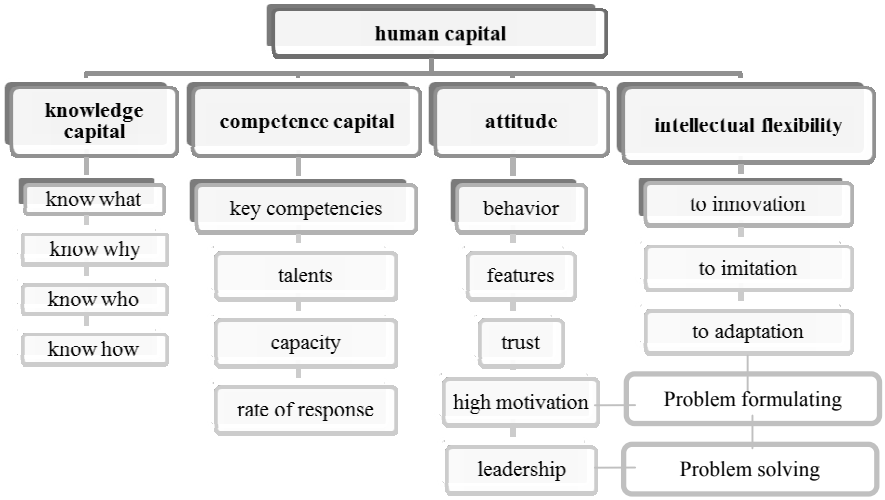

Fig. 7. Component composition of human capital as an IC component

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[27] Convergence and divergence in Europe: the Polish and Ukrainian cases: Monograph / [D. Lukianenko, V. Chuzhykov, Michal. G. Woźniak et al.]; under scientific editorship by D. Lukianenko, V. Chuzhykov, Michal. G. Woźniak. – K.: KNEU, 2013. – 688 p.– In English, Ukrainian.

The common feature of all the IC components is being the results of intellectual activities of a person and of the society. The most often mentioned major reasons for the need to measure IC can be grouped into the following blocks: 1) their use in implementation of institutional strategies, 2) their impact on behavior, and 3) external confirmation of their value[28].

IC component proving hardest to measure is the relationship capital consisting of relationships between all the subjects directly or indirectly related to the subject. At that, most often such subject groups are distinguished as: employees, investors and owners, communities and councils, suppliers, customers and distributors, strategic partners and the state. On the country scale the national IC is identified as the determining factor in development of the national market and financial capital.

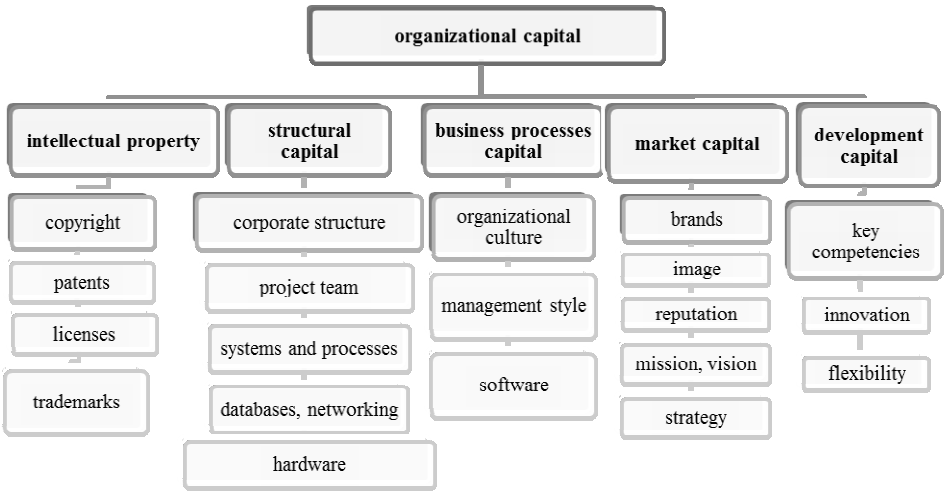

Fig. 8. Component composition of organizational capital as an IC component

Intellectual capital in the international practice

The key value of knowledge-based economy is innovation supported by competition and efficiency, whereas health state of such economy is determined by the legal system and state of jus-

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[28] *Marr B., Chatzke J.* Intellectual capital at the crossroads: managing, measuring, and reporting of IC // Journal of Intellectual Capital, Vol. 5 No. 2, 2004. — Emerald Group Publishing. — pp. 224-229.

[29] *Hsu G.J.Y., Lin Y.-H., Wei Z.-Y.* Competition policy for technological innovation in an era of knowledge-based economy // Knowledge-Based Systems, No. 21. — Elsevier.— 2008. — pp. 826–832.

tice in the country[29]. Until recently, various publications on regional models of the economy innovation development often advocated the idea of the *knowledge triangle* consisting of both public and private sectors of knowledge, but the said idea never gained sharp contours[30]. Although the knowledge triangle on the EU innovation agenda characterizes education, research and innovation as key development factors[31]. By virtue of the Bologna process European countries seek to create a common scientific and educational domain. Unfortunately, the higher education system as the key IC provider remains a marginalized element in terms of development, the evidence of which is provided by studies held by development research centers finding that less than 5% of researchers characterize themselves as engaged in matters of education[32].

On the example of the Arab world countries N. Bontis researched[33] interrelation between national IC components and determined their mutual influence coefficients (□) (Fig. 9). Human capital is regarded as the basis of forming IC of the nation whose citizens are engaged in internalizing knowledge to the systems and processes in the country (H1), which as the aggregate process capital form the basis for future renewal (H2) by investing in research and development activities. As a result of the renewal capital functioning (H3) the human capital is enriched, while developing and commercializing in the relevant markets (H4). Continual development of the national human capital (H5) and capability of the nation to commercialize intellectual welfare are united in the financial capital dynamics (H6), which in Arab countries made 20%.

