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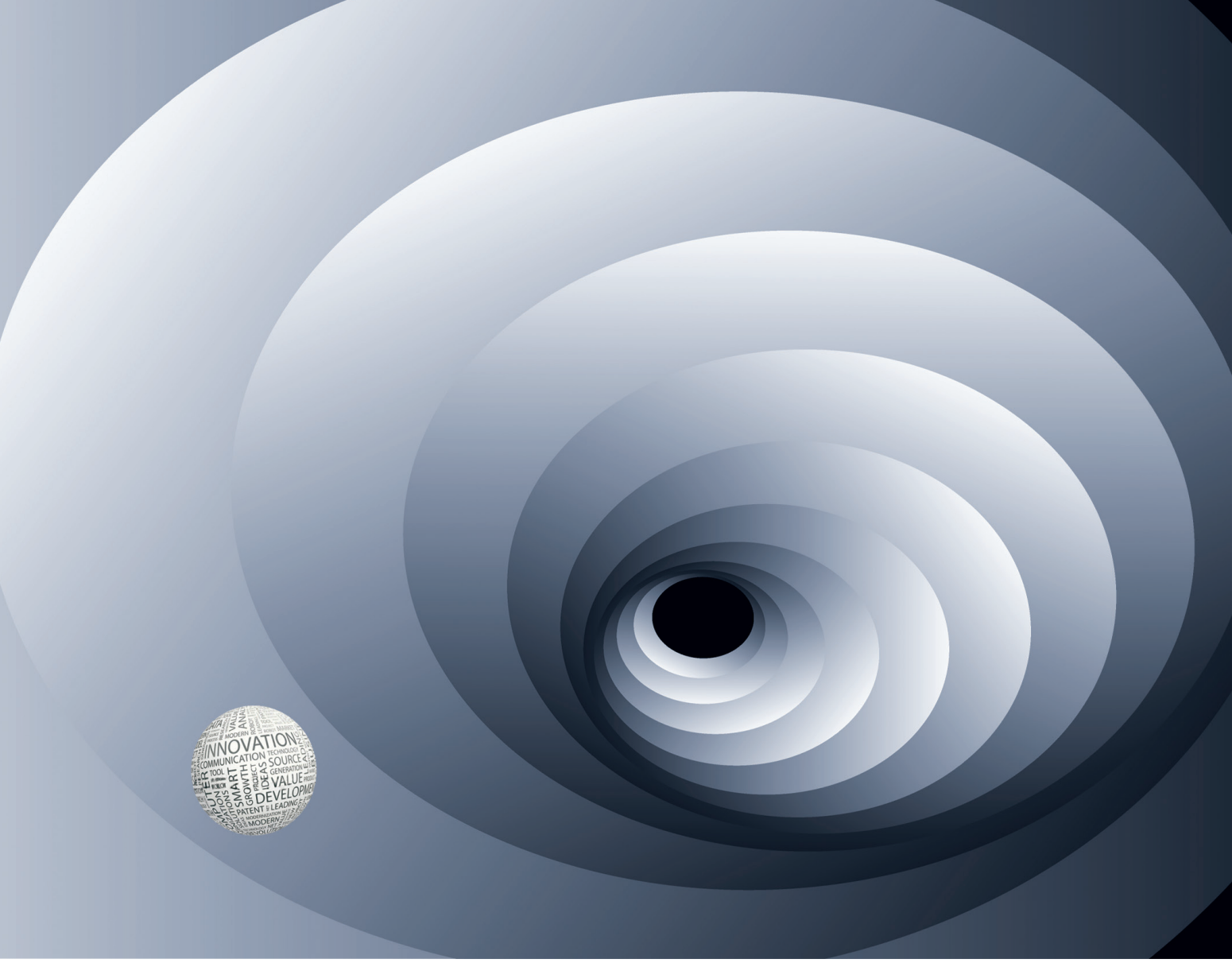

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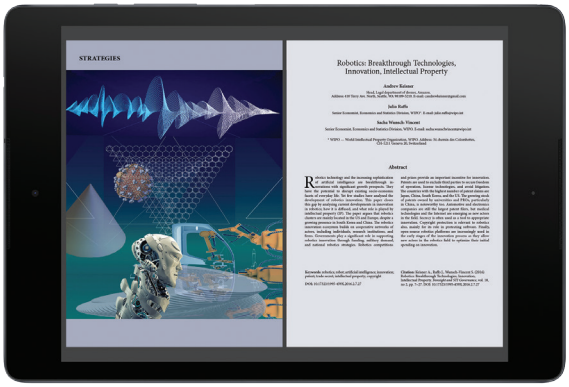

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Address:
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20, Myasnitskaya str., Moscow, 101000, Russia
Tel: +7 (495) 621-40-38
E-mail: foresight-journal@hse.ru

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Foresight and STI Governance (formerly *Foresight-Russia*) is an open access journal established by the National Research University Higher School of Economics (HSE) and administered by the HSE Institute for Statistical Studies and Economics of Knowledge (ISSEK), located in Moscow, Russia. The mission of the journal is to support the creation of Foresight culture through the dissemination of the best national and international practices of future-oriented innovation development. It also provides a framework for discussing S&T trends and policies.

TOPICAL COVERAGE:

- Foresight methodologies
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TARGET AUDIENCE:

Research scholars, university professors, policy-makers, businessmen, expert community, post-graduates, undergraduates and others who are interested in S&T and innovation analyses, Foresight and policy issues.

The topical coverage of the journal makes it a unique Russian language title in its field. *Foresight and STI Governance* is published quarterly and distributed in Russia and abroad.

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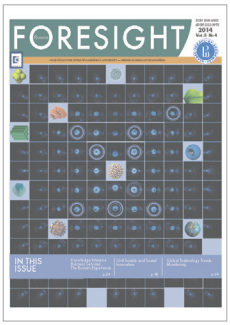


FORESIGHT AND STI GOVERNANCE 10 YEAR ANNIVERSARY

Dear Readers!

This is the first issue in our anniversary year: the *Foresight and STI Governance* journal, which has been published by the Institute for Statistical Studies and Economics of Knowledge (ISSEK) since 2007 turns ten years old. It is probably the first milestone in the journal's history big enough to review its mission, planning horizons, reliance on customary routines, the leadership "burden", and plans for the future. This is relevant particularly keeping in mind that speaking in such terms is very much appropriate here since they make up an integral part of the journal's essential thesaurus focused on long-term visions of the future, national development priorities, and STI policy.

There is hardly an area of life in Russia which has not experienced significant changes during the previous decade. The same goes for the institutional environment of research and innovation activities analysed in the very first issues of the journal: new institutions have emerged, relationships between economic agents have become increasingly complex, the administrative landscape has evolved, policy-shaping and decision-making mechanisms have improved. Throughout the years, the journal has strived to map the trajectories of future changes, foresee the more likely development scenarios, identify future growth points, and portray the new image of the economy, science, and innovation.

Like the ship in the Theseus's paradox which remained the same despite having its every plank replaced, todays' *Foresight and STI Governance* does not look much like its initial issues. Apart from the changes in subject matter, the journal's own image is now quite different — from the format and visual design to major content-related shifts reflecting the quality of the published papers. If at the beginning we saw the publishing of "a high-quality academic journal specialising in economics, statistics, sociology, STI policy, and Foresight methodology and practices" as the priority, this objective was quickly accomplished during the first few years, to be replaced by more ambitious goals.

Indexed in Scopus since 2013, the journal became the third Russian academic publication specialising in economics to be included in the database, and in just two years' time it has moved on from the fourth to the third Scopus quartiles, and then to the prestigious second Scopus quartile (Q2) in the Business, Management and Accounting category. It holds an honourable second place in the overall Eastern European regional ranking. Among our immediate objectives is inclusion in the DOAJ, ProQuest, Open J-Gate, Emerging Sources Citation Index — Web of Science Core Collection databases, significantly improving the journal's citation figures, and advancing into the Web of Science's Core Collection segment — the "heart" of this international database.

A full-fledged English-language electronic edition has been published since 2015 (4 issues a year). At the same time, it was decided to change the English version's title from *Foresight-Russia* to *Foresight and STI Governance*, to more precisely position the journal as a genuinely international (as opposed to regional) publication. The English-language version is considered an independent edition, which allows for consolidating the journal's archive in various databases.

There is no more eloquent evidence of a journal's success than the readers' interest. More than 17,000 users from more than 100 countries visited the journal's website in 2017, making about 35,000 requests for specific papers. Along with the journal's growing reputation and strengthening positions

in international citation databases, its popularity among authors interested in presenting the results of their studies on the *Foresight and STI Governance*'s pages has also grown. By the end of 2016 the editors received more than 200 papers (to compare, in 2015 the figure was 150, in 2014 — 113, and before that no more than 30). However, due to unwavering adherence to stringent research quality and depth requirements, the editors had to decline about 70% of the applications.

International experts also note the journal's leading positions. Following the expert evaluation of a large number of Russian academic magazines by Macmillan Science Communication (UK), *Foresight and STI Governance* was included in the top three most promising Russian academic publications. In 2014 the journal became one of the three winners of the open competition for participation in public support programmes to promote Russian academic magazines on the international arena, held by the Russian Ministry of Education and Science.

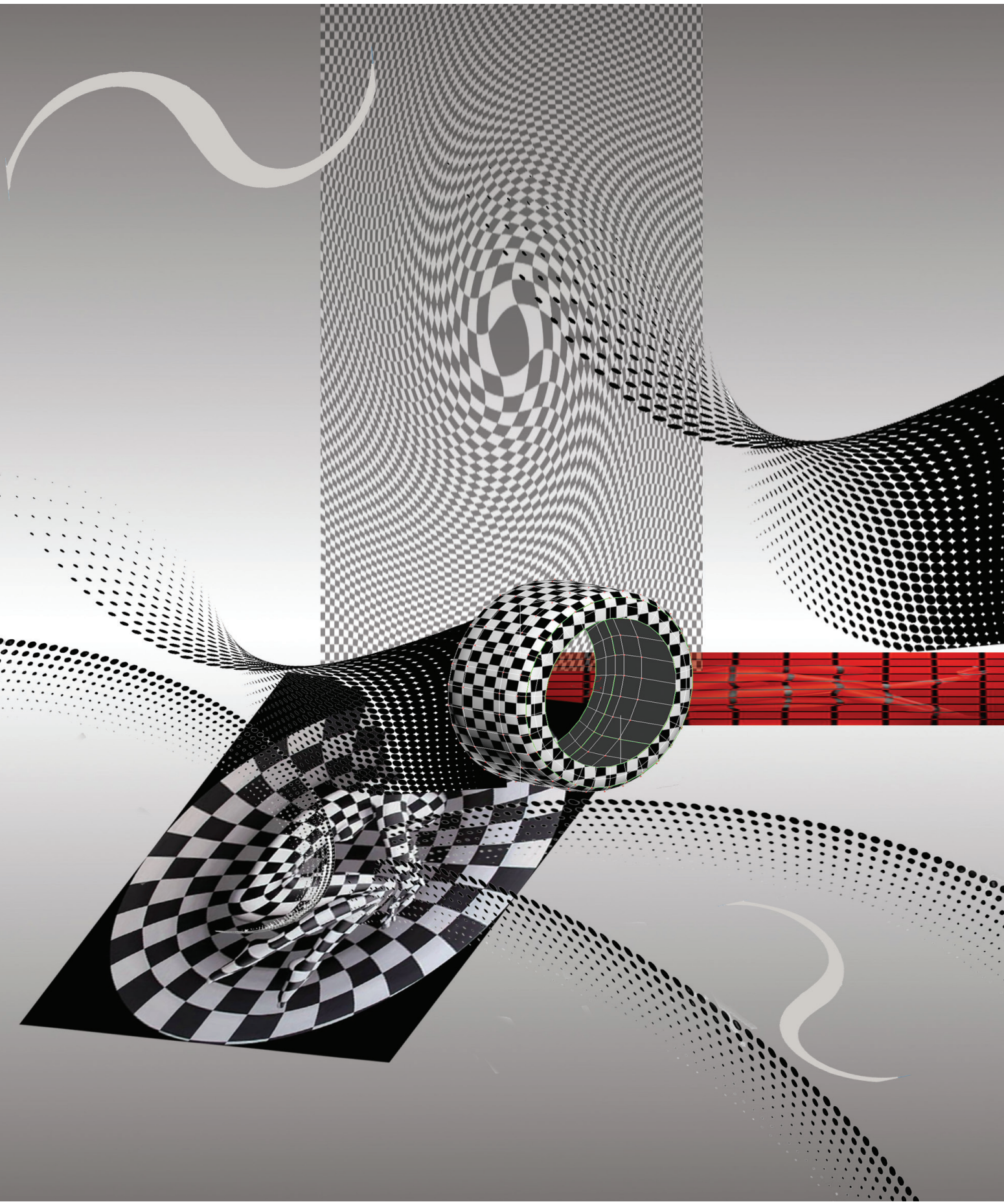
Implementing open access and digitalisation principles is the journal's strategic priority. Open access promotes the free exchange of S&T results, and the cooperation of scientists from various countries to accomplish common objectives. The journal is trying to pursue a careful editorial policy in this area. Given the ever-changing and increasingly complex international publication industry's landscape, we actively adopt advanced information formats, including those based on online technologies. We have launched bilingual mobile applications (*Foresight and STI Governance*, available in AppStore and Google Play) to increase the availability of electronic editions and attract new audiences, particularly young people. We are mastering SEO-optimisation technologies, and extending the website's functionality (electronic editing, etc.).

The journal is implementing a varied public events programme such as numerous scientific debates, lectures, workshops, round table discussions, and participation in conferences (including in the scope of specialised sections and panels). We provide information support to certain major events, and are extending the editorial board's network of partners. Such activities are the best channels for finding and engaging new authors, extending the journal's portfolio, promoting its international standing, and receiving feedback from the audience which can become a source of new ideas. All this helps to overcome limitations born by the inclination (conscious or unconscious) to adhere to a customary set of topics and maintain the circle of familiar authors with established reputations and steady research interests. The journal increasingly often publishes papers by new researchers who have never been among our authors before, some of them emerging from the audience. Thus, our readers become co-producers of knowledge. All this increases the journal's competitiveness as an academic communication channel.

Foresight and STI Governance actively cooperates with numerous Russian and international organisations, including other academic journals. The editors have established close partnerships with editors-in-chief of leading magazines specialising in relevant areas, such as *Foresight, Futures, Technological Forecasting and Social Change, Technovation, Science and Public Policy, Journal of the Knowledge Economy*, etc.

Today we can confidently say that *Foresight and STI Governance* has secured, and confidently holds an impressive niche in the professional information environment. The journal is original, easily recognisable, and commands a steadily growing interest from readers and potential authors alike.

STRATEGIES



Corporate Foresight in Multinational Business Strategies

Alexey Bereznoy [a]

Director, Centre for Industrial Market Studies and Business Strategies, Institute for Statistical Studies and Economics of Knowledge (ISSEK), abereznoy@hse.ru.

[a] National Research University Higher School of Economics (HSE), 11 Myasnitskaya Str., Moscow, 101000, Russian Federation.

Abstract

The paper explores corporate foresight as a new important tool within the strategic management system of multinational corporations (MNCs). The author directly connects the recent rise of corporate foresight with MNCs' growing need to fill the gaps in traditional corporate strategic management, which struggles with the challenges of today's global turbulent business-environment (known as VUCA world characterised by unprecedented volatility, uncertainty, complexity and ambiguity). From this perspective, corporate foresight is capable of providing a number of viable responses. They include the significant expansion of the horizon of MNCs' long-term future vision, enhanced capabilities of business-environment scanning (identifying not only clearly visible trends but the so-called weak signals as well) and strengthening intra-firm communications over the course of the strategy development process, thus contributing to the implementation capacity of the multinational corporate team. Within the analysis of the actual corporate foresight practices of major multinationals, special attention is paid to the common features of foresight organisation (standard process phases, the typical set of methods used) and peculiarities related mainly to different MNCs' sector-specific environment characteristics, including the complexity and dynamics of change. An attempt is also made to describe the actual impact of corporate foresight activities on the effectiveness of the key functions of MNCs' strategic management. The author draws the conclusion that corporate foresight is becoming a core element of the strategic management architecture of multinational businesses, striving to protect and strengthen its global market positioning in an increasingly turbulent and unpredictable environment. For MNCs' top management, trying to find the right strategic course in a radically changing competitive landscape, this powerful tool is increasingly playing the same role as a GPS navigator for drivers lost in an unfamiliar city.

Keywords: multinational corporations; corporate strategic management; corporate foresight; turbulent global environment; strategic positioning in global markets.

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Until recently, the analysis of long-term market shifts rarely appeared on the top of the agenda for major multinational corporations (MNCs),[1] which dominate practically all key industries of the global economy. It usually took a long time to realise the most significant changes, while their impact rarely spread beyond industry trends, gradually emerging within the global economic environment. Certainly, severe market upheavals did occasionally happen, leading to unexpected trend disruptions at the industry level, or even at the level of the world economy (e.g., the oil shocks of the 1970s). However, on the one hand, such a scale of change was rather an exceptional phenomenon. On the other hand, and more importantly, according to conventional wisdom, those outstanding events were absolutely unpredictable — and that automatically placed them outside the scope of regular corporate forecasts prepared by management practitioners.

A totally different situation in this area emerged during the first decade of the 21st century, which heralded the beginning of a new era of turbulence. The widespread use of revolutionary technologies (first and foremost ICT), the rapid acceleration of globalisation processes, the increased interference of geopolitics in global economic activities, the interconnection of all these factors resulted in a much more complex business environment, and in a qualitative transformation of the very nature of its inherent volatility. While in the past such volatility was essentially limited by relatively superficial and quite predictable (in terms of where they were headed) developments, today the radical nature of such changes, their ambiguous directions, and unprecedented speed, create a situation of total uncertainty — not only in terms of future markets' volume and segments, but even regarding their potential shape and general configurations. Even a new acronym has appeared in recent years in management literature — VUCA, which describes the new business environment in terms of Volatility, Uncertainty, Complexity, and Ambiguity (see, for example, [*Roland Berger*, 2013; *Bennett, Lemoine*, 2014]).

It should therefore come as no surprise that the first who experienced significant difficulties when doing business in a VUCA environment were precisely MNCs, as global players that are simultaneously present in numerous geographies and diverse industrial markets. Under such conditions, conventional approaches to corporate strategy development, oriented towards the relatively slow emergence of market changes, have become increasingly ineffective. A new strategic management architecture has begun to take shape, based on so-called corporate foresight as a key "uncertainty management" instrument for the new type of external business environment.