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[30] *Lansu A., Boon J., Sloep P.B.,* Rietje van Dam-Mieras Changing professional demands in sustainable regional development: a curriculum design process to meet transboundary competence // Journal of Cleaner Production, No. 49, 2013, pp. 123-133.

[31] *van Vught F.* The EU innovation agenda: challenges for European higher education and research // Higher Education Management and Policy, No. 21/2. – OECD. – 2009. – 22 p.

[32] *McGrath S.* Education and development: Thirty years of continuity and change // International Journal of Educational Development, No. 30. — Elsevier. — 2010. — pp. 537–543.

[33] *Bontis N.* National Intellectual Capital Index: A United Nations initiative for the Arab region // Journal of Intellectual Capital, Vol. 5 No. 1. — Emerald Group Publishing Limited.— 2004. — pp. 13-39.

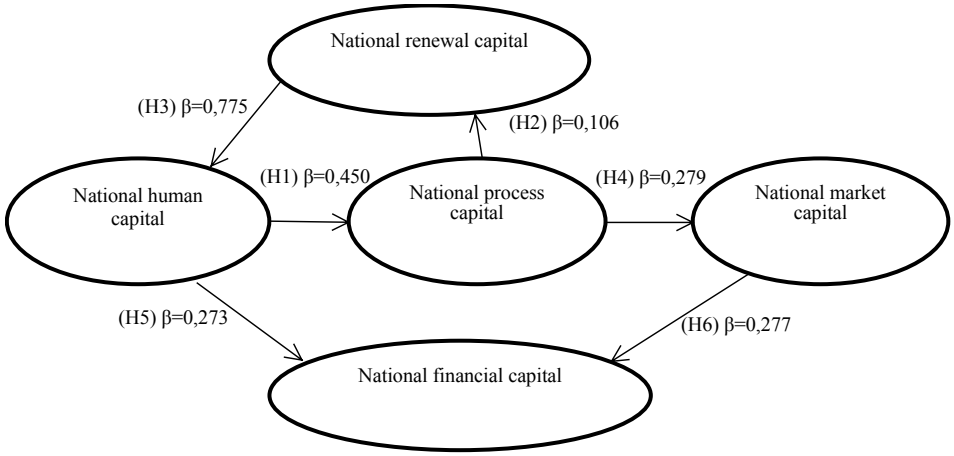

Fig. 9. Conceptual map of national IC relationships of the Arab world countries[34]

Another example of the practical IC application implies benchmarking countries by selected indicators[35] (table 2). Knowledge economy index shows that IC can be converted into a resource that is hardly ever used for the purpose of socio-economic development because of lacking effective interrelation between the institutional mode of economic initiatives and knowledge (education, innovation, ICT). It is harmoniously combined with the global human development index and the talent competitiveness index.

Table 2 **Knowledge economy index dynamics (World Bank)**

Rank		Country	Knowledge economy index	Knowledge index	Mode of economic initiatives	Innovation	Education	ICT
2012	2012-2000							
1		Sweden	9,43	9,38	**9,58**	9,74	8,92	9,49
2	6	Finland	9,33	9,22	**9,65**	9,66	8,77	9,22
3		Denmark	9,16	9	**9,63**	9,49	8,63	8,88
4	−2	Netherlands	9,11	9,22	**8,79**	9,46	8,75	9,45
5	2	Norway	9,11	8,99	**9,47**	9,01	9,43	8,53

[34] Ibid.
[35] In general, on a global scale there is a problem of data collection for ensuring the proper level of international research.

Rank		Country	Knowledge economy index	Knowledge index	Mode of economic initiatives	Innovation	Education	ICT
2012	2012-2000							
6	3	New Zealand	8,97	8,93	**9,09**	8,66	**9,81**	8,3
7	3	Canada	8,92	8,72	**9,52**	9,32	8,61	8,23
8	7	Germany	8,9	8,83	**9,1**	9,11	8,2	9,17
9	−3	Australia	8,88	8,98	**8,56**	8,92	9,71	8,32
10	−5	Switzerland	8,87	8,65	**9,54**	**9,86**	6,9	9,2
11		Ireland	8,86	8,73	**9,26**	9,11	8,87	8,21
12	−8	USA	8,77	8,89	**8,41**	9,46	8,7	8,51
13	3	Taiwan	8,77	9,1	**7,77**	9,38	8,87	9,06
14	−2	Great Britain	8,76	8,61	**9,2**	9,12	7,27	9,45
19	7	Estonia	8,4	8,26	**8,81**	7,75	8,6	8,44
55	9	Russia	5,78	6,96	**2,23**	6,93	6,79	7,16
56	**−2**	**Ukraine**	**5,73**	**6,33**	**3,95**	**5,76**	**8,26**	**4,96**
59	11	Belarus	5,59	6,62	**2,5**	5,7	7,37	6,79

Source: after Knowledge Economy Index (KEI) 2012 Rankings. World Bank.

University activity modes

Humanity is gradually transiting from the state when the amount of accumulated knowledge is abundant for satisfying needs to the state of excess demand for knowledge. This leads both to increasing knowledge value and to internal changes in the system and institutions that provide for knowledge accumulation, generation and commercialization. This trend was effectively described by M. Gibbons[36], who distinguished between two modes of knowledge production – the traditional mode-1 and contemporary mode-2, which has been growing ever more important since the second half of the twentieth century. Unlike mode-1 implying that production of knowledge at universities was characterized as the universities' internal motivation to search fundamental knowledge without immediate mandatory application and verifi-

[36] *Gibbons M., Limoges C., Nowotny H., Schawartzman S., Scott P., Trow M.* The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies. – Sage Publications, Thousand Oaks, CA. – 1994. – 16 p.

cation thereof, the contemporary mode-2 suggests a shift of motivational factors with the latter being represented mainly by external subjects seeking new knowledge for meeting their own social and economic needs, while globalization places them anywhere in the world economy (Table 3).

Table 3 **University concept evolution in economic context**

Mode	Past	Contemporary	Evolution
	1	2	3
University mission	knowledge preservation	knowledge factory	knowledge focus centre
University brief description	bureaucratic and elite, above society	IC supplier (both "raw material" and "output"), develops technologies	an integrated institution in the intellectual region promoting local development by creating new opportunities
Economic context	piece-production	mass industrial production	post-industrial and knowledge-driven age

Source: after Youtie J., Shapira P. Building an innovation hub: A case study of the transformation of university roles in regional technological and economic development // Research Policy, No. 37. – Elsevier. – 2008. – P.1188-1204.

Some scientists emphasize[37] that mode 3 contours are already becoming clearly visible, as the studies reveal transformation of the local development processes. This trend was supported by the emergence of such concepts as university-1 and university-2 with the university-3 concept also expected and the trend is apparently already spreading starting from the United States. In addition to the traditional roles, the university should be seen as a mediator in the innovation process linking research and results thereof with further commercialization acting as a catalyst and the engine of social and economic development. The knowledge creation, acquisition, deployment and diffusion processes are the core functions of the university in mode-3. This evolution is prompted by transition of the leading countries from mass production and linear transfer of knowledge to the open interactive post-industrial

[37] *Youtie J., Shapira P.* Building an innovation hub: A case study of the transformation of university roles in regional technological and economic development // Research Policy, No. 37. — Elsevier. — 2008. — pp. 1188-1204.

innovation system, with the knowledge being its engine[38]. In turn, transition to the knowledge economy[39] must be accompanied by a simultaneous reform of universities and the education system as a whole (Table 4).

The "third" mission of the University as to continual engaging in the local and regional socio-economic development process is the most notable in comparison with the traditional missions of education and research. Considering universities as the main source of new knowledge prompting the flow effect, a team of scientists revealed that with the geographical distance from the knowledge generation venue growing, the flow effect decreases [40].

Table 4 **Transition from elite to mass higher education system**

	Elite (closed) system	**Mass (open) system**
key features	subject-based; support of canonical scientific traditions; knowledge important in itself and not due to the instrumental value	curriculum-based; pluralism, heterogeneity; sensitivity to the needs of society and the economy
scale and forms	mostly two- and three-level system	trend towards a single unified system with a high level of diversification of programs and institutions
limits	distinct, strict and stern;	fuzzy, penetrable
attitude to society	isolated; academic colleagues are major related parties	open, accountable; partnership with the public, industry and other higher education institutions
knowledge structure	formal, academic; subject-based	hybrid forms: a combination of academic and professional/implicit knowledge
organizational forms	pedantic collegiality, canonicity; subject-based departments, faculties	managerial, pragmatic; transdisciplinary schools, interinstitutional projects
delivery	contact and resident teaching	different delivery modes: con-

[38] *Chesbrough H.W.* Open Innovation: The New Imperative for Creating and Profiting from Technology. Harvard University Press, Boston, Massachusetts. – 2005. – 272 p.

[39] *Christinidis G., Ellis H.* Knowledge, Education, and Citizenship in a Pre- and Post-National Age // Journal of Knowledge Economy, No. 4. – 2013. – pp. 63–82.

[40] *Laranja M., Uyarra E., Flanagan K.* Policies for science, technology and innovation: Translating rationales into regional policies in a multi-level setting // Research Policy, No. 37. — Elsevier. — 2008. — pp. 823–835.

	Elite (closed) system	Mass (open) system
mode	envisaging subject-based degree granting	tact and resident, distance learning, resources-based training; periodic training; adults education; short-term training along with certificate issue; lifelong learning;
access	restricted; mostly middle class elite youth	extended; more diversified population groups: young people and employed adults; representatives of previously marginalized social groups, etc.

Source: after Changing Modes: New knowledge production and its implications for higher education in South Africa. / Andre Kraak (ed). – HSRC Press – 2000. – pp. 12-16

Students of an entrepreneurial university do not only represent the next generation of professionals, but also prepare to become entrepreneurs and founders of companies by following a variety of programs on entrepreneurship and new educational modules, including interdisciplinary centers, science parks, academic spin-off companies, 'incubators' and venture companies. An entrepreneurial university is one of the entities creating new technologies and ensuring their transfer, while transforming from a source of new ideas for the existing firms into a source of emerging new firms, especially in such areas as science and innovation.

The main factors entailing changes of a university activity and research modes are globalization and democratization of access to the universities. For the first time in the world history, the most extensive investments in scientific research infrastructure of universities, especially in the US, as well as cooperation between universities, industrial and military entities during the 1960-1970s led to approachment of universities to the final consumers. The current wave of globalization requires achieving flexibility and adaptation in the knowledge economy[41], while international competitiveness is known to be based primarily on inner strength and willingness to change.

Criticism of the previous modes has led to emergence of the triple helix concept, which later developed into a coherent concept of innovative triple helix further to become logical extension

[41] Changing Modes: New knowledge production and its implications for higher education in South Africa. / Andre Kraak (ed). – HSRC Press – 2000. – P. 10

of the innovation triangle model proposed by J. Sabato in 1975[42], which assigned the leading role exclusively to the government. The concept of a triple helix revealed a shift from the dominance of the bilateral relations between the government and industry in the industrial society to the tripartite equal relations between universities, government and industry in the knowledge society. The potential of innovation and economic development in knowledge economy relies on the leading role of universities and formation of new institutional forms and social formats for production, transfer and application of knowledge. This vision includes not only the creative destruction resulting from the natural dynamics of innovation according to by Schumpeter, but also creative renewal in each of the three subjects

From the neo-institutional point of view there are three basic configurations in positioning of universities, industrial entities and government institutions[43]: (I) statesmanship-based configuration: the state plays a leading role in managing research institutions and industry, as well as limiting their ability to initiate and develop innovative transformations (e.g., Russia, China and some Latin American and Eastern European countries); (II) non-interference configuration: restricted state intervention in the economy (such as the USA and some Western European countries), with industry being the driving force and the other two subjects acting as support structures having a restricted role in the field of innovation: university operates mainly as supplier of skilled human capital, while the government is a regulator of social and economic mechanisms; and (III) – balanced configuration characteristic of transition to a knowledge-based society, where the university and other knowledge institutions act in partnership with industry and government, occasionally taking the lead.