Conceptual framework and methodology

The issue of the business environment's uncertainty affecting the strategic decision-making process has remained an overriding focus of the leading researchers in the area of corporate strategic management. In this case, (as has already happened infrequently in management science) theory has followed practice striving to suggest a theoretical justification of approaches already discovered by practicing managers. The first signs of emerging academic interest in corporate strategic planning issues were noted in the 1950s, when many large US and European corporations started to establish special organisational units responsible for strategy development and monitoring its implementation. The first full-fledged textbooks on strategic planning appeared only in 1965, covering both the process and basic tools for shaping corporate strategy [*Learned et al.,* 1965; *Ansoff,* 1965]. It is noteworthy that those works had already named achieving a clearer understanding of possible changes in the external environment and building capabilities to influence them as a major strategic management goal, which, as it was argued even then, was increasingly hard to accomplish, given the growing complexity and volatility [*Ansoff,* 1965].

Further advances of theoretical thinking in the corporate strategy field led to the emergence of two main strategic management schools, which have split precisely because they supported different approaches to dealing with the environmental uncertainty issues. The so-called planning (or "designer") school, which for a long time enjoyed unrivalled domination over strategic management theory, proposed to deal with environmental uncertainty by applying systemic analysis and integrated planning. Representatives of this school, which include some of the brightest strategic management classics (such as Igor Ansoff, Michael Porter and a number of others) stressed the need to carefully monitor the observable trends, develop forecasts and strategic alternatives, logically assess the collected information, and integrate it into the current operations of a firm [*Ansoff,* 1979; *Porter,* 1980]. This approach of course recognised that existing forecasting methodologies (based mainly on extrapolation of observable trends) were imperfect and limited, but also believed that they were the best available techniques for understanding the ever-changing business environment. One of the main conclusions emerging from the "planning" school's logical constructs was the hypothesis of a high correlation between the efficiency of applying strategic planning tools and corporations' competitiveness in an increasingly uncertain world. In other words, in an increasingly uncertain business environment, the firms, which are better organised to analyse and forecast the changing marketplace and other external conditions, should beat the competitors who failed to set up adequate mechanisms of this kind. Though some empirical studies [*Goll, Rasheed,* 1997; *Brews, Hunt,* 1999; *Dibrell et al.,* 2013] did confirm this hypothesis, numerous other works have put

[1] In fact, there were some exceptions, but very few. For example, one of the oil supermajors, *Shell*, and the giant conglomerate, *General Electric*, successfully implemented corporate systems of long-term scenario planning as far back as the 1970s.

forward much more controversial results [*Pearce et al.,* 1987; *Boyd,* 1991]. This was one of the reasons the "planning" school came under increasing criticism in academic literature, primarily for the approaches it suggested to deal with the business environment uncertainty.

The so-called adaptive (or "learning") strategic management school, which emerged on the wave of these criticisms, completely rejected systemic planning in this area. One of the school's most prominent representatives, Henry Mintzberg, stated that successful strategies cannot be planned because planning by definition is based on existing mental models, and thus from the start tries to preserve the existing order, at the very best leaving only limited opportunities for some small (incremental) change [*Mintzberg,* 1994a]. Criticising the planning school, Mintzberg also noted that the main objective of strategic planning was designing one "best" strategy, and this can be accomplished only if the developers can sufficiently clearly foresee future parameters of the business environment. However, in a situation of growing instability, such foresight seems to be practically impossible. Therefore, representatives of the adaptive school urged the abandonment of fruitless attempts to foresee future shifts, and instead concentrate on enhancing corporate potential for effective adaptation, i.e., the ability to react to actual changes as quickly and adequately as possible. In their opinion, the very concept of "strategic planning" is incorrect, and the firms should adopt "strategic thinking" as the basis for their strategic management activities. The latter concept aims at information synthesis (unlike strategic planning's focus on analysis), and includes such components as intuition, creativity, and learning by doing. According to the "adaptive" school postulates, "strategic thinking" makes it possible for successful strategies "to appear at any time and at any place in the organisation, typically through messy processes of informal learning that must necessarily be carried out by people at various levels …" [*Mintzberg,* 1994b, p. 108].

The fierce debates between representatives of the "planning" and "adaptive" strategic management schools contributed to the intensive development of various areas of thought in this field. On the one hand, carefully targeted criticism of the vulnerable aspects of the classic strategic planning theory gave a powerful impetus to numerous efforts to improve its methodological tools. On the other, many researchers started to work on integrating (combining) the most promising ideas of both schools on various theoretical platforms. Evidently, they were not happy with the fierce confrontation between these approaches, which in essence prompted firms to choose one of the alternative behaviour models: "either try harder to predict better (rational strategies advocated by the planning school), or move faster to adapt better (adaptive strategies espoused by the learning school)" [*Wiltbank et al.,* 2006, p. 983].

One of the most popular research areas, which allowed the two strategic management schools to come closer to each other, was the flexible planning concept. According to Sal Kukalis, one of the first proponents of this concept, the ability to quickly modify strategic plans allows firms to take advantage of "unplanned opportunities" emerging due to changes in the business environment [*Kukalis,* 1989]. Later works by other researchers also stressed the importance of "flexible planning" from the perspective of mitigating emerging external threats [*Barringer, Bluedorn, 1999*). Robert Grant introduced the concept of "planned emergence" which implied firms' ability to combine a structured, centralised strategic planning process with a degree of decentralisation in making decisions in a turbulent business environment [*Grant,* 2003]. It is noteworthy that supporters of the "flexible planning" concept never doubted the need to maintain the corporate strategic planning system, but only suggested various ways to reduce its rigidity. Stressing the absolute necessity and unquestionable usefulness of such systems, and of plans developed within their framework, Peter Brews and Michelle Hunt, for example, noted that "though these plans must be quite specific, at the same time they must also be flexible, especially in unstable environments. Having once prepared their plans, firms must be willing to adjust them and introduce changes as these plans were implemented. In certain cases it might even be necessary to abandon a plan altogether" [*Brews, Hunt,* 1999, p. 906].

Another research area striving to combine approaches adopted by major strategic management schools was focused on the integration of scenario planning into the strategic management architecture. The first attempts to introduce a scenario planning concept were made in the 1960s (i.e., approximately at the same time when most advanced MNCs started to systematically apply this approach within their strategic planning activities) [*Bradfield et al.,* 2005]. Over the next 40 years, the theory and practice of scenario planning made serious progress, both in terms of enriching methodologies and testing various tools over the course of their real-life application in corporate practices [*Bishop et al.,* 2007]. However, the ideas to use scenario planning as a platform for integrating "planning" and "adaptive" strategic management schools appeared only in the late 2000s. The proponents of these ideas pointed out such important advantages of scenario planning (in terms of integrating both approaches) as considering several alternative options for the future business environment — and, accordingly, various alternative response strategies, systemic planning processes, and an impressive set of various tools for designing and analysing strategic alternatives [*Wulf et al., 2010; Bodwell, Chrermack,* 2010].

Probably the most creative, in terms of overcoming conceptual controversies between the major strategic management schools, is the concept of the so-called constructive control over environmental changes. The concept critically reconsidered one of the fundamental theoretical assumptions, common to both schools, that the business environment where firms operate is absolutely exogenous to them, and they cannot control it by definition. According to this approach, it would be possible to create a partially endogenous (controllable) business environment if firms could make deliberate efforts to apply specific

market control tools. Accepting this key premise would "help to overcome this planning vs. learning dichotomy" [*Wiltbank et al.,* 2006, p. 987]. It would be important to stress that the concept meant not so much establishing "constructive control" over the existing business environment (by influencing its structural parameters or market institutional elements, such as distribution channels, quality standards, established business practices, etc.) but rather the deliberate creation of a new, controlled market "space" based on technological and business innovations (introduction of new business models). "Too often", wrote Gary Hamel and C. K. Prahalad, "strategy is seen as a positioning exercise in which options are tested by how they fit existing industry structure… The strategist's goal is not to find a niche within the existing industry space but to create new space that is uniquely suited to the company's own strengths — space that is off the map" [*Hamel, Prahalad,* 1989, p. 74].

A radically new stage in advancing theoretical thinking on "environmental uncertainty management" integrated into strategic decision-making is connected with the rise of the corporate (or strategic) foresight school, which from the beginning of the current century clearly took a leading role in this field. The school's theoretical groundwork was laid as early as in the 1950s in the works by Herman Kahn and his colleagues from the famous US Rand Corporation [*Kahn,* 1962], and in publications by Gaston Berger who, together with his followers, developed the French branch of this discipline called *La Prospective* [*Berger et al.,* 2008]. Subsequently the corporate foresight theory went through a number of evolutionary phases[2] and today seems to have achieved a pretty high maturity level, both in the development of the conceptual core and the sophistication of methodological tools.

Without going into details of the continuing professional debates on corporate foresight definitions,[3] it would be important to note that, in our opinion, this concept implies a coherent system of methods and organisational mechanisms which allow one: (1) to efficiently identify and thoroughly analyse the factors affecting significant (to a firm), and in particular radical, changes in the business environment in the medium to long term, and (2) to plan responsive corporate actions agreed upon by key members of the top management (as a preventive reaction to expected changes), aimed at both preparing the business organisation for such changes and creating favourable future external conditions.

From the perspective of strategic management theory, it would be possible to conclude that corporate foresight absorbed a significant proportion of the most promising elements (in terms of the "environmental uncertainty management") of the conceptual constructs which have emerged over the course of the decades-long debates between the "planning" and "adapting" strategic management schools. Firstly, a major conceptual postulate of corporate foresight is the thesis about the variability of the future, which implies considering various strategic options to match probable significant changes in the business environment, and to prepare the corporation for very diverse future shifts.

Secondly, a characteristic feature of the corporate foresight concept is the full recognition that influencing future changes of business environment in order to produce desirable effects (i.e., exercising partial control) is both possible and necessary. This is one of the radical differences between foresight and conventional forecasting. As one of the founders of the Russian school of foresight studies, Leonid Gokhberg, has underlined: "Forecasting is about moving from the present to the future. Foresight, on the contrary, is about moving from the future to the present. The difference is really fundamental… The objective of a foresight study is not to guess the future but to build a "target" vision of the future on the basis of achieving consensus among decision-makers and leading experts, and try to develop a prospective action plan to meet key challenges and accomplish relevant goals" (*cit. ex*: [*Gorbatova*, 2014].

Thirdly, a specific feature of the approach to develop a foresight toolkit is the combination of expert-based and so-called participative methods, implying that the process of developing and evaluating strategic alternatives of the corporate future should involve not just the traditional narrow circle of the top executives of the firm but also the vast majority of its managers who are participating in decision-making in one way or another. Such an approach not only results in a much more comprehensive analysis of these alternatives but creates a firm foundation for shared corporate understanding of potential strategic challenges and opportunities.

Numerous evident advantages of the corporate foresight concept led to rising expectations regarding its application in strategic management practices. Some researchers even started to argue that strategic foresight should fully replace the obsolete corporate strategic planning systems. As noted for example by highly acclaimed US strategic innovation expert, Idris Mootee, "Traditional strategic planning models cannot produce strategy that can handle the complexity, discontinuities, rapid change, and structural constraints of strategic management systems … We are entering a new era of strategy. Indeed, we went from strategic planning to strategic management, and now we are transitioning again from strategic management to strategic foresight" [*Mootee,* 2016].

It should be mentioned, however, that the "sphere of influence" of corporate foresight covers albeit very important, but still quite a limited segment of corporate strategic planning system, namely the one comprising the functions of scanning the business environment, analysing collected information, and

[2] A thorough analysis of this evolution can be found in a recent paper by the group of authors headed by an established authority in the field, Rene Rohrbeck [*Rohrbeck et al.,* 2015].

[3] The definition of corporate foresight remains a subject of lively discussions among Western and Russian researchers (see, e.g., [*Slaughter*, 1997; *Rohrbeck*, 2011; *Rohrbeck et al.,* 2015; *Ruff,* 2006; *Ruff,* 2015; *Vecchiato, Roveda,* 2010; *Sokolov,* 2007; *Tretyak,* 2007]).

setting strategic priorities in the scope of the corporation's pro-active (preventive) reaction to long-term challenges and opportunities. In other words, strategic foresight cannot "replace" the strategic planning system, but rather it can significantly increase its effectiveness if applied as an important superstructure built over the foundation of this system.

The logic of the study presented in this paper implies three consecutive steps. The first is identifying typical problems in the application of MNCs' conventional strategic planning mechanism — the problems that have been significantly aggravated in an increasingly volatile global business environment. This is followed by defining possible solutions based on foresight techniques. The second step covers an analysis of the general and specific features of the use of the foresight methodology by MNCs operating in global industrial sectors characterised by a different nature and pace of change. Finally, within the third step an attempt is made to define the main effects produced by a working corporate foresight system, first of all from the perspective of the improvement of MNCs' strategic management. In the final section, the main conclusions of the study are summarised, together with a review of the new features that effective foresight functionality could add to global corporations' strategic management systems.

Challenges of Strategic Planning in Turbulent Environment

Even at the end of the last century, major MNCs, which have succeeded in capturing leadership positions across global industrial markets, could confidently look forward into the quite long-term future, today this confidence no longer exists. In demographic terms, one can safely assume that the "life expectancy" of large corporations, the members of the global business elite, has become much shorter. This is particularly evident in the increasingly rapid changes in the list of the top 1,000 corporations regularly published by the US-based *Fortune* magazine. Specifically, in 1973–1983 the rate of change of the *Fortune 1,000* ranking was only 35%; in 1983–1993 it increased to 45%, in 1993–2003 — to 60%, and in 2003–2013 — to more than 70% [*Nicholls*, 2013]. Securing a large market share in a particular industry no longer gives viable guarantees of maintaining a leading position for any considerable period of time. Besides, the traditionally high correlation between corporations' market shares and profit margins in many industries is becoming rather insignificant.[4] Finally, the borders of industries are getting increasingly vague, leaving the biggest players' top management practically no opportunity to clearly identify their rivals or even the industrial sectors in which they actually compete.

All these changes create serious barriers to conventional approaches in the area of corporate strategy development. After all, this approach, despite seeing the strategy as a way to respond to the uncertainty of the changing environment, in essence is based upon the assumption of a relatively stable and predictable world. Indeed, in most cases the main objective of corporate strategies traditionally consists in creating a sustainable (and usually by default static) competitive advantage through creative market positioning (achieving dominant positions, or capturing some attractive market niche), or by acquiring resources and competences needed to produce and market a unique product or service. Within the conventional strategic management cycle, corporations periodically review their strategies, adjust (or define new) strategic directions for development, and put in place appropriate organisational structures based upon the analysis of current situation on certain industrial markets and their growth forecasts for some not very long period of time.

Adopting such an approach in a VUCA business environment is becoming increasingly unproductive. Under the conditions of radically new uncertainty, conventional competitive advantages based upon economies of scale and resource efficiency are obviously losing their long-term importance. Fuzzy borders between industries make even a rough assessment of the company's current (and much less prospective) market position an increasingly difficult task. But most importantly, unpredictable changes of the external environment reduce the value of conventional forecasts (which used to be the starting platform for corporate strategies) to a minimum, while the unusually high rate of such changes makes the five-year strategic planning cycle (routinely applied by most MNCs) meaningless. In such situations, corporate strategies often become obsolete before they are formally approved, and employees (including management personnel) are losing confidence in the rationale behind strategy development procedures[5].

Diving into the VUCA business environment had seriously aggravated a whole host of problems inherent to the conventional strategic planning systems of the largest MNCs. One of these issues relates to a quite short horizon of strategic planning, which (given the significant inertia common to large businesses) severely limits the possibilities for a timely adjustment of the chosen course (let alone making radical turns). As BCG experts have noted, "If a company's strategy-development process is focused only on

[4] According to US economists, M. Reeves and M. Deimler, the percentage of companies falling out of the top three rankings in their industry between 1960–2008 increased seven-fold (from 2 to 14%), and the probability of a company with the largest market share also being the industry leader in terms of profit rate, fell from 34% in 1950 to just 7% in 2007 [*Reeves, Deimler*, 2011].

[5] One of the managers of a big US corporation, when asked to give a general assessment of the strategic planning process at his firm, was very sincere to respond as follows: "Our planning process is like a primitive tribal ritual — there is a lot of dancing, waving of feathers and beating of drums. No one is exactly sure why we do it, but there is an almost mystical hope that something good will come out of it" (*cit. ex*: [*Kaplan, Beinhocker,* 2003]).

short-term imperatives, there's a danger of myopia. A chance of missing a strategic turn because no one sees an important sign in the distance increases" [*Kachaner et al.,* 2008, p. 2].

Another major issue, which significantly reduces the effectiveness of strategic planning systems employed by today's largest MNCs in an increasingly turbulent world, relates to their limited potential for identifying and effective processing signals of changes in the environment. Such systems are traditionally designed to track only clearly visible trends (the so-called strong signals), recognisable only within a limited horizon. But they entirely miss weak signals which often can give some good idea (for decision-making purposes) of the changing parameters within the future competitive environment. Furthermore, such weak signals may be forerunners of strategic surprises (so-called jokers, according to foresight studies' terminology), i.e., events with a low probability of occurrence but potentially capable of bringing about large-scale radical changes in the industry (or even in the whole economy). In recent years, such events occur increasingly often, while corporations adopting a conventional approach to strategic planning feel themselves increasingly disoriented. As noted by the prominent Italian researchers, Riccardo Vecchiato and Claudio Roveda, "In the case of a discontinuous driver of change, thinking the future through the lens of the previous experience and strategic beliefs about the business environment and the business models that were successful in that environment may be considered as driving a car in proximity of a bend by just looking at the rear mirrors. By doing so managers will inevitably fail when it most matters, i.e., when the rules of competition are going to shift sharply" [*Vecchiato, Roveda,* 2010, p. 1532].

Closely connected with this serious issue is the notoriously strong commitment of large corporations to their existing business models and related inability to adequately assess the strategic potential of new "disruptive" technologies. As shown in numerous recent studies, the strategic planning systems of most today's multinationals, even those with advanced R&D organisations, often appear unable to comprehend so-called disruptive innovations, which radically change the rules of the game in their industries by rapid replacing conventional business models with completely new ones [*Christensen,* 1997; *Kaplan,* 2012]. The standard corporate procedures for screening innovation proposals, when making decisions on subsequent investments, usually reject the projects that do not fit in with their current business model, sometimes neglecting even very promising inventions. Clearly, such practices became, among other things, one of the main reasons for the recent bankruptcy of Kodak, the long-standing leader of global photo industry (ironically, it was one of the Kodak's engineers who invented digital cameras, and it was exactly digital camera that in the end ruined Kodak's traditional business model). At another eminent US multinational, Xerox, this approach also prevented the introduction of a whole range of unique technical innovations (including the first personal computer) developed by its own engineers but implemented subsequently by other companies (see: [*Bereznoy,* 2015]).

Finally, there is one more long-standing problem, very typical for corporate strategic planning mechanism, which has been dramatically aggravated with multinationals' diving into the VUCA business environment. That is the widening of the so-called communication gap in the corporate strategy development process. This gap is primarily due to the traditionally low level of communications within corporate management (divided by hierarchical administrative barriers and bureaucratic walls between organisational units) over the course of strategy development. Quite common to many large corporations (and especially to MNCs with their globally distributed networks of production and sales subsidiaries), this lack of communications within strategic planning systems becomes particularly evident under the conditions of sharply increasing turbulence, when even the existing (very limited) communication channels can no longer cope with "digesting" contradictory data coming from internal stakeholders, and in effect block the multilateral dialogue on strategic development priorities. Meanwhile, it is exactly the insufficient involvement of stakeholders from various MNC divisions in corporate strategy development that appears to be a key factor leading to poor implementation of such strategies.[6]

The evident inability of conventional strategy planning systems to meet the increased requirements of a much more turbulent business environment forced many global corporations to actively seek new mechanisms and instruments that would help them to respond to emerging challenges in this area. One of such instruments is corporate (or strategic) foresight, which has already occupied prominent positions in the strategic management architecture of dozens of the largest MNCs operating in a wide range of global industries.

First of all, foresight allows for significantly extending the strategic vision horizon. It is important to realise that in this capacity, corporate foresight does not possess any more advanced "anticipation" techniques, but rather suggests a radically different approach in this area. Unlike conventional forecasts, which strive to draw a picture of the future based on the visible trends of the present, the foresight methodology by default assumes the variability of the future, and aims at providing proactive support for implementing the most desirable option out of all possible alternatives of the emerging economic order. In this regard a recent statement by a representative of the German car manufacturing MNC's top management seems

[6] A quite thorough review of several dozens of empirical studies on various factors influencing corporate strategy performance, prepared by a group of researchers at the Swiss-based Institute for Corporate Communication (Lugano), clearly revealed the extremely high importance of establishing effective dialogue among different management levels and business units (including, in the case of MNCs, mandatory participation of international subsidiaries' managers) as an integral part of the corporate strategy development process, to ensure the subsequent successful implementation of such strategies [*Li et al.,* 2008].

to be very instructive: "At BMW we believe that the best way to predict the future is to create it" (*cit. ex*: [*Tendulkar,* 2016]).

The ability to extend the strategic planning horizon is closely connected with another key corporate foresight characteristic: significantly enhanced opportunities for scanning signals coming from the external environment. In addition to clearly visible trends (or strong signals) which are usually monitored by conventional strategic planning systems, the corporate foresight mechanism for tracking and analysis is designed to identify weak signals, as well as strategic surprises (jokers), which could generate a final outcome with absolutely new qualities. It is this new capability of corporate "radar", which is much more sensitive to changes in the external environment that allow one to anticipate potential challenges and threats related to radical industry-specific shifts, disruptive technologies and innovative business models.

One of the most important distinctive features of the corporate foresight methodology is also a set of clearly defined procedures for multi-phase discussions of a company's strategic challenges and priorities within its management team, including managers of all levels and all organisational units responsible for making relevant decisions, and frequently also involving eternal experts and consultants to provide an independent view on prospective development trends in the business environment. This approach largely eliminates the communication gap between major corporate stakeholders that arise over the course of developing a strategic vision, and ensures the necessary consensus regarding a firm's strategic goals and objectives, a key prerequisite for successfully mobilising a corporate team to implement the formulated strategy.

Overall, corporate foresight adds new important elements to the conventional strategic management mechanism employed by major MNCs, capable of significantly increasing its effectiveness in an increasingly turbulent world. It serves as an important superstructure based on the established strategic management architecture and is primarily aimed both at implementing a powerful "early warning" system, capturing signals about forthcoming shifts in the business environment, and at shaping effective and timely responses that a company should initiate as a preventive measure to such changes.

Characteristic features of the corporate foresight mechanism applied by major multinationals

Given the very sensitive information generated by corporate foresight studies, it is not surprising that the specifics of these activities and the details of how foresight outcomes are practically used by MNCs' management remain largely unavailable to external observers. However, a few empirical studies have appeared in recent years, which allow one to have a look into the "holy of holies" of these activities and to get some idea of their organisation at a number of major MNCs operating in various sectors (industries) of the global economy. These studies reveal, on the one hand, the quite similar basic characteristics of the general organisation of corporate foresight activities, and on the other — a number of very specific features mainly determined by the nature of industrial sectors where individual MNCs operate and, not infrequently, by their corporate culture.

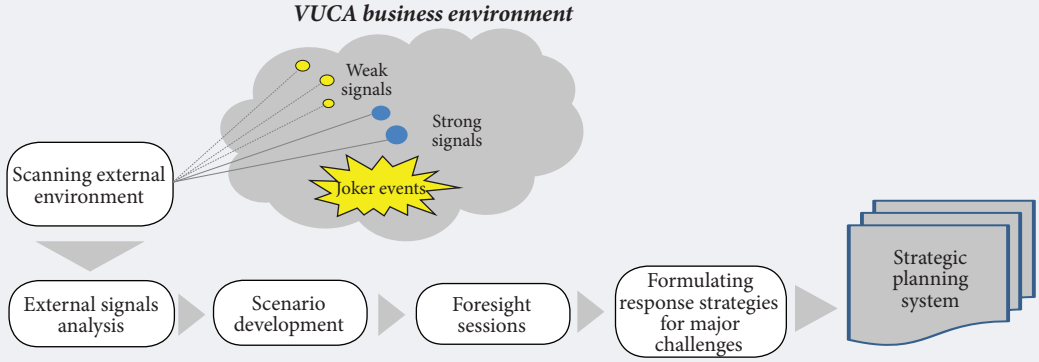
The common features of corporate foresight organisation become evident, first and foremost, when foresight activities are institutionalised as a specific function (in various forms) responsible for this work at the corporate level. Other dimensions, showing a number of similarities, could be found in the general logic of corporate foresight process design (including the sequence of its main phases), and in the mix of key tools (methods) applied. If we turn to the formal institutionalisation of foresight activities, today already a good number of major MNCs have special organisational units responsible for directing this work (usually located at the corporate headquarters), and their population is growing every year. The most recent large-scale survey of major European MNCs operating in various industries (conducted in 2014) revealed that out of 145 surveyed corporations, 89% had had a special corporate foresight division for at least one year, and 65% had such function for more than six years [*Danielson,* 2014, p. 38]. Other empirical studies also disclose that separating the corporate foresight function also became quite common in multinationals based in the US and Japan (see: [*Nash,* 2013; *Yoda,* 2013]).

As for the corporate foresight process, at the vast majority of MNCs, which do have relevant experience, it was organised along a more or less common five-phase general scheme (see Figure 1).

The first phase implies scanning the external environment and creating databases of trends (strong signals) and weak signals. The second phase includes an in-depth analysis of all identified signals, the definition of possible radical shifts, potential threats and market opportunities that these shifts could bring about. The main focus of the third phase is the formulation of several long-term future development scenarios for the external environment basing on an analysis of collected data and taking into account possible strategic surprises. The fourth phase involves a series of foresight sessions where managers of various levels discuss draft scenarios, adjust them in accordance with their vision, and ultimately agree upon the final versions. Finally, long-term strategic priorities are set during the last phase of the foresight process, together with specific milestones to ensure the company's adequate response to strategic challenges and map the optimal course to secure the desired position on future markets.

MNCs foresight practices also indicate that the key prerequisite for the whole process success lies in ensuring efficient cooperation with the existing corporate strategic planning system. As the head of

Figure 1. **High-level map of corporate foresight process: Sequence of main phases**



Source: compiled by the author using [*Peter et al.,* 2015, p. 59].

foresight studies group at Daimler AG, Frank Ruff, has rightly noted, "Overall corporate foresight fulfils a mission to detect changes and signals that are outside the reach of standard corporate sensors and thus takes a *complementary* role to existing strategy and innovation functions. But this complementary function also implies that a close alignment and collaboration with strategy and innovation departments is a decisive role to create impact" [*Ruff,* 2015, pp. 39–40].

Though the specific mix of foresight techniques used by major MNCs often significantly varies, the basic (rather limited) toolset usually remains essentially the same. Out of the quite diverse range of foresight techniques applied by various public and private sector organisations (according to UNIDO estimates, there are more than 40 of such tools available)[7], major MNCs use less than 15. As to the techniques most actively used in corporate foresight projects, experts usually name no more than 5–6, including the following: scenarios, brainstorming, literature reviews, cost-benefit analysis, patent analysis. Such methods as trend identification and analysis, roadmaps, relevance trees, and stakeholder analysis are also quite popular in corporate foresight studies. Bibliometrics, historical analogy forecasting, and Delphi methods are applied less often (Figure 2).

Along with the similarities, foresight mechanisms operating at individual MNCs often have very specific characteristics. These specific features are primarily due to different major drivers of change affecting corresponding sectors of the global economy. Such differences become particularly evident if one compares the foresight systems of MNCs operating in mature sectors (like the mining and processing of natural resources), on the one hand, and in the so-called modern industries displaying very dynamic qualitative and quantitative shifts in market demand (e.g., telecommunications, consumer electronics), on the other. In the first case, corporate foresight mechanisms are usually designed to identify and find solutions for potential issues originating from the extraordinarily complex external environment, whose development is affected by numerous very diverse and hardly predictable factors. In the second case, the priority objective of corporate foresight is the quick development of adequate responses to threats emerging in an extremely volatile external environment.[8]

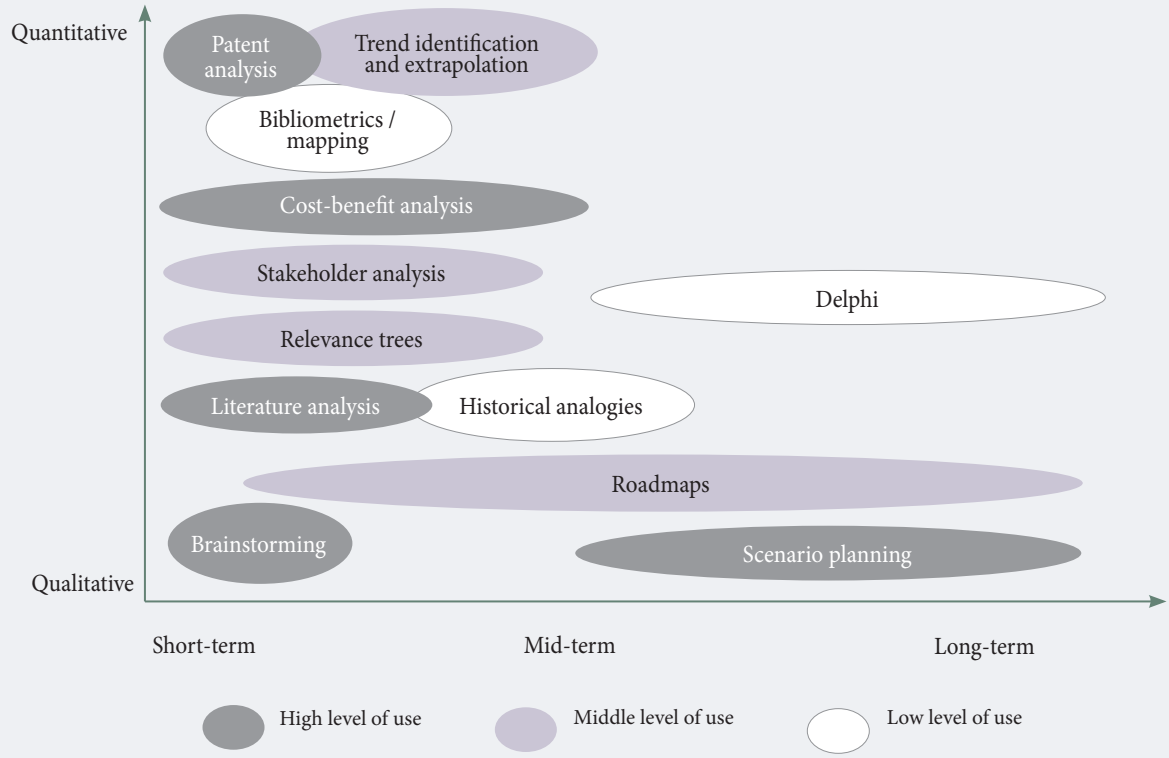
Corporate foresight systems used for many years by the oil supermajor, Shell, and global chemical giant, BASF, are specifically designed to help company management in dealing with the challenges presented by an increasingly complex macro-environment. To that end, both corporations put in place very robust, scenario-based, multiple-level strategic management systems, where all main organisational units constantly receive information required for their constructive participation in strategy development at the corporate, business segment, and operational levels. Targeted efforts at all these corporate levels launch a quite lengthy multi-step process dictated by the particularly complex external environment. Time horizons of scenarios developed by these companies usually exceed 15–20 years (a period comparable with the payoff period of capital investment projects in relevant industries), while the analysis of the main drivers of change covers as wide a range as possible, including not only economic and technological factors but also social, political (together with geopolitical), environmental, and values-related factors (Table 1).

MNCs operating in industrial sectors characterised by a more volatile external environment adopt quite different corporate foresight systems. For example, the foresight systems of Philips and Deutsche

[7] See [UNIDO, 2005]. A more recent and fairly detailed description of specific foresight techniques can be also found in a number of works by Russian researchers (see, e.g., [*Miles et al.*, 2016]).

[8] Certainly, the above classification is conditional and does not imply that mature sectors (oil and gas or chemicals) do not occasionally experience very radical changes, or that factors affecting the so-called modern industries are not very complex in nature. However, comparative analysis makes the abovementioned differences between these groups of industries (sectors) very tangible.

Figure 2. **Main methods used in corporate foresight practices**



Source: [*Rohrbeck,* 2012, p. 29].

Telecom AG (the first is a leader on the global home appliances and consumer electronics market, and the second — a leading European telecommunication services operator) demonstrated extremely high flexibility and rapid response rates. Their foresight mechanisms are designed primarily to identify drivers of radical changes capable of breaking the "rules of the game" and the industry's competitive landscape in a very short period of time. All techniques and tools used in such systems are primarily focused on defining the potential effects of such changes on the company's market position, and the new market opportunities they may open. Another distinctive feature of such systems is combining the scenario-based approach with the design of technology and product roadmaps, which could help to establish links of the identified potential technological shifts and related emerging market opportunities with specific prospective products that the company could offer.[9] Accordingly, time horizons of scenarios and technology roadmaps developed by corporate foresight systems of these companies usually do not exceed 5–10 years.

The actual competitive behaviour of MNCs operating in global industries which in recent years have experienced the most radical changes (usually referred to as "disruptive") also provide evidence of certain limitations of corporate foresight capabilities, especially when traditional industry borders are being quickly eroded by the so-called digital revolution taking place right in front of our eyes. The recent story of Nokia, the former global mobile phones market leader, which failed to maintain competitive positions in the radically changing industry, could serve here as an illustrative case. Despite having one of the most advanced corporate foresight systems in Europe, this Finnish MNC made a number of serious strategic mistakes and in the mid-2000s clearly lost the competitive battle for leadership in the personal mobile communication devices market to US-based Apple.

Many experts believe that one of the main reasons for this strategic disaster was the company's inability to set appropriate objectives for their corporate foresight function, because they (managers) failed to comprehend the fundamental shift in the boundaries of their business. Indeed, the digital revolution has led to convergence of a number of different markets, including those for mobile phones, photo cameras, sound recording devices and personal mini-computers. Against this background, the global sales of the iPhone, a new type of mobile device (which integrated the functionality of all the aforementioned

[9] A good example in this respect is Deutsche Telecom AG (DTAG). As the authors of a special study of corporate foresight practices noted, "DTAG's strategic roadmaps system combines strategic vision provided by the scenario-based approach with benefits of planning provided by technology roadmaps" [*Rohrbeck, Thom,* 2008, p. 5].

Table 1. **Specific features of MNCs' corporate foresight mechanisms: impact of external environment complexity and rate of change**

Main areas of differences	Key characteristics of the industry's external environment that determines the specific features of the foresight mechanism	
	High complexity of business environment (e.g. oil & gas sector, chemical industry)	High dynamics of change in business environment (e.g. consumer electronics, telecom services)
Process organisation	Relatively long-term multi-level process, involving all main organisational units of the company	Flexible process with quite short overall duration, aimed at securing timely (proactive) company response to dynamic changes of external environment
Focus of methods and tools	Methods and tools are focused on the analysis of main trends and interaction of numerous drivers of macroeconomic changes (intensive use of STEEPV-analysis*) Development of hierarchical system of complex development scenarios for long-, medium-, and operative perspectives Time horizon of scenario planning — more than 15-20 years	Methods and tools are focused on the identification of limited number of factors driving radical changes, able to quickly transform competitive landscape of the industry Wide use of technology roadmaps to establish links of forecasted technological shifts with emerging market opportunities for prospective company products Time horizon of scenario planning and technology roadmaps — usually not more than 5-10 years
Integration of results in strategic decision-making	Used primarily as the instrument to support investment decision-making, including changes in portfolio of key assets, entering new foreign markets, financing of major capital projects etc.	Used primarily as the instrument to identify new market opportunities and to support implementation of serious organisational changes

* STEEPV is an acronym created by combining *social*, *technological*, *economical*, *environmental*, *political,* and *values* issues related to the evolution of the object under consideration [*Miles et al.,* 2016].

Source: compiled by the author using [*Vecchiato,* 2012; *Rohrbeck, Thom,* 2008].

products), launched by Apple, very quickly reached a huge scale. However, Nokia stubbornly kept trying to promote its own obsolete technological platform, even despite the company's rapidly falling global market share. As Riccardo Vecchiato has stressed in his analysis of the unsuccessful application of the foresight methodology by the management of the Finnish giant, "in the case of discontinuous drivers of change — early predictions about the future components of the business are likely to become the source of inertia rather than adaptation. Under boundary uncertainty, decision-makers should emphasize thereby strategic flexibility and quick learning instead of planning and foresight… Decision-makers might then start using and relying on foresight techniques once boundary uncertainty has been solved…" [*Vecchiato,* 2015, p. 268].