The key element in the triple helix concept is an entrepreneurial university taking a proactive position in creating and applying new knowledge, while acting in an interactive mode. By means of developing relationship universities combine scattered intellectual property objects and use them together. Innovations cease being an exclusively intra-corporate matter and attract external partners, including universities, which have traditionally not been characterized as innovators.

Experience of researching innovation system in the city of Monterrey (Mexico)[44] shows that the range of subjects defining

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[42] Ibid. pp. 109-123

[43] Ibid, P. 109-123

[44] *Garcia B.C., Chavez D.* Network-based innovation systems: A capital base for the Monterrey city-region, Mexico // Expert Systems with Applications, No. 41. — Elsevier. — 2014. — pp. 5636–5646.

the institutional framework of cooperation within the triple helix concept is extremely wide and thus each of the three components of the spiral should be seen more widely. So, universities comprise institutions that ensure preservation, generation and diffusion of knowledge, such as private and public research centers, parks and organizations, libraries, museums, technological institutes and universities themselves which have to cooperate with each other in order to provide opportunities for meeting the needs of the other two subjects. Therefore, it would be expedient to dub the university component as the knowledge generation and diffusion subsystem. Similarly, industry should rather be dubbed the knowledge use and exploitation subsystem, while the government should be characterized as the innovation policy subsystem (Fig. 10).

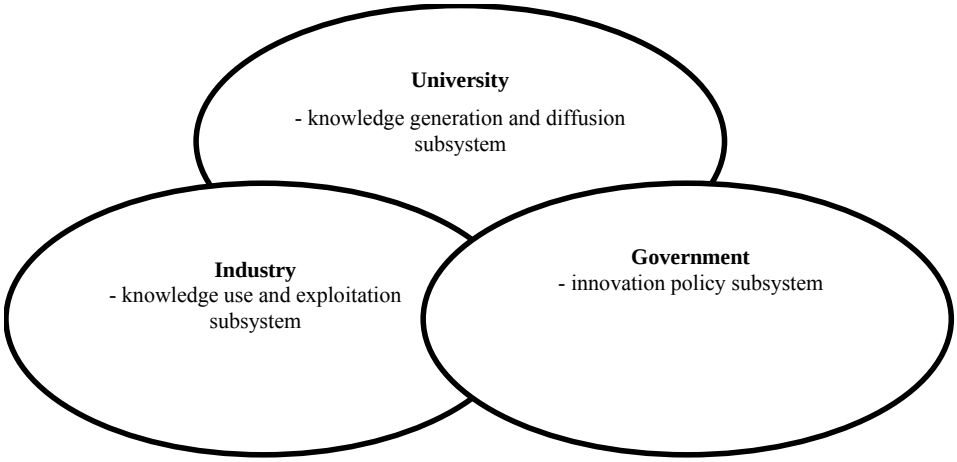

Fig. 10. Triple helix concept model

The need for introducing the fourth subject to this model has been argued as well[45] implying public organizations primarily being the place for identification of challenges and development problems. So, one can expect development of the 'four pillars' concept. At the same time one should acknowledge that universities, research and development as well as other knowledge trans-

[45] *Heng L.H., Othman N.F.M., Rasli A.M., Iqbald M.J.* Fourth Pillar in the Transformation of Production Economy to Knowledge Economy // Procedia - Social and Behavioral Sciences, No. 40. Asia Pacific Business Innovation and Technology Management, Pattaya, Thailand. — Elsevier. — 2012. — pp .530 – 536.

fer programs as such while being essential fail to launch the innovation system mechanism in view of the importance of complementary assets, which are venture capital and high-quality education system. At that, as well profits from innovation should be gained not only by innovators themselves but also by consumers, suppliers, simulator companies and other followers[46]. Perhaps, distribution of roles should imply that institutions representing the state are aiming to create favorable conditions, while the universities should generate and disseminate knowledge (Fig. 4).

Theoretical views are confronted with the political economy practice dominant in the country. Obviously, the neoclassical theory, the theory of growth after Schumpeter, the neo-Marshallian theory as well as systemic institutional and evolutionary theories have different views on the scientific, technological and innovation policies, in particular as regards the place and domain of technologies, government intervention rationale, intervention objectives and level, the role of the authority implementing the policy, instruments thereof and operationalization mode (objective, criteria of legitimacy, selectivity)[47]. The most attractive is the evolutionary approach to the development of science, technology and innovation policy as justification for state intervention, since state intervention is conditioned by educational failure and cognitive gaps, while the intervention is aimed at growth of cognitive capacity.

For innovative systems operating on the national, regional or international scale, a number of educational and knowledge engines is identified (Table 5). Each dimension provides significant space for the activity of universities. For example, industry-university interaction can take such forms as cooperative industrial and university R&D, joint industrial and university patenting, joint industrial and university publishing, industrial use of university patents, industrial and university exchange of information. It is advisable to identify the quality engines that provide for the international competitiveness of universities as such[48].

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[46] *Teece D.* Profiting from technological innovation: implications for integration, collaboration, licensing, and public policy. Research Policy, #15. – 1986. – pp. 286.