Corporate foresight effectiveness

Setting up a viable corporate foresight function involves significant financial costs, time spent and organisational efforts needed for putting together a professional team of highly skilled experts and arranging their smooth cooperation with other key company divisions. It is no surprise that only relatively large corporations could afford building such function. In this context, legitimate questions arise regarding the actual effect of corporate foresight on MNCs' strategic development, especially from the perspective of the improvement of their strategic management systems.

One of the most common approaches to answering such questions is to refer to the most significant (and sometimes vitally important) strategic decisions made by specific MNCs based on their foresight function analysis. Probably the most striking, and by now almost paradigmatic, example in this area relates to very rational strategic decisions made by Shell over the course of the oil shocks of the early 1970s. Unlike other oil and gas supermajors, Shell appeared to be ready for the four-fold increase in oil prices, just because it had a well-developed scenario describing such developments prepared by their in-house foresight team. Less well-known (though possibly no less important) were Shell scenarios which ensured the company's high readiness for the subsequent radical structural shifts in the global oil and gas industry caused by the collapse of the Soviet Union, and by the transfer of major global energy consumption centres (and thus the bulk of demand for hydrocarbons) from the West to the East, first of all to China and India. These particular scenarios served as a basis for a number of strategic investment decisions to enter long-term production projects, including the huge *Sakhalin-2* project, which focused on Asian markets and already boasts more than $10 billion in Shell investments.[10]

A number of examples of corporate foresight studies significantly affecting the strategic decision-making process were also noted at other major MNCs, including those operating in the so-called modern industries. For instance, Philips' recent decision to shift its strategic focus from consumer electronics to medical equipment was based on the conclusions made by its in-house corporate foresight team. Trend

[10] This is Shell's largest investment project in the company's 120-year history.

analysis, undertaken by this team, allowed the company to conclude that such global trends as the ageing of the population and the wide proliferation of healthy lifestyle values, should provide a firm ground for changing its strategic priorities in favour of the health sector, while the ongoing commoditisation processes (product standardisation accompanied by sharply decreasing profit margins) would inevitably result in the stagnation or decline of the conventional consumer electronics industry. This vision of the future was adopted as a foundation upon which to mobilise the company to take a new strategic course.

At the same time, it is quite clear that even having very serious corporate foresight capabilities is not a panacea against making big strategic errors. The evidence supporting this conclusion is provided not only by Nokia's much-publicised disaster on the global mobile phones market, but also by the preceding and largely similar failure of another corporate giant, Ericsson. This Swedish MNC, initially one of the top-five global mobile phone market leaders, also failed to maintain competitive positions and finally was pushed out of the market at the end of 1990s.[11] Though both of these firms had very qualified and experienced foresight teams, they failed to prevent their chief executives from making very expensive strategic mistakes.

On the other hand, a number of observers believe that the main reason for the failure had nothing to do with the insufficient qualifications or experience of the corporate foresight experts, but rather was directly connected with the irrelevant objectives set for them by company management. According to a former head of the Shell scenario planning division, "Managers must look out for the right conditions for using predictive techniques like scenarios by weighing what these tools allow one to learn about the future against what they require as their own input. If the key issues and challenges to be faced by the organisation have not been properly defined yet, scenarios will lack focus, and executives will be involved in a blinding process which actually misleads them and reduces their understanding of the future" (*cit. ex*: [*Vecchiato,* 2015, p. 268]).

In any case, though such examples are undoubtedly interesting for identifying best practices, or on the contrary typical mistakes, in applying corporate foresight outcomes in strategic decision-making, they suggest too little to define key areas of such activities' impact on strategic processes at the respective companies. From this perspective, it would be much more relevant to analyse the results of MNCs' special surveys, which allow one to make certain conclusions regarding corporate foresight's actual contribution to enhancing the specific functionality of their strategic management systems.

Thus, one of such surveys, undertaken among 77 large European multinationals, revealed that more than 75% of CEO respondents were quite positive in their assessment of the value added by corporate foresight to the performance of strategic management. More than 80% of these respondents agreed (fully or partially) that corporate foresight made a tangible contribution to enhancing such strategic functionality as environment scanning (by gaining insights into changes of the environment and contributing to the reduction of uncertainty regarding its future parameters); the development and implementation of corporate strategy (by fostering an internal conversation about overall corporate strategy, creating the ability to adopt alternative perspectives, supporting the adjustment of the company in case of uncertainty); the development and implementation of market entry strategies (by enhancing the understanding of target markets, the identification of opportunities and threats for company products and the technology portfolio); and influencing the parameters of the future environment (see Table 2).

A particularly revealing finding of this survey seems to be the high share of respondents who consider corporate foresight a powerful instrument for shaping future external conditions of their company's business. Indeed, the activities of corporate foresight divisions, especially in the case of major multinationals, are not usually limited to providing support for internal strategic decision-making processes. The external component of their work is clearly growing in importance, aiming at systematically "putting pressure" upon the minds of key stakeholders, those who in in one way or another could influence the global business environment. One obvious channel to do so is through the regular publication of global industry forecasts, future development scenarios of key technology areas and markets, etc. Since such studies are usually conducted by highly skilled experts, who use the most advanced methodologies and have access to practically all existing data, and the results they obtain are published under the auspices of major players in relevant global industries, the influence of such publications is difficult to overestimate. Thus, the three largest oil and gas supermajors (ExxonMobil, Shell, and BP) annually publish their long-term forecasts for global energy industry development, whose influence is essentially on par with the forecasts published by the leading multilateral organisation in this industrial sector, the International Energy Agency.

Certainly, multinationals do not limit their influence to only the massive dissemination of their corporate foresight studies. They allocate significant funds to their corporate experts who are delegated to "support" such publications by working with the target stakeholder audiences, including the organisation of various conferences, workshops and meetings with public authorities, business partners, consulting firms, etc. It

[11] As noted in Bloomberg special review, "With the $7.2 billion sale of its mobile-phone business to Microsoft Corp., Nokia Oyj is following a path trodden by Ericsson AB of Sweden in abandoning handset manufacturing … Nokia, struggling to regain relevance in smartphones after Apple Inc.'s iPhone was introduced in 2007, is getting out of the business almost a decade after Nordic rival Ericsson split off mobile phones into a separate venture with Sony Corp. [*Web, Baigorri,* 2013].

Table 2. **Assessing corporate foresight's contribution to enhancing various functions of strategic management (based on the results of a survey of 77 European MNCs)**

Functions of strategic management influenced by corporate foresight	Share of respondents reported high assessment (%)
Environment scanning	
Gaining insights into changes in the environment	95
Contributing to a reduction of uncertainty (e.g. through identification of disruptions)	83
Development and implementation of corporate strategy	
Fostering conversation about overall strategy of the company	85
Creating the ability to adopt alternative perspectives	84
Supporting adjustment of the company in case of uncertainty	75
Development and implementation of market entry strategies	
Enhancing the understanding of the market	92
Identification of opportunities and threats for our product and technology portfolio	84
Influencing parameters of future environment	
Shaping the future (e.g. through influencing other players such as politicians or other companies	81

Source: compiled by the author using [*Rohrbeck, Schwarz,* 2013, pp. 1599–1603].

goes without saying that not all the findings of corporate foresight studies are made available to the general public. Furthermore, these studies, designed to influence an external target audience, by definition imply certain interpretations of their main conclusions in order to induce major stakeholders to accept the vision of the world (industry, market, etc.) that the sponsoring corporations would like them to have.[12]

Another quite effective channel to exert influence on the future parameters of rapidly developing global high-tech industries, that has been increasingly used by major MNCs, is their active participation in the development of international foresight studies and sectoral technology roadmaps, usually sponsored by inter-governmental institutions or industrial associations. These multilateral engagements became a quite popular mechanism used for the coordination of efforts of national governments and multinational businesses in the area of indicative planning where there is a common interest in cultivating new industry sectors with significant potential for a global economic impact. One of the first successful attempts to create such a mechanism was the development and continuous updating of the International Technology Roadmap for Semiconductors (ITRS) on the basis of the Semiconductor Industry Association (SIA), which involved practically all global industry players, including Intel, IBM, Texas Instruments, Intersil, Rochester Electronics, Micron, Landsdale Semiconductor Inc. and others (see, for example, [*Rosso,* 2016]). A more recent example of the powerful international sectoral future study is the interdisciplinary foresight project "The Bioeconomy to 2030" (undertaken in 2007–2008 under the auspices of OECD). The steering group, created to supervise this work, included representatives of such global industry leaders as Organon, Ciba, Novo Nordisk, Novozymes, Evonik and others [OECD, 2009, p. 18].

Finally, it would be important to note one more, very significant effect of the creation of a working corporate foresight function at MNCs, which strictly speaking goes beyond the scope of a strategic management system. We mean the actual transformation of the overall corporate culture, its radical shift to absorb the ongoing change as a new, normal environment for the firm's operations. Indeed, by involving a wide range of managers in regular discussions on future challenges (threats and opportunities) engendered by a changing business environment, and on possible responses to such challenges, the corporate foresight mechanism inevitably makes a very important contribution to building such competencies as adaptability, flexibility, and the ability to quickly (or even preventively) transform itself (a specific competency which has recently got a special management term "agility"), i.e., exactly those organisational features that MNCs increasingly need as they are diving into the VUCA business environment. As noted by Yvette Salvatico, one of the founders of the foresight division at the largest US media MNC, Walt Disney, "The power of strategic foresight lies not primarily in its tools and methodologies but in its ability to alter minds and perspectives. With an integrated, holistic approach, firms can create a foresight competency that has the ability to truly alter their organisational culture" [*Salvatico,* 2013].

Conclusion

The fundamental reason for setting up a corporate foresight function at major multinationals lies in their objective need to have an in-house "early warning" system, which is able to identify potential

[12] It is quite indicative that one of the conclusions made in a special study of long-term energy forecasting practices in the US reads as follows: "More often than we would like to believe, forecasts are unduly influenced by the particular perspective of the sponsoring institution, and perspectives alien to that organisation are downplayed, misrepresented or ignored" [*Craig et al.,* 2002].

threats and emerging market opportunities. Large companies' inherent inability to recognise dangerous changes in the external environment was noted as early as in the 1970s by a classic of strategic corporate management theory, Igor Ansoff, who suggested using special tools to scan external weak signals [*Ansoff et al.,* 1976, p. 69]. However, only at the beginning of the current century, with the arrival of a new era of turbulence, MNCs started to introduce corporate foresight on a truly significant scale. Compared with conventional corporate strategic management mechanisms, the same systems equipped with effective foresight functionality acquired a number of crucially important new features: the time horizon of the vision of the future becomes significantly more extensive; the processes of scanning and analysing the external environment begin to proceed in a much broader, cross-industry and multidisciplinary context; intensive ongoing intra-corporate dialogue on the future development scenarios is launched and maintained; significant opportunities appear for influencing the development of the future business environment in the desired way. Finally, a new corporate culture emerges, leading to increased flexibility, adaptability, and transformative agility. Overall, it would be natural to conclude that foresight is becoming a key element of today's corporate strategic management architecture. In the toolset of MNCs' managers, who are striving to identify landmarks for positioning in rapidly changing global markets, under the conditions of permanent shifts occurring in the competitive landscape, the corporate foresight mechanism is increasingly playing the role of a GPS navigator helping drivers who are lost in the maze of an unfamiliar city.

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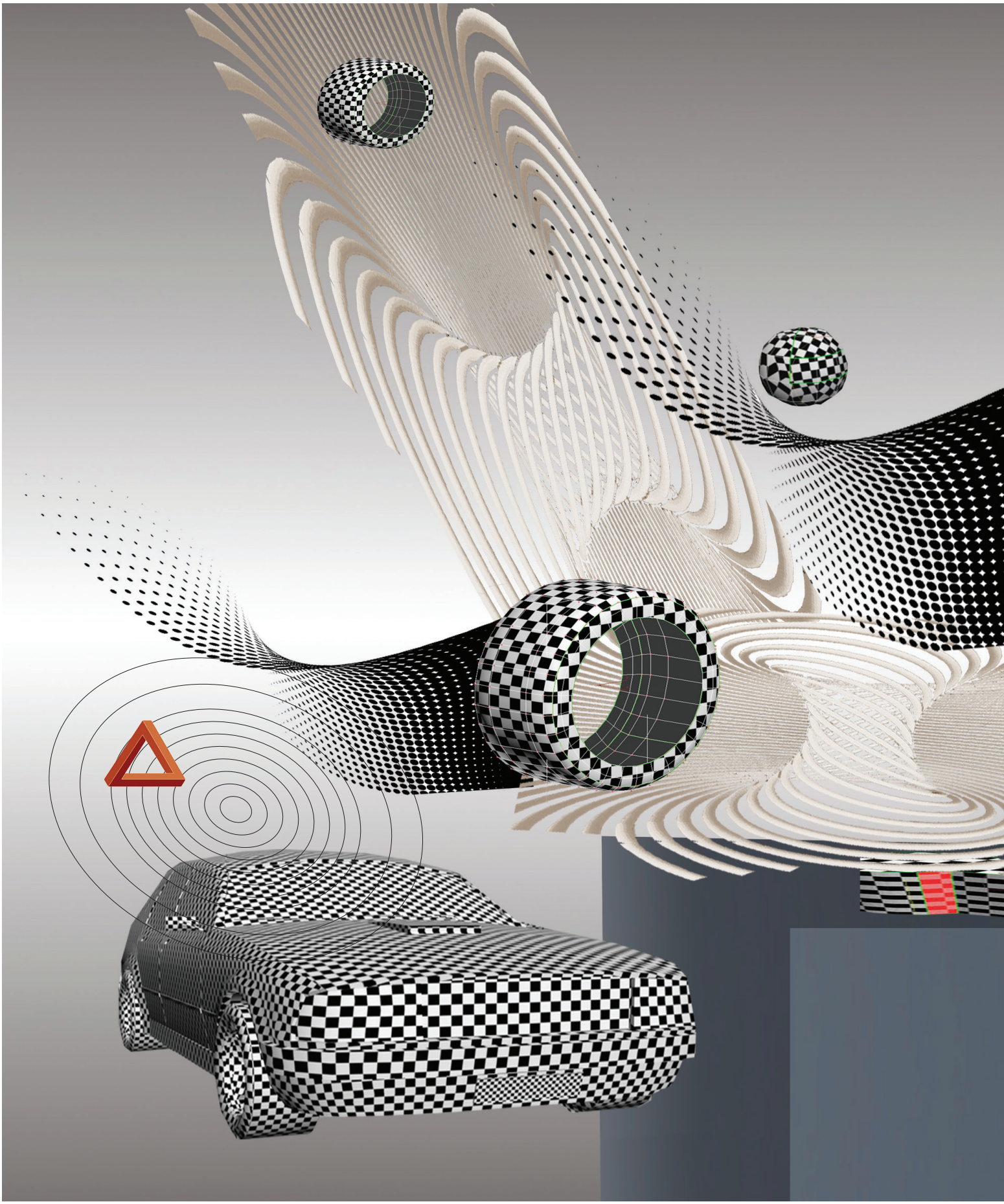

Why and How the Value of Science-Based Firms Violates Financial Theory: Implications for Policy and Governance

Sergey Bredikhin [a]

Junior Research Fellow, Centre for S&T, Innovation and Information Policy, Institute for Statistical Studies and Economics of Knowledge (ISSEK), sbredikhin@hse.ru

Jonathan Linton [b; a]

Head of Operations and Technology Management, School of Management; Head of Laboratory, Research Laboratory for Science and Technology Studies, ISSEK, j.linton@sheffield.ac.uk

Thais Matoszko [c]

Graduate Student, thais@itamambuca.com.br

[a] National Research University Higher School of Economics, 11 Myasnitskaya str., Moscow 101000, Russian Federation

[b] University of Sheffield, B067, Conduit Road, S10 1LF, UK

[c] Universidade Federal de São Carlos, Rodovia Washington Luís, 310, São Carlos - SP, Brasil.

Abstract

This paper considers how and why the positive net effect of science-related activities substantially increases the value beyond what would be anticipated by the financial theory, which seems to work so well for other fields. A qualitative analysis of 25 small biotechnology R&D firms listed on a stock exchange illustrates that these firms do not follow the neo-classical expectation of Gaussian returns. To better understand this deviation from the expected Gaussian returns, the firms are compared to S&P 100 and the Thomson Reuters Global Innovator List. It is found that while these large firms have a higher than expected frequency of non-Gaussian events, the causes appear to be dominated by macro-economic or industrial events that impact a large number of firms. With the small R&D-intensive biotechnology firms, it is possible to identify specific events that appear to trigger a sudden increase or decrease in value. A better understanding of the nature and magnitude of these events allows policy makers, investors and managers to better comprehend the unusually large risks and new opportunities associated with biotechnology R&D. From this, a greater insight is afforded into the dynamic value of R&D in general.

Keywords:
firm value;
biotechnology R&D;
financial theory;
volatility of market value;
R&D intensive firms.

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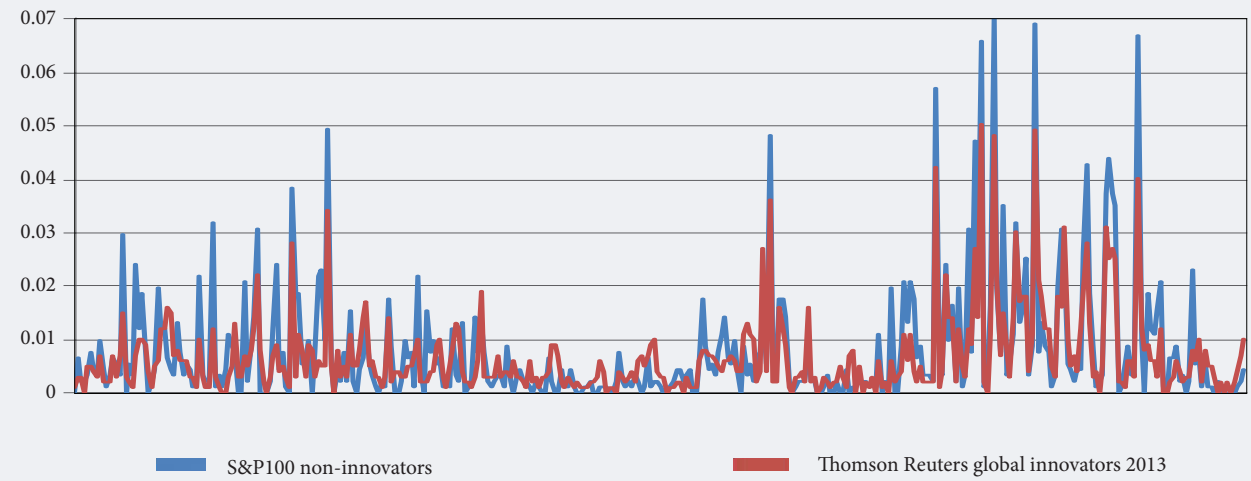
This paper considers how and why R&D-intensive smaller firms have significant differences in financial return behavior [*Casault et al.,* 2013, 2014] than from what is expected based on the prevailing neo-classical economic theory [*Willigers, Hansen,* 2008; *Newton et al.,* 2004]. Our paper is dedicated to exploring the nature of such contradictions and why they may appear. While the focus of this paper is on the direct impact of research-related activity, information is provided on events that are both related and unrelated to research activity. In doing so, a general understanding of non-equilibrium behavior is offered, while providing deeper insights into the impact of science, technology and innovation on R&D intensive organisations.

While it is relatively well-known that strong uneven fluctuations in the marginal distribution of returns can arise as a result of pure randomness [*Filiasi et al.,* 2014], the herding behavior of investors is also considered a general mechanism behind speculative bubbles [*Sornette, Ouillon,* 2012; *Wosnitza, Sornette,* 2015]. In the case of R&D-intensive firms, however, innovation activity results could potentially serve as a common trigger for such 'herding' dynamics. To clearly understand how the behavior of R&D intensive firms is similar and different from other firms, consideration is given to the 76 S&P100[1] firms that are not on the Thomson Reuters Global Innovator List[2] to obtain an indication of baseline behavior for large, successful firms. Next, the 83 companies on the Thomson Reuters 2013 Global Innovator List are considered (this list includes 24 S&P100 firms and 59 other large international firms).

To test our hypothesis that R&D activity is an important driver of sudden increases (and decreases) in share value, the average daily number of financial market events (>3σ price changes) is considered for large innovative and less innovative firms over the period of 2003–2013. The proportion of each of these groups having a number of >3σ price changes is shown for each day in Figure 1. An examination of the S&P 100 firms that were not noted by Thomson and Reuters as innovators (blue line) demonstrates a large number of non-Gaussian events. In fact, it is easy to obtain the impression that the less innovative large firms (blue line) experience more non-Gaussian events than the more innovative firms (red line). A careful examination of the occurrence of common dates for sudden changes in market value found that many firms were experiencing sudden changes on exactly the same date. As such a co-occurrence is potentially explained by macro-economic factors, further consideration was given. This assessment is perhaps best summarized and simplified through the consideration of Figure 2 — the share of firms with a value change greater than 3σ without considering years 2008, 2009 and 2011 that were removed from consideration. Removing these years eliminates the impact of major macroeconomic events, such as the stock market crash and concerns regarding Greek and US debt and budgets. Removing these three years of tremendous economic volatility eliminates the dominance of the less innovative large firms (blue) from Figure 2. Now the more innovative firms (red), dominate the less innovative firms on the majority

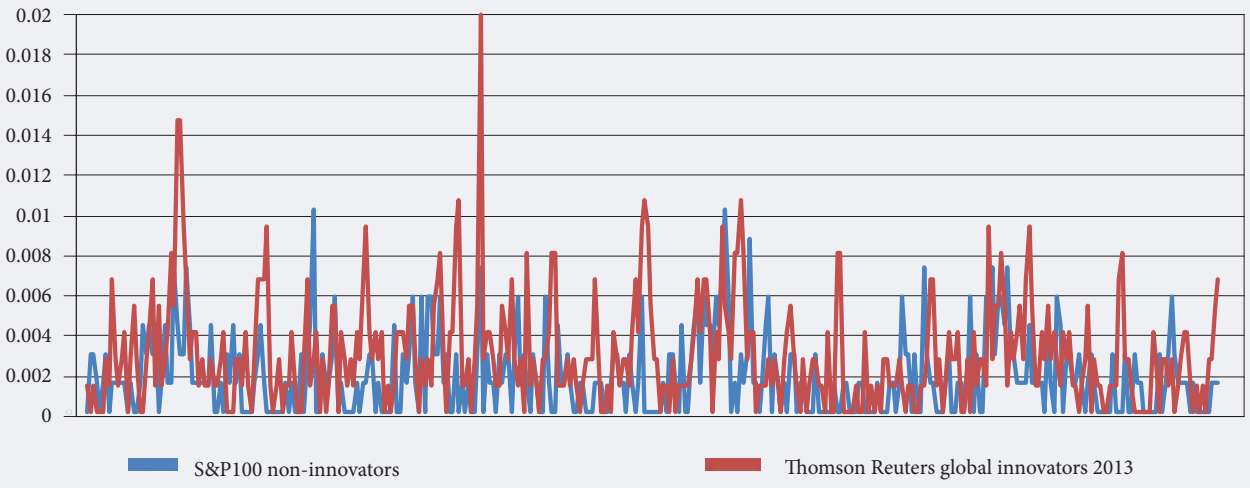
Figure 1. **The daily average of a number of >3σ price changes over the period of 2003–2013 by the day of the year**



Source: compiled by the authors.

[1] Available at: http://us.spindices.com/indices/equity/sp-global-100-c, accessed 17.08.2016.
[2] Available at: http://www.reuters.com/bizfinance/technology/Top100Innovators, accessed 17.08.2016.

Figure 2. **The daily average of a number of >3σ price changes over the period of 2003–2013, financial crisis years of 2008, 2009 and 2011 excluded, by the day of the year**



Source: compiled by the authors.

of days. The correlation between the share of volatile events as a function of time for more-innovative and less-innovative large firms falls from 0.87 to 0.24 — between Figures 1 and 2. The important conclusion from Figures 1 and 2 is that more innovative large companies are strongly dependent on the rest of the economy; prices move in a coherent manner during the times of powerful exogenous shocks, less strongly otherwise.

Having considered larger innovative firms' sudden changes in value, focus is now shifted to the smallest most R&D-intensive biotechnology firms. This group has been chosen as an example, because the smallest listed firms are likely to be based on one technology product or platform. Consequently, there should be no portfolio effect dampening the impact of favorable or unfavorable science, technology and innovation-related events. Furthermore, the value of biotechnology firms is heavily associated with intellectual property (IP). The presence or absence of real estate holdings or manufacturing facilities is unlikely to make a significant difference in day-to-day market valuation. Firms were also selected based on the presence of sufficient external media coverage so that one could determine the nature of events that appear to cause a sudden change in price (i.e., when an event and a sudden dramatic change in price coincide). This requirement reduced the number of appropriate small R&D intensive firms from 52 to 25.

Over the period of 2003 to 2013, these firms experienced 20 events with daily price changes of greater than 8σ, although the chance of a single event occurring above this level during this period is less than one out of 10^{11}. If we consider smaller but still uncommonly large daily price changes (3σ-8σ) there are 663 events instead of the 69 expected by financial and statistical theory. By understanding the nature of these events, insights into how R&D intensive biotechnology firms are unique are offered. It is likely that these results could be applied to other industries. However, in industries where IP and regulations such as FDA trials plays a lesser role in firm value, it may be more challenging to isolate the impact of science, technology and innovation on a firm's value. A search of company websites and Business Wire[3] allowed for the identification of announcements that explained the unexpected extreme financial behavior for 295 (44%) of these dates.

Biotechnology R&D and Thick Tails: Empirical Evidence

As daily changes in price increase in magnitude, the frequency of occurrence should decline exponentially. While the occurrence of large changes in price drop-off quickly, the decline is slower than anticipated (see Table 1). This is important as R&D intensive biotechnology firms have large price change events many orders of magnitude greater than expected. In terms of investing, this suggests that a portfolio consisting of these R&D intensive small biotechnology firms will have a series of unexpected large

[3] Available at: http://www.businesswire.com/portal/site/home/, accessed 23.06.2016.

Table 1. **Summary of the frequency of high variability change and the difference in order of magnitude between theoretically anticipated and empirical occurrence***

Magnitude of Price Change	Number of Events in 25 Firms Under Consideration	Difference in Actual versus Difference in Expected Occurrence (order of magnitude)
Under -8σ	32	12+
From -7 to -8σ	10	7+
From -6 to -7σ	7	4+
From -5 to -6σ	18	2+
From -4 to -5σ	55	1+
From -3 to -4σ	128	0 (1.4 times)
From 3 to 4σ	239	0 (2.6 times)
From 4 to 5σ	84	1+
From 5 to 6σ	37	3+
From 6 to 7σ	17	5+
From 7 to 8σ	9	7+
Over 8σ	27	12+

* For example if an event should occur 1 in a 1,000 times, but is occurring 2 in 10 times — the order of magnitude is 2+).

Source: compiled by the authors.

magnitude events that will contribute to a net positive change of over 600σ. As financial theory suggests, the distribution of change is symmetrical around 0, this finding is unexpected and important. While theoretically unexpected, this positive performance is consistent with the strong market performance of firms that are based on research in biotechnology.

Sudden unexpected changes in price for biotechnology research-based firms have both managerial and technical drivers. While the managerial drivers are of interest to investors and managers, the technical drivers are important to scientists and policy makers as they offer insight into how the value of research can soar and plummet as the result of a single event. As some suggest that research should be managed like other investments, evidence that the behavior of science differs greatly from other investments is critical to prevent high-risk, high-value research from being discarded by the Generally Accepted Practices and Principles of accountants and other investment analysts. Consequently, both managerial drivers and technical drivers are reported (Table 2).

However, this article focuses on the implications of the technical drivers to theory and practice. One-hundred and forty-six of the extreme events are related to the underlying science and technology in some way — trial results, FDA approval, new discovery/use, science-related conference calls or agreements and patents. The net impact of these science-related changes for firm value is equivalent to 108σ (Figure 3). Changes in value can be either positive or negative. The failure of an experiment may wipe out value equivalent to over 22 σ — a change so large it eliminates all or almost all of the host firm's value. Similarly, a successful experiment can add tremendous value (23σ) and the identification of a new use or product can add over 13σ. Sudden events having values of this magnitude are unheard of in effective financial market theory and consequently suggest that the *rules of the game* in biotechnology are different. In effect, it makes such an event a potential candidate as a so-called "dragon-king". Dragon kings are extreme events of higher frequency than expected by power-law scaling occurrence that do not belong to the same classification as the other events [*Sornette,* 2009], rather than as the inherently unpredictable class of "Black Swans" [*Taleb,* 2007]. This type of dragon-king can be exemplified by the 'lucky villager' metaphor, when one of the village residents hits the jackpot in the national lottery and this results in creating an outlier compared to the statistics of players' wins provided by local gambling houses [*Malkov et al.,* 2012]. However, further research and adequate statistical tests are needed to diagnose a dragon-king in the sample and thus assess the degree of predictability [*Sornette, Ouillon,* 2012] of R&D-driven value changes. In the meantime, they should be treated as purely stochastic phenomena. This being the case, it is worth considering these implications for decision support and managing biotechnology research.

Implications for Decision-Making and Management of Biotechnology R&D

As suggested earlier, the management and investing side is acknowledged and included in the table, but the article itself is focused on the implications of the extraordinary events for assessing and managing the

Table 2. **Summary of the science and managerial related reasons for large sudden shifts in firm value ***

Type of Event associated to Jump in Firm Value	Occurrences Identified:			Extrema (σ)		Average (σ)	
	total	positive	negative	positive	negative	positive	negative
Trial Result	81	45	36	23.0	22.1	5.1	7.3
FDA Announcement	38	21	17	21.9	9.3	5.8	5.7
New Discovery/ Product Release	19	14	5	13.8	5.3	6.9	3.9
Conference Call — re Science	7	4	3	4.7	7.1	3.5	4.8
Third Party Agreement — re Science	8	6	2	13.6	4.6	7.1	4.0
Patent Granted	3	3		3.9		1.7	
Financial Result Published	40	23	17	8.8	18.8	4.3	5.6
Common Stock Issued	24	9	15	22.5	24.5	7.7	7.4
Financing Announcement	17	11	6	5.2	6.0	4.9	4.1
Conference Call — re Management	12	8	4	6.1	4.0	4.3	3.6
Third Party Agreement — re Management	8	6	2	17.8	8.9	7.0	6.3
Change to Management Team	12	9	3	5.4	12.1	7.0	6.3
Court Announcement	5	4	1	4.0	3.1	3.7	3.1
International Agreements	10	8	2	5.0	4.5	4.3	4.1
Acquisition of New Equipment	1	0	1		3.1		3.1
Public Offering	7	2	5	8.4	6.5	8.3	5.4
Change of Firm Name	1	1	0	5.7		5.7	
New Strategy Announced	1	1	0	18.6		18.6	

*Frequency, extrema, and averages – for positive and negative events – are all expressed in terms of standard deviation of share price (σ).

Source: compiled by the authors.

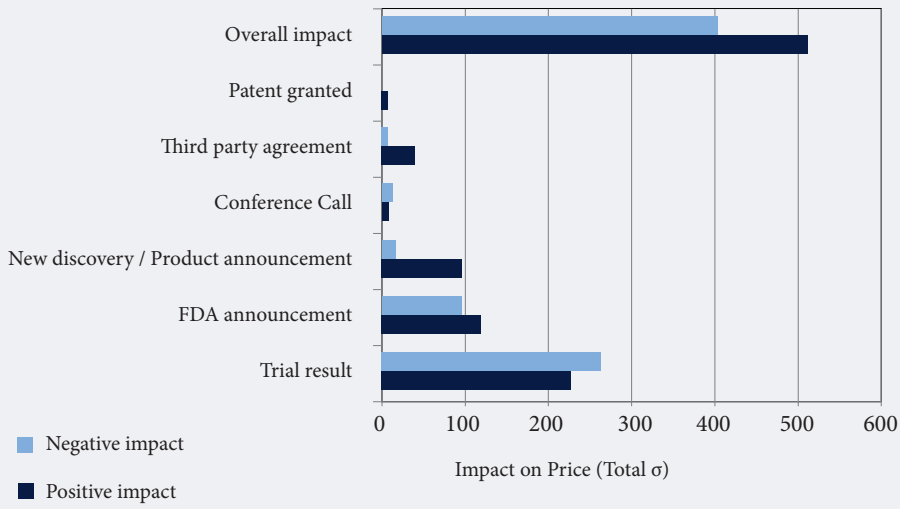
underlying science. The extreme and sudden shifts in value that can occur when a scientific experiment succeeds or fails call for different approaches to management. The consideration of single experiments or discoveries should be replaced with a consideration of portfolios. Otherwise, managers and analysts will tend to make decisions against projects with high potential — as failure can lead to a tremendous and sudden loss in value. What is also apparent is that a single extremely valuable discovery is not proof of brilliance; nor is an extreme failure a sign of incompetence. While scientists should be acknowledged for their successes, it is the portfolio results that are telling with regard to the quality of the scientist. It is critical that scientists who experience significant failures not be discouraged from taking on significant challenges as one or more large magnitude failed experiments do reflect the willingness of the scientist to conduct high risk/high return research, but not their ability to do so.

To some extent, the shift to portfolios has already commenced. The occurrence of taking partial stakes in a larger number of projects and risk sharing with competitors, supply chain members and other stake holders continues to increase. The Bayh-Dohl Act in the United States supports the ability to conduct research in this manner. Other social innovations should be devised to enable and support risk sharing, consortia building, and technology transfer.

To better model expectations and the value of biotechnology research, the behavior of research-intensive biotechnology firms (such as the sample of the 25 firms considered here — Table 3) should be considered and methods such as Monte-Carlo resampling can be used to determine the potential outcomes of research.

To approximate the added value of unexpected large price change events for a portfolio of research, we consider our sample of 25 firms, together they offer a surplus of 108σ. If we assume that the firms have a mean value of 100 and a σ of 10, traditional financial analysis would consider no surplus over the mean value of 100 — as the symmetry around the mean results in the value equaling the mean. However, as there is an asymmetrical surplus of 108σ (Figure 3) — corrected for 25 firms, it is equivalent to 4.32 σ. The value of the portfolio is equal to the product of the mean and the asymmetry (4.32 x 10) = 143.20. Consequently, recognizing the net positive effects associated with the uncertainty related to the science increases the value by 43.2% in this illustration of results from a portfolio of 25 R&D intensive biotechnology firms.

Figure 3. **Visual summary of impact of extreme science related events and how they move the value of the portfolio of biotechnology firms away from and above the expected mean price**



Source: compiled by the authors.

Table 3. **R&D Intensive Biotech Firms that made up the sample**

Company Name	Activities	Location
ACADIA pharmaceuticals Inc.	Noncommercial Research organisation	San Diego, CA
Access Pharmaceuticals Inc.	Commercial Research Laboratory	Dallas, TX
Adolor Corp	Pharmaceutical Preparations	Lexington, PA
Alexza Pharmaceuticals Inc.	Pharmaceutical Preparations	Moutain View, CA
Ap Pharma Inc.	Pharmaceutical Preparations	Redwood City, CA
Aastrom Biosciences Inc.	Medical Labs	Ann Arbor, MI
Athersys inc.	Pharmaceutical Preparations	Cleveland, OH
Cyclacel Pharmaceuticals Inc.	Research and Development Laboratories	Berkeley Heights, NJ
Elite Pharmaceuticals Inc.	Pharmaceutical Research Labs	Northvale, NJ
Emisphere Tech Inc.	Pharmaceutical Preparations	Cedar Knolls, NJ
Entre Med Inc.	Pharmaceutical Preparations	Rockville, MD
Fibrocell Science Inc.	Autologous Cellular Therapeutic Company	Exton, PA
GenMark Diagnostics Inc.	Biotechnology Products and Services	Carlsbad, CA
GenVec Inc.	Pharmaceutical Preparations	Gaithersburg, MD
Hemispherx Biopharma Inc.	Biotechnology Products and Services	Philadelphia, PA
Insmed Inc.	Pharmaceutical Preparations	Monmouth Junction, NJ
NovaDel Pharma Inc.	Specialty Pharmaceutical Company	Bridgewater, NJ
Northwest Biotherapeutics	Pharmaceutical Preparations	Bethesda, MD
Oculus Innovative Sciences Inc.	Biotechnology Products and Services	Petaluma, CA
Oncothyreon Inc.	Commercial Physical & Biological Research	Seattle, WA
Oxigen Biotherapeutics Inc.	Commercial Physical & Biological Research	Morrisville, NC
OXIS International Inc.	Pharmaceutical Preparations	Beverly Hills, CA
Regenerx Biopharmaceuticals Inc.	Pharmaceutical Preparations	Bethesda, MD
Virtual Scopics Inc.	Surgical and Medical Instruments	Rochester, NY
WaferGen Biosystems Inc.	Laboratory Analytical Instruments	Fremont, CA

Source: compiled by the authors.