[47] *Laranja M., Uyarra E., Flanagan K.* Policies for science, technology and innovation: Translating rationales into regional policies in a multi-level setting // Research Policy, No. 37. — Elsevier. — 2008. — pp. 823–835.

[48] *Antoniuk L.L., Satsyk V.I.* Concepts of international competitiveness of universities. [Electronic resource]. Access mode: http://meim.kneu.edu.ua/get_file.php?id=2292. [In Ukrainian].

Table 5 **Educational and knowledge engines of innovation systems**

Engine	Dimension
knowledge flows	industrial alliances
	industry and university cooperation
	industrial and research institutional cooperation
	diffusion of technologies
	staff mobility
institutions	institutional subsystems
	other institutional/organizational structures
	standards and their perception
interactive learning	uncertainty
	scientific knowledge
	comprehensiveness
	experimentation
	cumulativeness
training in economic competencies (company level)	strategic/selective capacity
	internal organizational/integrating/coordinating capacity
	technical/functional capacity
	learning/adapting capacity
	external organizational/integrating/coordinating capacity

Source: after Garcia B.C., Chavez D. Network-based innovation systems: A capital base for the Monterrey city-region, Mexico // Expert Systems with Applications, No. 41. – Elsevier. – 2014. – P.5636-5646.

Universities occupy a unique place in the institutional structure of the national innovation system of any country. E.g.[49], institutional development strategies under Taiwan national program of intellectual electronics aimed at achieving interdisciplinary innovations being implemented during 2011-2015 clearly identify place the position of universities.

[49] *Wang C.-T., Chiu C.-S.* Competitive strategies for Taiwan's semiconductor industry in a new world economy // Technology in Society, No. 36. — Elsevier. — 2014. — pp. 60–73.

In studies focusing on knowledge as on the key resource a wide range of regional innovation systems is considered (Fig. 11). Given that innovation is inherent in all economic entities, they should comprise not only industrial manufacturers, as Chavez and Garcia insist, but all the manufacturers. In addition, research activities engage not only public but also private specialized institutions and corporate divisions, which should be adequately reflected in the institutional structure of any innovation system. However, as they correctly point out the example of NAFTA, regional and urban university systems in cross-border cooperation play the role implying more than just transfer of knowledge from universities to manufacturers, but also provide key support in the formation of clusters and innovation systems, whereas governments should take care of the local level development and social studies.

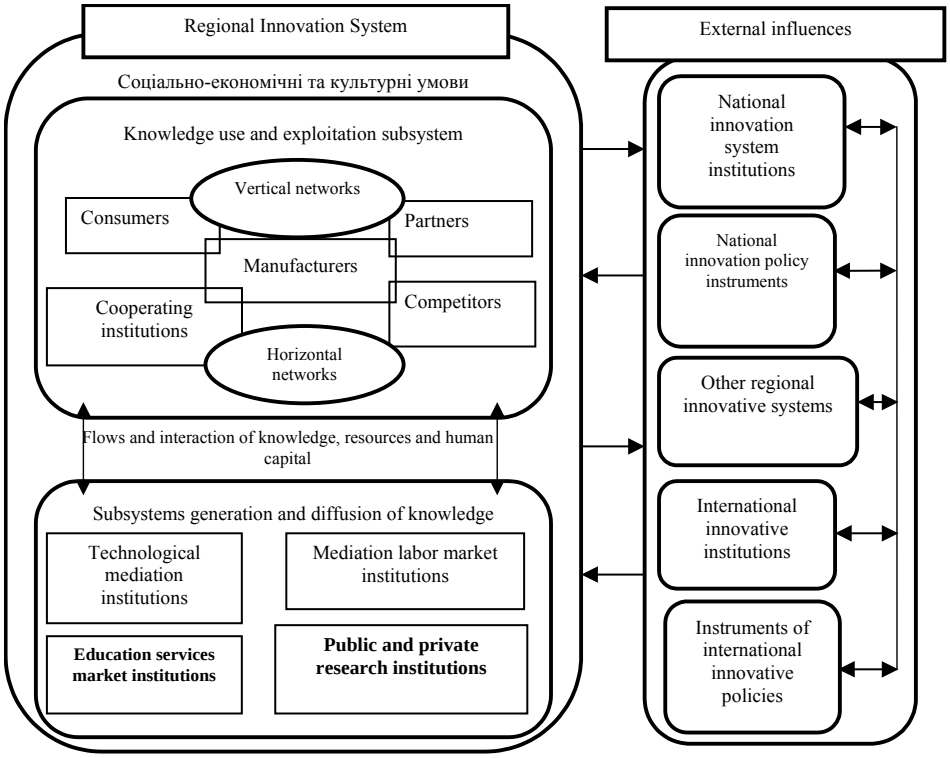

Fig. 11. Scientific and educational institutions in the innovation system

Source: after Garcia B.C., Chavez D. Network-based innovation systems: A capital base for the Monterrey city-region, Mexico // Expert Systems withApplications, No. 41. – Elsevier. – 2014. – pp. 5636-5646.

The main yielding activity of the universities is teaching and research, however development of mode-3 leads to deep integration of universities into local innovation systems[50]. At that, a significant role in the activity of universities is vested in such parameters as activity within the university and relationship with local communities[51]. With the growing importance of interdisciplinary research, search for various ways of cooperation of universities with local companies, the authorities and community more clearly outline the need for the formation of innovation hubs around the universities as points where rational traditions of knowledge handling are established. Technology transfer offices that have become traditional for the top universities[52], quite successfully perform the functions of technology commercialization, but still have considerable potential for cooperation involving universities.