Conclusions

This study of 52 research-intensive biotechnology firms indicates a departure from the fundamental assumptions of financial theory — efficient markets and Gaussian Brownian motion. A further consideration of the sample of 25 firms that had readily available news releases for a substantial number (44%) of the sudden large price change events found that events with a scientific base (e.g. discoveries and critical experiments) resulted in a net increase of value (108σ for the portfolio or 4.32 σ/firm). Consequently, traditional techniques such as Net Present Value (NPV), Internal Rate of Return (IRR) and simple payback to assess value will systematically undervalue and discourage worthwhile research. To assess value more appropriately it is worthwhile to model R&D and science investment decisions for biotechnology on the behavior associated with research-intensive firms. While screening of projects is likely to be done on a project-by-project basis, evaluation and tracking should be done on a portfolio basis. Through the consideration of the magnitude of extreme events such as trial results, FDA approvals, patents and discoveries it is possible to obtain a better understanding of the impacts of scientific research and to gain a better appreciation of the real value it offers.

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Intellectual Capital and Its Impact on the Financial Performance of Russian Manufacturing Companies

Tatiana Andreeva [a]
Lecturer, School of Business, tatiana.andreeva@nuim.ie.

Tatiana Garanina [b]
Associate Professor, Graduate School of Management, garanina@gsom.pu.ru.

[a] Maynooth University, Maynooth, Co. Kildare, Ireland.

[b] St. Petersburg University, 1 Volkhovsky per., Saint-Petersburg 199004, Russian Federation.

Abstract

It has been argued that intellectual capital (IC) is the key element of value creation in the contemporary economy. According to expert calculations, in the 1980s the share of tangible assets accounted for about 62% of market capitalization of companies on developed markets. However, by the start of the 2000s, their share fell to 16%. This has been widely supported by empirical research, but mainly based on the data from developed markets. The questions as to how IC and its elements work on emerging markets remains under-researched due to a lack of empirical research devoted to this topic. The aim of the study is to provide empirical insight into the relationship between three main elements of IC (human, relational and structural) and the organisational performance of Russian companies, such as asset profitability, net sales growth and market share. The sample includes 240 Russian companies. Information about different elements of intellectual capital has been gathered with the help of a questionnaire that has been answered by the executive management of the companies included in the sample over the course of January-March 2015. The data was collected with a survey using the scales that have already been applied internationally. The findings based on regression analysis demonstrate that structural and human capital positively influence organisational performance, while relational capital does not.

We can assume that the results we obtained can be explained by the specific features of the analysed industries. For manufacturing companies, organisational structure and the effectiveness of internal processes play a much more important role in company value creation than relationships with customers and other stakeholders. The core managerial implication of this study is that building structural capital, providing employees with efficient and relevant information systems and tools to support cooperation between employees, as well as carefully documenting organisational knowledge and making it easily accessible for employees, should be in the focus of the managers of manufacturing companies. The concept of IC management in our article was developed within the international context and focuses on emerging markets. At the end of the paper, the main areas for further research are presented.

Keywords:
intellectual capital;
elements of intellectual capital;
companies' performance;
manufacturing sector;
Russia.

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Knowledge-based assets are turning into a key factor affecting companies' growth in the present-day economy. In the long term, companies that innovate on a regular basis, which make full use of new knowledge and technologies, skills and experience of their staff, and which have put an adequate organisational infrastructure into place, tend to become successful and competitive. Added value created by companies is increasingly generated from intangible assets [*Edvinsson, Malone,* 1997; *Guthrie,* 2001; *Sveiby,* 1997]. The latter include knowledge, know-how, innovation potential, licence agreements, management culture, and other resources of company growth. The firm's ability to manage such assets is crucial for its prospects in the knowledge-based economy. However, relevance of these concepts, which are well established in the international literature, still needs to be verified for the Russian market.

Limitations hindering the direct application of international management theories in Russia were analysed in a number of Russian studies (e.g. [*Elenkov*, 1998; *Andreeva*, 2008]). Other researchers concentrated on the specific cultural and institutional context, as a part of which knowledge-based processes take place in a different way compared with Western or Japanese companies [*Andreeva, Ikhilchik,* 2009; *May, Stewart,* 2013]. However, despite these efforts, the question of how applicable the concept of intellectual capital is to Russian realities remains open. Very few studies have researched the relevant issues on the basis of Russian material [*Baiburina, Golovko,* 2008; *Bykova, Molodchik,* 2011; *Volkov, Garanina,* 2007; *Garanina,* 2010; *Tomchuk et al.,* 2013], and their results frequently were quite different from international ones. For example, tangible assets make a much more substantial contribution to Russian companies' performance than intellectual capital does; note that studies of other emerging markets produced similar results [*Chan,* 2009; *Suraj, Bontis,* 2012; etc.]. On the contrary, on developed markets, intellectual capital plays a key role in companies' performance [*Inkinen,* 2015; *Molnar,* 2004].

The specific correlation between key intellectual capital elements and Russian companies' performance indicators remains insufficiently researched due to several reasons. Firstly, the existing studies use small samples, typically consisting of just over 100 companies [*Bykova, Molodchik,* 2011], which makes the authors' conclusions significantly less representative and valid. Secondly, some of the indirect indicators applied to assess intellectual capital elements were severely criticised in international literature as poorly reflecting the actual state of affairs at the companies [*Coombs, Bierly,* 2006]. However, on the whole Russian studies note a positive correlation between corporate performance indicators and intellectual capital [*Bykova, Molodchik,* 2011; *Volkov, Garanina,* 2007; *Garanina,* 2010], the characteristics of the latter's specific elements frequently turn out to be incompatible, due to essential incongruity of analytical tools applied by the authors.

Increasing Russian businesses' competitiveness requires an understanding of the workings of intellectual capital management mechanisms [*Dumay*, *Garanina*, 2013]. This, in turn, means that Russian companies must know which intellectual capital elements directly affect their performance indicators. The paper strives to answer the following questions:

- Is there a connection between intellectual capital and Russian companies' performance?
- Which intellectual capital elements have the strongest impact on Russian companies' performance indicators?

240 manufacturing companies operating in various Russian regions were included in the sample. A survey of their managers provided data on various intellectual capital elements; the study contributes to the further development of the relevant concept. The results of the study may promote Russian companies' competitiveness, by helping them to better understand the role of intellectual capital and ways to efficiently manage it in the Russian institutional and cultural context (see, e.g., [*May, Stewart,* 2013]).

The first section of the paper introduces the basic concepts and reviews other studies of the correlation between various intellectual capital elements and companies' performance. Next, the methodology, sample, and conclusions are presented, arrived at by applying models based on structural equations. In the concluding section, recommendations on managing intellectual capital elements are provided and areas for future studies are outlined.

Elements of intellectual capital and companies' performance

In line with the dynamic approach presented earlier in [*Volkov, Garanina,* 2007, p. 87], we understand intellectual capital as "the company's ability to turn its current resources, skills, and competencies into future economic benefits". This definition implies that achieving growth requires not just an understanding of the nature of intellectual capital, but also the possession of special competencies required to efficiently apply it to obtain economic benefits in the future. There ifs no consensus among scholars regarding the structure of intellectual capital [*Molodchik et al.,* 2014], but the majority [*Edvinsson, Malone,* 1997; *Sveiby,* 1997] are inclined to distinguish three key elements: human, relational, and organisational (or structural) capital.

We define human capital as a company's ability to economically benefit from the potential of their staff, embodied in the latter's knowledge, skills, experience, innovativeness, creativity, loyalty, efficiency, ability to learn, motivation to develop, etc. Similarly, relational capital is seen not as a resource but as a company's ability to make use of the potential offered by its internal and external interactions [*Volkov, Garanina,* 2007] — i.e. good relations with clients, suppliers, partners, and other parties. Organisational (structural) capital, sometimes referred to as the company's "skeleton" or "glue" holding it together, amounts to the management's ability to efficiently apply such intangible assets as corporate culture, philosophy and mission, management structure, and efficient business processes, including those related to the accumulation and transfer of knowledge.

The correlation between companies' performance and various elements of their intellectual capital has been thoroughly studied in developed countries [*Bontis,* 1998; *Cabello-Medina et al.,* 2011; *Maditinos et al.,* 2011; *Mention, Bontis,* 2013; *Subramaniam, Youndt,* 2005]. Numerous international authors recognise the decisive role of human capital in improving companies' financial performance [*Cabello-Medina et al.,* 2011; *Jardon, Martos,* 2012; *Mention, Bontis,* 2013], and in increasing their structural and relational capital. This is due to the fact that educated, skilled, and experienced staff tend to establish better relationships with a wide range of partners (thus capitalising on relational assets), and improve the efficiency of business processes (thus generating structural capital) [*Cabrita, Bontis,* 2008; *Kim et al.,* 2012]. Other authors, on the contrary, insist that relational capital ultimately makes the highest contribution to companies' financial performance [*Reed et al.,* 2006; *Huang, Hsueh,* 2007; *Sharabati et al.,* 2010]: reliable client and supplier relations allow for cutting costs and increasing sales, thus improving the company's overall competitiveness.

Henri Inkinen [*Inkinen,* 2015] presented a thorough review of empirical studies on the role of human capital comprising more than fifty relevant works. He said companies' performance is most often measured using internal (or accounting) indicators such as returns on assets and equity, sales dynamics, innovation activity, and certain external (or market) indicators measuring the company's capitalisation, Tobin's coefficient, or market share. Inkinen concludes that intellectual capital first of all positively affects companies' innovation activity, while its various elements create a synergy which increases their combined impact on the firm's performance [*Inkinen,* 2015].

The question of the forms the above correlation takes in Russia remains open. We tried to summarise the results of previously conducted studies on correlation between various intellectual capital elements and Russian companies' performance in Table 1. The only issue about which Russian researchers seem to agree is the positive effect of structural capital on corporate performance, which contradicts the evidence from developed countries where human capital plays the key role [*Inkinen*, 2015]. The view of the other two intellectual capital elements varies significantly. Not all researchers even consider relational capital at all, so we were unable to assess its importance. The different opinions of Russian researchers may be explained by the fact that they have studied different industries during different periods of time, using different tools individually selected for each specific case. Also, most of the reviewed studies were based on small samples — which limits the applicability of the authors' conclusions.

The authors of the reviewed studies used only open data sources and did not have access to raw data. In our opinion, the potential effect of intellectual capital elements on companies' financial performance should primarily be studied in an empirical manner, among other things through the prism of company managers' opinions. This approach turns out to be much more productive in terms of increased the efficiency of companies' operations.

Taking into account the controversial conclusions about intellectual capital elements' correlation with Russian companies' performance indicators suggested by the authors of previously conducted studies, we propose the following preliminary hypotheses:

H1: There is a positive correlation between human capital and companies' performance indicators.

H2: There is a positive correlation between relational capital and companies' performance indicators.

H3: There is a positive correlation between structural capital and companies' performance indicators.

Methodology of the study

Sample and data collection procedures

The range of companies surveyed during our study was limited to those employing at least 100 people, which use sufficiently formalised management practices. The issues under consideration can be researched for various sectors of the economy, though the service companies, which on average tend to be relatively small, do not allow for building a representative sample meeting the minimum number of employees mentioned above. Their inclusion in the sample along with manufacturing companies would result in

Table 1. **Results of empirical studies of the correlation between Russian companies' intellectual capital and their performance**

Authors	Country, industry, sample size	Intellectual capital measurement technique	Companies' performance indicators	Impact of intellectual capital elements*			Note
				HC	RC	SC	
[*Tovstiga, Tulugurova,* 2007]	Russia, 20 innovative companies in St. Petersburg and Leningrad Region	Survey	Internal (accounting) and external (market) performance indicators	+	n/a	+	
[*Bayburina, Golovko,* 2008]	Russia, 19 companies specialising in various industries	Proxy indicators	IP added value	+	n/a	+	A positive impact of innovation and network capital was also established
[*Garanina,* 2010]	Russia, 43 companies; industry not specified	Proxy indicators	Share price	++	+ / no	+	Results somewhat varied between industries. Relational capital had the highest impact on telecommunication companies, while in the energy industry it was insignificant
[*Bykova, Molodchik,* 2011]	Russia, the Perm Region, 115 companies; industry not specified	VAIC	Returns on equity, sales dynamics	+	n/a	+	A positive correlation was found only with the dependent variable measuring rate of sales
[*Molodchik, Nursubina,* 2012]	USA (143 companies), Russia (60 companies); industry not specified	Proxy indicators	Share of new products in the product range (innovation activity)	–	+	+	Explanatory power of the model was higher when Russian data was used (compared with the US data)
[*Tomchuk et al.,* 2013]	Russia, the Perm Region, 15 companies; industry not specified	VAIC	Profit margin	+	n/a	+	

* *Legend*:

HC = human capital; RC = relational capital; SC = structural capital;

++ = strong positive correlation, defined as one explanatory variable coefficient being significantly larger than others; + = positive correlation; – = negative correlation; no = no correlation established; n/a = data not available because this intellectual capital element was not assessed.

Source: compiled by the authors, based on analysis of the abovementioned studies.

a noticeable bias in favour of the latter. These industries have a different configuration of intellectual capital elements, and tend to use different approaches in managing them [*Kianto et al.,* 2010], which creates additional problems with the comparative analysis of correlation with companies' performance.

Given the above limitations, we decided to concentrate on manufacturing companies in our study — a strategic sector for the Russian economy whose traditionally important role is confirmed by official statistics: the manufacturing industry's contribution to the GDP in 2014 amounted to 32.4%[1]. The data for analysis was collected in the period of January–March, 2015; its representativeness and diversity were ensured by wide territorial (24 Russian regions) and industrial (11 manufacturing industries) coverage. Companies employing more than 100 workers were identified in the surveyed regions — 615 altogether, approximately evenly distributed between the various regions and industries. At the next stage, the members of the company contracted to provide support during the survey invited top managers (general directors, heads of personnel departments, or other executives of a similar position) to take part in a telephone interview. In the end managers from 240 companies were surveyed, or 39% of the total sample. The highest representation was achieved for the city of Moscow and the Moscow Region (12.5%), Yekaterinburg and the Sverdlovsk Region (10%), St. Petersburg and the Leningrad Region (8.8%). Industry-wise, the largest shares of companies specialised in mechanical engineering (including the production of electrical machinery and equipment, 17.5%), vehicle production (11.7%), the food (10.4%) and light (9.6%) industries.

Most of the respondents hold important positions at their companies (Table 2). We believe their experience and authority were sufficient to objectively assess their companies' situation, management practices, and performance.

[1] Gross domestic product, annual data by OKVED sections // Federal Statistical Service. Available at: http://www.gks.ru/free_doc/new_site/vvp/vvp-god/tab10.htm, last accessed on 9.01.2017 (in Russian).

Table 2. **Information about the survey respondents**

Position in the company	Number of companies	Share in the sample, %
Deputy general director	93	38.8
Other management positions	58	24.2
Personnel director	56	23.3
General director	33	13.7

Source: compiled by the authors.

Study tools

The various elements of intellectual capital are assessed in different ways. Researchers usually adopt one of three major approaches. In the first case, they prepare practical, applied recommendations for company managers. For example, the Skandia Navigator [*Edvinsson, Malone,* 1997] or the Intangible Asset Monitor [*Sveiby,* 1997] techniques are based on algorithms for assessing intellectual capital which, due to the lack of a solid conceptual framework, cannot be standardised — and therefore only have limited applicability. For the same reason such methods are not suitable for quantitative studies which imply analysing large volumes of aggregated data on the companies included in the samples.

The second approach is based on assessing intellectual capital elements using various proxy indicators calculated on the basis of open source data. An example of using this approach is the *Value Added Intellectual Coefficient (VAIC*) model [*Pulic,* 2000]. The following indicators are used most often: labour costs to assess human capital [*Sydler et al.,* 2013; *Pulic,* 2000]; administrative costs and R&D expenditures to assess structural capital [*Edvinsson, Malone*, 1997; *Roos, Roos,* 1997; *Sydler et al.,* 2013]; and commercial expenditures to assess relational capital [*Edvinsson, Malone,* 1997, *Wu, Tsai,* 2005]. This approach does not guarantee accurate results either, since the indicators are calculated using open-source data and do not reflect the actual value of intellectual capital elements: balance sheets and profits-and-losses statements are published in accordance with conservative corporate standards which do not take into account market expectations. An analysis of previously conducted studies (Table 1) reveals that the most commonly used methods for assessing Russian companies' intellectual capital are the VAIC model and the proxy indicators technique based upon it.

As part of the third approach, intellectual capital elements are assessed by surveying company managers using specially designed questionnaires [*Sharabati et al.,* 2010; *Suraj, Bontis,* 2012]. According to the proponents of this methodology, it allows for conducting an integrated assessment of the overall intellectual capital and its specific elements [*St-Pierre, Audet,* 2011], so it seems to be best suited for the purposes of our study. We have used a questionnaire designed by a team of experts, participants in an international research project. The questionnaire was tested using Finnish corporate sector data [*Inkinen et al.,* 2014]. The questions and the scales borrowed from the English-language questionnaire were formulated in Russian in line with the standards for cross-cultural studies [*Harzing,* 2005]. The translation was carried out with the participation of experts, an independent peer review, comparison and adjustment of wording. The translated questionnaire was tested at several companies.

Questions for assessing intellectual capital were borrowed from the work [*Inkinen et al.*, 2014], which in turn was based on other studies: [*Kianto*, 2008; *Yang, Lin*, 2009] for relational capital; [*Kianto*, 2008; *Kianto et al.*, 2010] for structural capital; and [*Bontis*, 1998; *Yang, Lin*, 2009] for human capital. Companies' performance was assessed using questions cited in [*Delaney, Huselid*, 1996], which have proved their theoretical and practical value through numerous empirical tests. These questions are designed to measure the profitability of companies' assets, their sales performance, and the changes in their market share during the year preceding the survey, compared with competitors (Table 3). The answers were ranked using the 5-point Likert scale.

Company size (i.e., the number of employees) and the previous year's financial performance indicators, namely financial leverage and current liquidity ratio, were used as control variables. The debt-to-own-equity ratio (financial leverage) and the current-assets-to-current-liabilities ratio (current liquidity) directly affect companies' financial performance [*Chan,* 2009; *Santidrián,* 2010; *Sriram,* 2008]. Financial stability allows companies to invest in intellectual capital and increase their productivity. Financial data was obtained from the SPARK database. 51 out of the 240 companies in the sample, or 21.2%, did not provide any data for 2014. In subsequent calculations, the control variables were used in logarithmic form.

Table 3. **Questions included in the questionnaire and factor analysis results**

Model's variables and corresponding questions	Factor loadings, ranging from 1 (insignificant) to 5 (high)
Company performance: How successful was your company in the previous year compared with other firms specialising in the same industry, in the following areas?	Cronbach's α = 0.851
Net sales growth	0.885
Returns on assets*	—
Market share	0.832
Human capital: How true is each of the following statements about your employees' competence?	Cronbach's α = 0.838
Our employees are highly skilled in their professions	0.848
Our employees are highly motivated	—
Our employees are highly competent	0.850
Structural capital: How true is each of the following statements about your company's internal structure?	Cronbach's α = 0.830
We have efficient and adequate information systems in place to support our operations	0.897
We have tools and mechanisms in place to promote cooperation between our employees	0.790
Our company's documentation and databases contain a lot of useful knowledge*	—
Our documentation and equipment are easily accessible	—
Relational capital: How true is each of the following statements about your company's external and internal interactions?	Cronbach's α = 0.773
The company's various departments (e.g. R&D, Marketing, and Production) understand each other well*	—
Our employees frequently work together to accomplish specific objectives	0.680
Internal interactions in our company are smooth	0.545
Our company and its stakeholders (such as consumers, suppliers, and partners) understand each other well*	—
Our company frequently works together with its stakeholders to accomplish specific objectives	0.679
Our company actively cooperates with external stakeholders (such as consumers, suppliers, and partners)	0.799

** Excluded following the corroborative factor analysis.
Source: composed by the authors

Study results

To test the questions' relevance for measuring the selected variables, a preliminary factor analysis was conducted [*Hurley et al.,* 1997]. Table 3 presents the questionnaire's questions with factor loadings and the scales' internal consistency indicators. Unlike the results of international testing for the questionnaire [*Inkinen et al.,* 2014] whose authors distinguished between external and internal relational capital, we have treated these factors as one and the same. Cronbach's Alpha coefficient for all variables in the model exceeded 0.7, which is evidence of a high internal consistency and validity of the questions.

Table 4 presents descriptive statistics of latent variables calculated as mean values of answers to relevant questions.

Checking independent variables for multicollinearity produced a negative result: the variance inflation factor (VIF) ranges between 1.173–1.624, so it is quite removed from 3. Preliminary testing also revealed a constant remainder variance and a lack of random errors' heteroscedasticity. The theoretical model was assessed in line with the methodological recommendations in [*Anderson, Gerbing,* 1988]. First the measurement model was analysed to determine how the data matches the structure of interconnections. Next, the theoretical model based on previous studies (the one presented in the Hypotheses section) was assessed. Following the corroborative factor analysis, some of the answer options were excluded from the questionnaire (marked with * in Table 3), and the analysis's results were applied to test the theoretical model (Figure 1). Since there was no data on two control variables for more than 20% of companies in the sample, testing was done twice: for all 240 companies using a single control variable (company size), and for a truncated sample, which included 188 companies using three control variables. In both cases the model produced similar results. The results of testing the model for the truncated sample using three control variables are presented below.

Table 4. **Descriptive statistics of variables used in the study**

Latent variable	Mean value	Standard deviation
Human capital	4.2	0.73
Relational capital	4.06	0.65
Structural capital	3.95	0.84
Company performance	3.28	1.06
Company size (number of employees)	1024.2	4019.7
Financial leverage	1.49	4.06
Current liquidity ratio	2.52	2.95

Note: correlation is significant at p = 0.000 (bidirectional).
Source: composed by the authors.

Criteria for testing the model which describes the correlation between the three elements of intellectual capital and company performance are presented in Table 5 (Column 3); they describe the suitability of covariation matrix for the data we have collected. All resulting indicators fall within ranges recommended in the methodological literature.

The testing of the model (Figure 1) revealed that companies' structural and human capital does affect their performance (with B-coefficients of 0.505 and 0.249, respectively), while relational capital does not. At the same time, all three of these elements have a positive correlation with each other. Among the control variables, only company size had a similar effect, while objective financial performance indicators did not play a comparable role. The latter's impact factors are also shown in Figure 1. On the whole, the model explains 35.4% of the dependent variable's variation.

Main conclusions

The study confirmed the hypothesis about structural and human capital affecting manufacturing companies' performance (which explains a quarter of dependent variables' variations), while relational capital does not have such an effect. Structural capital turns out to be more significant than human capital. These conclusions in general match the data obtained over the course of Russian and international studies (see Table 1), with certain important stipulations.

Firstly, the authors of most of the publications on the role intellectual capital plays in business use open-source financial data, in most cases they use the VAIC model to process it. Such an approach does allow one to establish a positive correlation between specific intellectual capital elements and companies' performance [*Komnenic, Pokrajcic,* 2012; *Maditinos et al.,* 2011], but the indicators built on its basis are not perfect. A survey-based approach, i.e., working with raw data collected using questionnaires, results in a better understanding of the actual state of companies' intellectual capital [*St-Pierre, Audet,* 2011], and our study is eloquent proof of this.

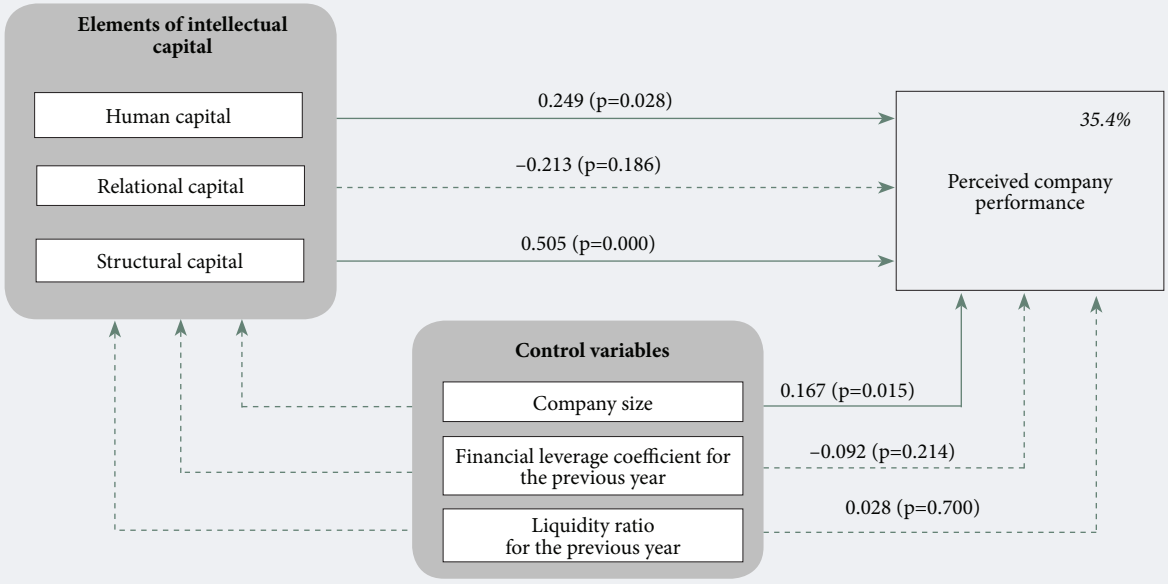
Secondly, as previous research demonstrated, the contribution of specific elements of intellectual capital to companies' performance may vary depending on the industry [*Kianto et al.,* 2010]. Therefore, the important role of structural capital we have noted may be due to the specific features of our sample, which

Table 5. **Results of testing the final model**

Designation	Name	Recommended value	Values obtained using the tested model
Column 3	1	2	3
χ^2 /df	Ratio of χ^2 to the number of degrees of freedom	≤ 3	1.085
GFI	Goodness-of-fit index	≥ 0.9	0.975
AGFI	Adjusted goodness-of-fit index	≥ 0.9 (≥ 0.8)	0.952
TLI	Tucker-Lewis index	≥ 0.95	0.996
CFI	Comparative fit index	≥ 0.95	0.998
RMSEA	Root Mean Square Error of Approximation	≤ 0.08 p ≥ 0.05	0.024 p = 0.911

Source: compiled by the authors.

Figure 1. **Empirical model of the study**



Source: compiled by the authors.

included manufacturing companies. The authors of [*Bontis et al.,* 2000] came to similar conclusions, having proved the exceptional role structural capital plays in the financial performance of companies unrelated to the service sector. At the same time, other studies have demonstrated, using pharmaceutical companies as an example, that human capital can make a no less of a significant impact [*Komnenic, Pokrajcic*, 2012; *Maditinos et al.,* 2011]. This seems to be quite logical, keeping in mind that personnel is the main source of such companies' innovations and therefore of their success. Another series of studies which have used the telecommunications sector as an example [*Garanina,* 2010; *Suraj, Bontis,* 2012] showed that relational capital (a measure of clients' loyalty) may make a critical contribution to such companies' revenues. In turn, [*Cabrita, Bontis,* 2008] point out that the industry companies specialise in determines the impact that specific elements of intellectual capital make on their performance.

Thirdly, the specifically Russian aspects of doing business matter. The institutional environment and cultural attributes may determine the relative weight of particular elements of intellectual capital in relation to each other. For example, relational capital is especially important to Chinese and Japanese companies [*Glisby, Holden,* 2003; *Michailova, Hutchings,* 2006]. We did not analyse the impact of Russian institutional and cultural features on the dynamics of various intellectual capital elements. Indirect evidence of such an impact is provided in a number of knowledge management studies [*Andreyeva, Ikhilchik,* 2009; *May, Stewart,* 2013].

The main practical conclusion of our study is that manufacturing companies should concentrate specifically on upgrading and increasing their structural capital, i.e., creating convenient and efficient information systems, designing and applying mechanisms and tools for stepping up cooperation and information exchanges between their staff, cataloguing organisational knowledge, and providing easy access to all of the above facilities to all links of the production chain.

Limitations, and future studies

Continuing our research in this area involves certain limitations. One of them is due to the nature of data on company performance and intellectual capital elements collected by surveying company managers. As other studies in this field show, the latter has a delayed impact on companies' performance (see, e.g., [*Väisänen et al.,* 2007]). This, combined with specific features of relational capital (a long period required to build it up) allows for suggesting that relational capital's impact on Russian companies has a long-term, inertial character. This hypothesis requires further testing using longitudinal techniques to increase the model's explanatory power (currently intellectual capital elements explain the variation of Russian companies' performance by 35.4%). Future studies could combine subjective and objective

measurements of businesses' performance, which would allow for more accurately measuring intellectual capital's impact on it.

Another possible research area is studying various approaches to and techniques for measuring intellectual capital. For example, a comparative analysis of the heuristic value of indicators based on financial data and on survey results (similar to those presented by us) can be conducted. Finally, the aspects of intellectual capital specific to various industries and sectors of the economy also seem worthy of researchers' attention. One can suggest that in the services sector, human capital would be more important (see, for example, [*Kianto et al.,* 2010]). Applying these arguments to various industries and elaborating them further would help in the acquisition of a more detailed and accurate understanding of intellectual capital's contribution to companies' performance and thus stipulate more efficient management techniques.

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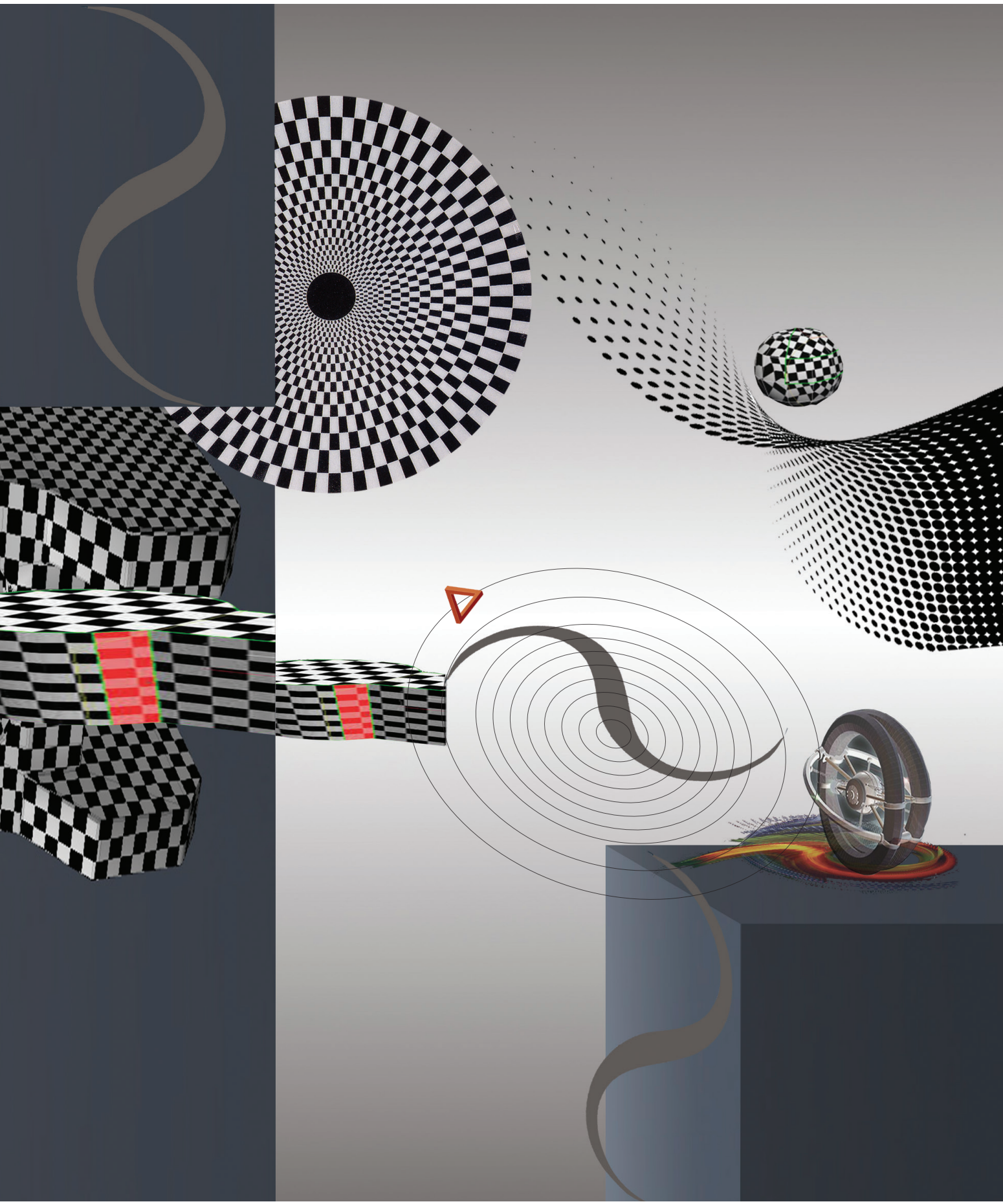

Scientific Cooperation in a German Polish Border Region in the Light of EU Enlargement

Jutta Günther [a]

Professor and Chair for Economics of Innovation and Structural Change, Faculty of Business Studies and Economics, jutta.guenther@uni-bremen.de.

Gresa Latifi [b]

PhD Student, Department of Management, Economics and Industrial Engineering, gresa.latifi@polimi.it.

Judyta Lubacha-Sember [c]

PhD student, Faculty of Economics and International Relations, judyta@sember.pl.

Daniel Töbelmann [a]

Research assistant, Chair for Economics of Innovation and Structural Change, Faculty of Business Studies and Economics, daniel.toebelmann@gmx.de.

[a] University of Bremen, Hochschulring 4, 28359 Bremen, Germany

[b] Polytechnic University of Milan, Via R. Lambruschini 4/b, 20156, Milan, Italy

[c] Cracow University of Economics, Rakowicka 27, 31-510 Krakow, Poland

Abstract

This paper evaluates the economic advantages and disadvantages of the Eastern expansion of the European Union for old and new EU member states, and introduces support programmes which aim to integrate regions on both sides of the border. It focuses especially on the development of cross-border scientific cooperation between Germany and Poland. An empirical study on the example of the Europa University Viadrina (EUV), a newly founded university in the German-Polish border region, shows the extent of German-Polish cooperation based on co-publication activity. In our small-scale empirical investigation for the Faculty of Business Administration and Economics of the EUV, we identified quite a number of co-publications between EUV staff and Polish colleagues. Most of them take place within the EUV, and many relate to cooperative work with scientific entities in both Poland and Germany. The entire intensity and frequency of cooperative scientific activities is, however, much broader than the publication analysis shows and offers scope for further integration with possible positive spillovers for the economic development as well.

Keywords: EU eastern enlargement; Central and Eastern European Countries (CEECs); economic development; cross-border scientific cooperation; border region; European University Viadrina (EUV); co-publication analysis; Germany; Poland.

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After the collapse of the communist system in East Germany and Poland, enormous socioeconomic changes took place at the country and regional levels. East Germany quickly became part of the reunified Germany and thus of the EU in 1990. It was integrated in an already established system with all its formal institutions and benefitted from financial transfers within Germany and the EU. Poland, on the other hand, had to establish a market-based economic system from scratch, and its accession to the EU took place only 14 years after the beginning of transition towards a market economy. The predictions about the effects of the enlargement of the EU on old and new member states were manifold with positive and more sceptical expectations alike.

In 2004, the European Commission expected, that the eastern enlargement, also referred to as the fifth enlargement, would bring the following benefits [European Commission, 2003, p. 5]:

- "The extension of the zone of peace, stability and prosperity in Europe will enhance the security of all its peoples.
- "The addition of more than 100 million people, in rapidly growing economies, to the EU's market of 370 million will boost economic growth and create jobs, both in old and in new member states.
- "There will be a better quality of life for citizens throughout Europe as the new members adopt EU policies for the protection of the environment and the fight against crime, drugs and illegal immigration.
- "Enlargement will strengthen the Union's role in world affairs – in foreign and security policy, trade policy, and the other fields of global governance."