The term 'commercialization' of research is not quite a correct characteristic feature of universities, therefore it is better to speak about purposeful research, because the result is not always guaranteed. As long as public funding of research becomes less adequate, an objective need occurs to diversify sources of financing, which requires more creative approaches in search for the latter, while on the other hand – universities and other research organizations more clearly realize the value of intellectual property and IC both in terms of their market value and long-term potential; which ultimately is called the process of university research commercialization.

University intellectual capital

The global knowledge economy institutions independently determine their mission and success factors. One of the key components is identification of the University IC (Fig. 12). Given the crucial relevance of these studies, results of which enable universities to form local and global competitive strategies, the number of open publications is limited.

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[50] *Youtie J., Shapira P.* Building an innovation hub: A case study of the transformation of university roles in regional technological and economic development // Research Policy, No. 37. — Elsevier. — 2008. — pp. 1188–1204.

[51] *Cortese A.D.* The critical role of higher education in creating a sustainable future. Planning for Higher Education, No. 31 (3). – 2003. – P.15-22.

[52] *Ilnitskyi D.O.* Competition in the global scientific and educational domain / Evolution of global development: global challenges and global diplomacy: collection of scientific abstracts (December 18, 2014, Kyiv) / under general editorship by M.A. Kulinich, N.O. Tatarenko, V.G. Tsivaty. – K.: DAU at FAM of Ukraine, 2014. – pp. 65-66. [In Ukrainian].

Based on the proposed structure and indicators[53] the relative value of the IC components in European universities has been identified (Table 6). At that, it should be borne in mind that not everything measured is necessarily already managed or can be managed[54]. Obviously, the expansion of sources database will contribute to obtaining more objective results that may be different in various universities, industries and even countries.

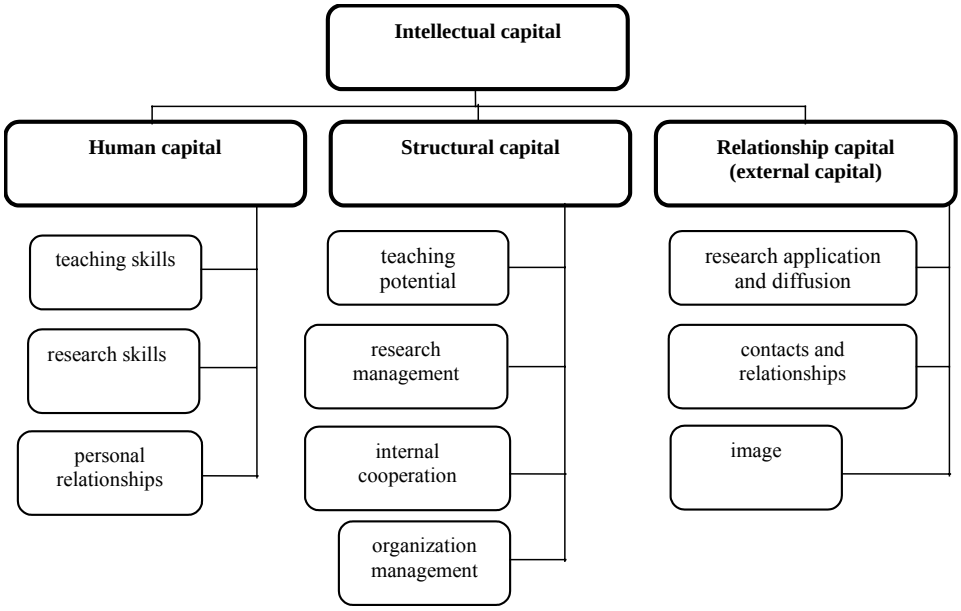

Fig. 12. University IC structure

Source: after Martınez-Torres M.R. A procedure to design a structural and measurement model of Intellectual Capital: An exploratory study // Information & Management, No. 43. – Elsevier. – 2006. – pp. 617-626.

Research of Taiwan universities' assets structure revealed the ratio between intellectual property and university tangible assets (Table 7). One can argue that those relate to Taiwan only, but its educational system and universities occupy much better positions in the leading rankings[55] compared to those of Ukraine and

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[53] *Martınez-Torres M.R.* A procedure to design a structural and measurement model of Intellectual Capital: An exploratory study // Information & Management, No. 43. – Elsevier. – 2006. – pp. 617–626.

[54] *Arnulf J. K.* What's measured is not necessarily managed: Cognitive contingencies of organizational measurement // Scandinavian Journal of Psychology. No. 46(1). – 2005. – pp. 59-68.

[55] International university rankings facilitate stratification of universities, in particular into groups operating on local, national, international and global scale, which causes increased competition between them at all levels.

have been developed by following the best world standards. Therefore, one can definitely state that circa 80% of a modern university assets are vested in the intangible assets.

Table 6 **Relative value of university IC components, %**

components	by the conceptual card method	by the partial least squares method
Human capital	28,6	24,9
Relationship capital	25,7	25,2
Structural capital	45,7	49,4

Source: after Martinez-Torres M.R. A procedure to design a structural and measurement model of Intellectual Capital: An exploratory study // Information & Management, No. 43. – Elsevier. – 2006. – P. 617-626.

Neo-institutional analysis of university corporatization processes in developed countries has revealed key trends, namely: marketization deepening as market orientation of universities increased with the market regarded as a source of financial resources; direct control reduction; relative decrease in public funding compared with the number of students[56]. Considering the autonomy and accountability as different aspects of a single process, the Austrian universities were obliged to report along with including two mandatory reporting components – financial statements and knowledge balance[57], because of the said components forming part of knowledge management. Transparency of university activity is aimed at promoting more efficient integration into national and global market environment.

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[56] *Parker L.* University corporatization: driving redefinition // Critical Perspectives on Accounting, No. 22. – 2011. – pp. 434–450.

[57] *Habersam M., Piber M., Skoog M.* Knowledge balance sheets in Austrian universities: The implementation, use, and re-shaping of measurement and management practices // Critical Perspectives on Accounting, No. 24. — Elsevier. — 2013. — pp. 319–337.

Table 7 **Weight coefficients in university IC measuring**

components	Indicators	weight coefficients		factor priority	university type
		of components	Of indicators		
intellectual property	innovative references	**0,801**	0,163	3	intensive research
	innovative culture		0,342	1	intensive education
	new valuable ideas		0,295	2	
tangible assets	number of publications	**0,199**	0,049	5	
	financial support		0,034	6	intensive professional
	research results		0,096	4	

Source: after Wu H.-Y., Chen J.-K., Chen I.-S. Innovation capital indicator assessment of Taiwanese Universities: A hybrid fuzzy model application // Expert Systems with Applications, No. 37. – Elsevier. – 2010. – P. 1635-1642.

Universities and creativity

Economic globalization in combination with the processes of informatization, intellectualization, development of ICT, networks and creative economy lead to the virtual economy formation[58]. Universities are encouraged to consider creativity as one of the competencies that can be gained by their graduates, but at that should demonstrate creativity as to the challenges they face[59].

Creativity has to become one of the key areas of research in the coming decades, because creation of products with new properties is one of the key factors determining competitiveness of

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[58] *Lukianenko D.G.* Virtualization of economy and transformation of global competition domain / Evolution of global development: global challenges and global diplomacy: collection of scientific abstracts (December 18, 2014, Kyiv) / under general editorship by M.A. Kulinich, N.O. Tatarenko, V.G. Tsivaty. – K.: DAU at FAM of Ukraine, 2014. – pp. 6-9. [In Ukrainian].

[59] *Ilnitskyi D.O.* Global competition in the scientific and educational domain: creativity / National models of economic systems: formation, management, transformation. Materials of the international research and practice conference (Kherson, October 10-11, 2014). In 2 volumes / ed. board: K.S. Shaposhnikov[et al.]. – Kherson: *Helventyka* Publishing House, 2014. – Vol. 1. – pp. 33-37. [In Ukrainian].

[60] *Cominelli F., Greffe X.* Intangible cultural heritage: Safeguarding for creativity // City, Culture and Society, No. 3. — Elseveier. — 2012. — pp. 245–250.

companies. The researchers argue that creating of novelties must be legacy-based[60]. In the global knowledge economy its main forms imply tangible and intangible cultural heritage[61]. There are also opinions that creativity is the result of crossing characteristics, paradigms and values which are generally outside the traditional activities of an individual, and therefore creativity requires organizing such crossing of both explicit and tacit, general and local knowledge[62]. In studies by M. Polianyi creative issues, especially inventions are associated with 'shots-through' or prove burdened by personal feelings and commitments, however science is not free from values and implies the result of creative tension as well as of reasoned and critical search[63].

Works by M. Hranovetter gave start to researching the relationship between creativity and social networks[64] along with identifying differences between strong and weak social relationships that can be detected by the analyzing the process uniting people, namely: 1) amount of time; 2) emotional intensity; 3) proximity, mutual trust; 4) mutual utility. Global access to social networks[65] transforms the world into a source of creativity, while the creative parks[66] are used at the national level to find niches in global markets.

Even at the level of international organizations and governments it has been acknowledged[67], that by diversifying the struc-ture of the national economy, especially in developing countries, the creative sector of economy, aims to promote more sustainable economic development by means of countering future economic crises.

Deepening of the labor international division processes in the sector of services based on knowledge leads to formation of specialized clusters serving global markets. Their origin, formation

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[61] See Convention for the Safeguarding of the Intangible Cultural Heritage (2003) and Convention Concerning the Protection of World Cultural and Natural Heritage (1972)

[62] *Cominelli F., Greffe X.* Intangible cultural heritage: Safeguarding for creativity // City, Culture and Society, No. 3. — Elseveier. — 2012. — pp. 245–250.

[63] *Polanyi M.* The Tacit Dimension. / ed. Amartya Sen. — University of Chicago Pres. — 1967/2009. — 108 p.

[64] *Hranovetter M. S.* The strength of weak ties // American Newspaper of Sociology, Volume 78, Issue 6. – 1973. — pp. 1360–1380.

[65] Which similarly to the Internet emerged as a result of university research and experiments.

[66] *Dong Q., Gao C.* Knowledge Engineering, Intellectual Capital of Creative Industry Park Based on Multi-objective Decision-Making and Entropy Methods // Systems Engineering Procedia, No. 3. — Elsevier. — 2012. — pp. 326 – 332.

[67] UNCTAD 2010. United Nations Conference on Trade and Development. The Creative Economy Report. Retrieved 30 September 2012, from http://unctad.org.

[68] *Manning S., Ricart J.E., Rique M.S.R., Lewin A.Y.* From blind spots to hotspots: How knowledge services clusters develop and attract foreign investment // Journal of International Management, No. 16. — Elsevier. — 2010. — pp. 369–382.

and development are primarily locally-rooted which allows to use possibilities for transformation into a global player. Researches[68] of knowledge-based services cluster development in Argentina, Brazil, Mexico and India has enabled identifying the key factors that determine their specificity as originating from countries wishing to catch up with the developed countries. Here, universities collaborating with companies play an important role in the formation of local talented workforce resource, conducting and commercialization of applied research as well as in creating venture companies.

Quite often, based on studies conducted the universities resort to creation of companies, by which they try to implement progressive ideas. C. Curado K. and N. Bontis developed an IC control matrix based on the combination of disciplines such as organizational learning, knowledge management and IC, in which the scientists consider a process but not a set of options (Figure 13). In terms of this process the company's progress from a new company (a start-up) to mature business and during this progress a company has to make choices between the activity aimed at gaining new knowledge, and activities on research and knowledge exploitation.

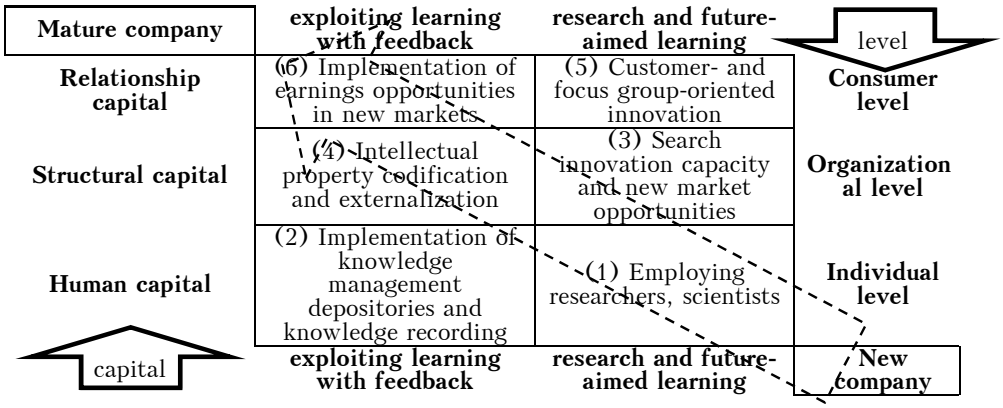

Fig. 13. Learning and intellectual capital management matrix

Source: after Curado C., Bontis N. Managing intellectual capital: the MIC matrix // International Journal of Knowledge and Learning, Vol. 3, Nos. 2/3. – 2007. – P.316-328.

Particular importance of this matrix is in providing users with methodological framework allowing to identify the predominant type of action in the organization and, if necessary, to change

priorities. Unfortunately, practical experience still provides very restricted evidence of the matrix application efficiency by organizations and consulting companies. Therefore, it is important to preserve the corporate memory, including that of universities as quasi-corporations, as well as in the form of corporate memory unifying the knowledge on IC management in a particular organization and becoming ever more important as competition rate in the market keeps growing. The corporate memory[69] is developed based on analytical expertise, defined as knowledge providing answers to the questions 'who, when, where, what, why and how'.

Conclusion

Today the paradigm of universities is eclectic, although in late XX century scientists agreed with the thesis[70] that the IC of an organization grows when the organization uses knowledge of the employees, while the latter continue to increase their knowledge. At the level of universities[71] aiming to produce and disseminate knowledge in the global competition environment, the main engines are academic staff, academic research and involvement in the local development process.

The contemporary level of specialization in scientific research does not only drive but also requires researchers to engage in external relations with the representatives of other countries and organizations with the purpose of ensuring individual evolution of knowledge. Universities should maintain close ongoing cooperation with the government, industrial entities and civil society, which is a key factor of socio-economic development. Such multi-lateral cooperation ensures that the knowledge performs the functions of the socio-economic development factor.

The knowledge-based economies regard knowledge production as the key factor, while the flipside of such implies acknowledgment of the economic dimension dominance in the field of higher education[72]. This transformation from the social to the economic function of the universities requires further research, since universities are at the heart of global competition for knowledge that determines their current mode of activity. The conscious ac-

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[69] *Huang C.-C., Fan Y.-N., Chern C.-C., Yen P.-H.* Measurement of analytical knowledge-based corporate memory and its application // Decision Support Systems, No. 54. — Elsevier. — 2013. — pp. 846–857.

[70] *Stewart T.A.* Intellectual Capital: The New Wealth of Organizations. – New York. – 1997. – 320 p.

[71] *Ramirez Y., Lorduy C., Rojas J.A.* Intellectual capital management in Spanish universities // Journal of Intellectual Capital, No. 8 (4). – 2007. – pp. 732–748.

[72] *Christinidis G., Ellis H.* Knowledge, Education, and Citizenship in a Preand Post-National Age // Journal of Knowledge Economy, No. 4. – 2013. – pp. 63–82.

tivity of universities concerning intellectual capital and all of its components and elements determines the effectiveness of the knowledge economy development in a country or a region, as well as their competitiveness on a global scale. World-class universities (unlike other universities traditionally producing intellectual resources only) are of entrepreneurial nature and engaged in purposeful activity on intellectual capital formation, while receiving a certain share of the added value created by the IC.

The global advantages of the educated society have been widely discussed in scientific literature, however contemporary universities should adequately meet the mass education challenge while maintaining control over education quality level. Such development leads to emergence of ever more skilled professionals, employees and organizations outside universities and working with the knowledge, thus offering a challenge to the universities and prompting them to find their place in the new economy and establish cooperation with external operators of knowledge in the new official and unofficial organizational formats.

Country-scale and sectoral dimensions of the universities' activity in the knowledge economy have their own specifics, which given the need for ensuring interrelation between them requires separate studying and publication. At that, particular attention should be paid to the internal management of universities, issues related to teachers and students as well as to the entrepreneurial, financial and other resources of the universities and to their place in the global production networks, corporate strategies and forms of cooperation with other national and global economy entities.

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2014, Kyiv) / under general editorship by M.A. Kulinich, N.O. Tatarenko, V.G. Tsivaty. – K.: DAU at FAM of Ukraine, 2014. – pp. 65-66. [In Ukrainian].

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6. *Kolot A.M.* Innovative labor and intellectual capital in the system of the knowledge economy factors / A.M. Kolot // Theory of Economics. – 2007. – No. 2. – pp. 3-13. [In Ukrainian].

7. Convergence and divergence in Europe: the Polish and Ukrainian cases: Monograph / [D. Lukianenko, V. Chuzhykov, Michal. G. Wo□niak et al.]; under scientific editorship by D. Lukianenko, V. Chuzhykov, Michal. G. Wo□niak. – K.: KNEU, 2013. – 688 p. – English, Ukrainian.

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