Nevertheless, there were also more sceptical voices about the enlargement process [*Verdun*, 2005, p. 14]:

- "Enlargement might jeopardise the process of 'deepening';
- Sharing the budgetary means with the applicant states lowers the effectiveness of budget funds;
- Being sceptical about the applicant states ability to implement the EU acquis communautaire;
- Fear of mass migration from the accession countries to the old member states;
- Concern that the EU will no longer be governable with so many member states and without clear institutional and policy-making reforms."

For applicant countries, both political and economic reasons played a role. They could benefit from being a part of a larger community sharing similar norms and practices, and from gaining access to the common European market [*Verdun*, 2005]. Moravcsik and Vachudova pointed out that Central and Eastern European Countries (CEECs) faced the choice of taking part in the accession process due to the economic, institutional and geopolitical benefits of EU membership or of staying behind while others moved forward [*Moravcsik, Vachudova,* 2005].

There tends to be an agreement concerning the notion that EU integration and enlargement is an important process that leads to growth and economic development. However, such implications are not the same across countries. In this line of argumentation, Lejour et al. claims that this process leads only to small welfare increases in most older EU members whereas new members derive great advantages from the process [*Lejour et al.,* 2001]. Epstein argues that this process will benefit the new countries that join the enlargement in particular [*Epstein*, 2014].

The border between the Eastern and Western parts of the European Union is a border between countries that belonged to fundamentally different economic systems until 1990. It is not surprising that there are lasting differences between the two sections of Europe, but the question remains for how long the former separation will be visible and, even more, how the East-West divergence can be overcome.[1] One obvious perspective in this context would be to look at the border regions between Eastern and Western European countries and their cooperation activities. This will be attempted in this paper, with a focus on the German-Polish border and the potential for research cooperation.

In the following, we will set the scene through a brief introduction to the enlargement process including a discussion of the pros and cons and the effects of enlargement for the border regions. In this paper, we will focus on the Eastern enlargement. We will proceed with an elaboration upon the specific EU programmes that support cross border regional activities and economic development. After this, we will provide a small empirical analysis of the research cooperation induced by a newly founded university in the border region between Germany and Poland. Finally, we will draw conclusions and discuss further research topics.

[1] There is a large amount of literature on the convergence process between East and West Germany (e.g. [*Udo*, 2015; *Heimpold, Titze,* 2014; *Aumann, Scheufele,* 2011]). The convergence process between the East and West of Germany slowed down in the second half of the 1990s and has nearly come to an end now. It would be far beyond the scope of this article to go into this literature and analyses on East and West Germany.

Enlargement of the European Union

The expansion of the EU is a widely discussed topic and relevant to several disciplines, such as economics, political science, sociology and law. In this study we focus on the economic aspects only. Indeed, this aspect was the initial reason why the EU was originally established.

The history of the European Union begins in 1951-1952, when the European Coal and Steel Community (ECSC) was founded in order to regulate the market for coal and steel in an attempt to solve economic problems in those sectors [*Elvert*, 2004]. In 1957-1958 the European Economic Community (EEC) was founded with the aim "to create a new politically stable and economically prosperous European order, which was supposed to be able to overcome the traditional tensions and conflicts between nation-states" [*Elvert*, 2004, p. 201]. Economic integration was seen as a way to secure peace. Since the Maastricht Treaty, which introduced the three pillars of the European Union (Economic and Monetary Union, Common Foreign and Security Policy, Justice and Home Affairs), the European Union started to be seen not only as an international economic organisation, but also as an organisation that supports democracy and rule of law [*Curzon Price, Landau,* 1999].

Over time, the alliance grew from the original six to the current 28 member states as a result of continued negotiations and enlargement agreements.[2] Tebbe defines the process of enlargement as a joint endeavour in which potential candidate states are obliged to attain the EU's state of economic and political integration, the so-called "acquis communautaire" [*Tebbe,* 1994]. And vice versa, the EU is responsible for providing the relevant support for reaching the standard. From an institutional point of view, the enlargement of an organisation is, according to Schimmelfenning and Sedelmeier [*Schimmelfenning, Sedelmeier,* 2002], a process of gradual formal horizontal institutionalisation of the organisational rules and norms.

Due to the success of the former European Community (EC), the first enlargement took place in the year 1973 when Denmark, the United Kingdom, and Ireland joined the European community. This was followed up by Greece, which became a member in 1981, and Spain and Portugal, which joined the European community in 1986 [*Preston*, 1997]. The achieved depth of cooperation, particularly after the decision to sign the Maastricht Treaty in the year 1991 which aimed to create a single political union, motivated another round of enlargement in 1995 when Austria, Sweden, and Finland joined the European Union leading to 15 member countries.

Although the beginning was difficult, the EU became the most important means for providing prosperity on the continent, especially after the fifth and the greatest enlargement during which many Eastern European countries joined the agreement some 15 years after the collapse of communism. This unification is therefore considered the most radical break that ever occurred in the history of the EU [*Moravcsik, Vachudova,* 2002]. In 2004, the EU welcomed 10 new countries, most of them from Central and Eastern Europe to join the EU (Cyprus, Malta, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia) [*Zeff,* 2006].

The next enlargement of the EU led to two new member states: Romania and Bulgaria. These countries became the newest members of EU in 2007, followed by Croatia, which joined in 2008.

This "great European event" has been part of academic debates over the years (e.g. [*Baldwin,* 1995; *Sjursen,* 2002; *Diez et al.,* 2006]), especially concerning the reasons why the EU intended to expand into Central and Eastern Europe. Baldwin argues that this decision was undertaken to achieve stronger political stability and long-term economic prosperity [*Baldwin,* 1995]. He furthermore overestimates the political reasons as compared to the economic interests of EU incumbents on newcomers. He writes that when an economically small region integrates with an economically large region, both gain benefits but the small region gains much more[3], implying that the EU intended to integrate Eastern European countries to create more stability on the whole European continent.

Somewhat surprisingly, Epstein and Jacoby find that the enlargement of the EU has had more direct and far-reaching effects on CEECs' economies than on their democracies [*Epstein, Jacoby,* 2014]. For this reason, we will analyse the economic effects of the EU's eastern enlargement.

Economic effects of the EU expansion for border regions

The EU's eastern enlargement left in its wake many discussions, expectations as well as concerns. The changing of the borders from the EU15 to the EU28 raised the attention of economists to the effects

[2] When writing this article, the referendum over the membership of Britain in the EU took place the country. The majority voted for an exit from the EU and negotiations on this subject are still ongoing.

[3] Baldwin's conclusions were based on the work by Francois and Shiells [*Francois, Shiells,* 1992] who described the impact of NAFTA on Mexico and US, so he made some tentative analysis-by-analogy assuming that a similar situation occurred in EU as well.

of such an expansion, since the new members were anticipated to play a crucial role within these new spatial dynamics [*Niebuhr,* 2008]. This becomes even more important when one realizes that 11 out of the 13 new member countries are post-communist economies which gained their independence from the Soviet bloc between 1989 and 1991. Nevertheless, the main concern after the formalisation process of enlargement was the economic and structural divergences between the old and new member states.

Early contributions in economic literature relating to the enlargement process of the EU focus on the possible growth effects for the member countries (e.g., [*Bröcker, Jägre-Roschko,* 1996; *Bröcker,* 1998]). In a quantitative analysis, Bröcker and Jägre-Roschko [*Bröcker, Jägre-Roschko,* 1996] estimate the regional effects expected to be caused by the integration of the CEECs. In particular, they focused on the effects of the enlargement on the lagging regions of the EU. They found that the trade of lagging regions would not be harmed due to the enlargement, and that there are no grounds for concern. In contrast, due to the geographic proximity of Greece[4], they stand to benefit from the Eastern expansion by having the opportunity to increase their new commercial links with new members from the East. Baldwin et al. [*Baldwin et al.,* 1997] in their analysis of the costs and benefits of the eastern enlargement estimated that real income in the CEECs would increase by 18.8 percent in the long-run. Lejour et al. [*Lejour et al.,* 2001] made an attempt to estimate the economic consequences of the enlargement of the European Union, taking into consideration three dimensions of enlargement: a customs union, an internal market, and the free movement of labour. It was found that the Eastern European states' accession to the EU would be of significant importance, and that GDP per capita would increase by more than 8% in the long-run[5]. For the EU15 countries, there were no significant changes, however for Germany it was found that GDP per capita could slightly decrease due to migration.

Later on, Brülhart et al. [*Brülhart et al.,* 2004] also investigated the economic effects of the enlargement at the regional level and the consequences of changes in market access. Niebuhr and Stiller [*Niebuhr, Stiller,* 2002] discuss the effects of the enlargement on the regions which were located on the borders of new member states. They argue that border regions might have an advantage in attracting resources – hence the above-average benefits. However, there still is no clear conclusion either from theory or from empirical findings about the spatial effects of integration, since in some specific circumstances border regions might lose and sometimes national borders are the main barriers to economic relationships. The consequences of the eastern enlargement for the EU and CEECs are visible in various areas. In economic research, the two most relevant topics are economic convergence at the national and regional levels and migration movements after the EU's eastern expansion.

Oblath et al. [*Oblath et al.,* 2015] when analysing beta and sigma convergence showed in their preliminary results that both types of convergence have been visible within the EU26 since 2000.[6] Forgo and Jevcak [*Forgo, Jevcak,* 2015] confirmed that the CEECs (10 new member states) achieved real and nominal convergence vis-à-vis Eurozone countries[7]. Also, Koh [*Koh,* 2015] found that economic convergence takes place in new member states as compared to old member states[8]. A quite different picture can be found at the regional level. Mikulić et al. [*Mikulić et al.,* 2013], in analysing regional beta convergence in new member states, confirmed that beta convergence can be found at the national level but that on the regional level, the convergence speed is lower. Similar results were obtained by Pukelienė and Butkus for NUTS-3 level analysis [*Pukelienė, Butkus,* 2012]. Also Monastiriotis confirmed that "regional evolutions continue to be on the whole divergent, with a pattern of convergence at the middle- and lower-ends of the distribution and a slower tendency for club formation at the higher end, and thus overall an increasing trend of polarization" [*Monastiriotis,* 2011, p. 23].

Considering the great importance of migration on the macroeconomic stability of a country, we should briefly shed some light on the effects of the enlargement on the propensity towards migration. Generally it is found that the enlargement of the EU in May 2004 was followed by an increase of migration from the poorest Central and Eastern European regions to richer regions in the EU15 [*Barrell et al.,* 2010], but there was no evidence for a negative effect from migration on wages or employment in the older member

[4] Proximity to Bulgaria in this situation and with forthcoming potential candidates (Macedonia, Bosnia and Herzegovina, Kosovo, Albania, Serbia etc.)

[5] Henrekson et al. [*Henrekson et al.,* 1997] when analysing the effects of European integration on economic growth of EU-15, found that European Community membership may increase growth rates (by about 0.6-0.8 percentage points), and that technology transfer is the main mechanism through which membership can affect growth.

[6] The paper [*Oblath et al.,* 2015] discusses some methodological issues regarding to measures of comparative growth performance (which can influence the interpretation of the results). Beta convergence refers to "a statistically significant negative relationship that exists between the "initial" per capita GDP of individual countries on the one hand, and their per capita growth rates on the other", while sigma convergence refers to "the cross-section dispersion in levels of income declines over time" [*Oblath et al.,* 2015, p. 26].

[7] Authors probably analysed the beta-convergence process, but the type of convergence was not directly mentioned in the text.

[8] Koh also analysed social cohesion processes in new member states in his paper [*Koh,* 2015].

countries [*Kahanec, Zimmermann,* 2007]. The macroeconomic impact of migration is expected to be more strongly visible in English-speaking countries of the EU15 rather than, for example, in Germany or Austria, which were regarded as attractive destinations for a large migration flows [*Boeri, Brucker,* 2001]. The United Kingdom, which is expected to be more affected by migration, experienced a period of low productivity growth[9]. Generally, the high outflow migration from new member states predicted by Boeri [*Boeri,* 2002] did not take place. Around 2.2 million residents from the CEECs migrated to Western European countries between 1988 and 2012 [*Balazs et al.,* 2014], which equals 2% of total CEECs-10 population in the year 2012.[10]

Concerned about the impact of the EU enlargement on border regions, Niebuhr [*Niebuhr,* 2008] measured the enlargement's effects, this time with a special focus on the border regions in the EU27. Firstly, he concedes that the greater benefits of the EU's expansion are seen in the new member states rather than in the EU15 (important signal toward cohesion). This finding is categorically opposed by Ellison [*Ellison,* 2006] who states that the benefits of West European states are clearly underestimated[11]. Secondly, Niebuhr [*Niebuhr,* 2008] argues that border regions indeed realise higher integration benefits than non-border regions, demonstrating that there are certainly above-average benefits for these newer members [*Niebuhr, Stiller,* 2002; *Niebuhr,* 2006].

Overall, from the literature and EU reports, it can be concluded that the enlargement positively affected the economies of the EU in general and especially the new member states. Furthermore, border regions of the EU15 are considered to benefit the most from this process.

EU financial support programmes for border regions

The cross-border cooperation between countries of the EU has always been one of the priorities of the EU. A trans-frontier region is a region inherent in geography, history, ecology, ethnic groups, and economic possibilities, but disrupted by the sovereignty of the governments ruling on either side of the frontier [CoE, 1995].

Through various programmes, the EU has attempted to intensify the cooperation within border regions of the EU. In the following, we would like to discuss the specific EU support programmes for border regions and their relevance for successful cooperation on the EU's East-West border.

Cross-border cooperation programmes are aimed at developing a shared space and at sharing, integrating and improving quality of life. Knowledge, infrastructure, and other assets can be shared by using cross-border programmes. The improvement of quality of life includes programmes aimed at environmental protection, healthcare services or access to the labour market. Within the programmes, all types of partners are welcome: ministries, small municipalities, universities, NGOs and SMEs. The European Territorial Cooperation has been established as a part of a policy of cohesion. The first INTERREG programme started in 1990. INTERREG II and III were undertaken in the years 1994–1999 and 2000–2006 [European Commission, 2011]. INTERREG IV covered the years 2007–2013. This policy was set up by the European Commission and it aims to foster cooperation between EU regions, with a particular focus on border zones [*O'Dowd,* 2002]. For the years 2014–2020 INTERREG EUROPE was launched as part of the Europe 2020 strategy. It is being used as an instrument for the implementation of a cohesion policy. The following objectives are addressed by INTERREG EUROPE programme [European Commission, 2015]:

1. Strengthening research, technological development and innovation
2. Enhancing the competitiveness of small and medium-sized enterprises
3. Supporting the shift towards a low-carbon economy in all sectors
4. Protecting the environment and promoting resource efficiency.

Another category of programmes effective during the period of 1997–2003 and established by the European Commission for inter-regional cooperation between the EU and CEECs is that of OUVERTURE/ECOS. It focused on local economic development in the sense of administrative and regional urban planning [*Gruchman, Walk,* 1997]. Countries within the EU that had at least two territorial units were eligible for this programme.

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[9] Duffy et al. [*Duffy et al.,* 2005] found that the immigration level has an impact on welfare implications for residents and affects the aggregate productivity, like the case in the UK, which experienced a period of slow productivity growth.

[10] Total CEECs-10 population figures were calculated based on Eurostat database (online data code: demo_pjan, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_pjan&lang=endemo_pjan, last accessed on 05.07.2016).

[11] The author also found that the overestimation of the benefits of new EU members and underestimation of their costs were irrational. For more information see [*Ellison,* 2006].

The additional possibility of benefiting from another Action Programme supporting the cooperation between local and regional territorial units of at least three EU countries in the Action Programme for Exchange of Experience (PEE). Its main focus is in the field of know-how exchange in the implementation of EU policies regarding public administration, transport, applied research, universities and enterprises, local resources, energy and the environment [*Gruchman, Walk,* 1997].

There were also specific programmes in support of tourism and cross-border environmental policies such as LIFE [*Gruchman, Walk,* 1997] which started in the year 1992. In 2007, according to the new regulation (Regulation (EC) No 614/2007)[12], the LIFE+ programme became the successor of the LIFE programme. It is divided into three components: Nature & Biodiversity; Environmental Policy & Governance; Information & Communication. For the years 2014–2020, the Programme for the Environment and Climate Action (LIFE Programme) was established (Regulation (EU) No 1293/2013)[13]. Besides the aforementioned programmes, a particularly important programme for the Polish-German border regions is RETEX, which focuses on the textile and clothing industry. Finally, the original programme, PHARE, and its two sub-programmes TEMPUS and STRUDER were specifically designed for the assistance of Eastern European countries in their transition to market economies [*Cunderlíková,* 2007].

For the years 2007-2013, the Cross-Border Cooperation Operational Programme between Poland (Lubuskie) and Germany (Brandenburg) was approved by the European Commission. The main objective of the programme was the reduction of the inconvenience caused by the location of the regions' borders and the joint development of the regions.

Operational objectives of the programme were the following [Europäischen Kommission, 2008]:

1. Improvement of infrastructure and environmental protection.
2. Development of economic relations and cooperation of scientific and economic sectors.
3. Support of the development of human capital and cross-border cooperation.

The expansion's impact on Polish-German border regions

The enlargement of the EU and integration of Poland had economic implications for both Poland and Germany, especially in the regions along the border. Reflecting the historical tensions between the two countries, we explore the changes of cooperation activities over the years. In 1945, as a consequence of the Second World War, the two rivers Oder/Odra and Neisse/Nysa became heavily guarded dividing lines between the German Democratic Republic (GDR) and Poland. As a consequence, there was little opportunity for direct contact or local cooperation between communities and regions [*Gruchman, Walk,* 1997].

Over time, the GDR, due to a shortage of manpower, encouraged people from Poland to work in large industrial plants close to the border. The effect of commuting to work became particularly significant in cities like Guben/Gubin or Görlitz/Zgorzelec, both located close to the river Neisse/Nysa. In the 1970s, there was a short period of freedom of mobility between both countries, the border could be crossed without a passport and visa. However, until 1989, when socialism in the GDR and Poland collapsed, cooperation between the two countries faced many obstacles and not very many opportunities for trans-frontier synergy effects and development [*Gruchman, Walk,* 1997].

Only after the changes in 1989 did administrative entities, economic and social institutions, enterprises and local governments emerge on both sides of the border to institutionalize mutual economic and social cooperation. Starting, for example, from the launch of *Neisse-Nysa Euroregion* in 1992 followed by *Pomerania Euroregion, Spree-Neisse-Bober* in 1993*, Pro-Euorpa Viadrina Euroregion* in 1993. These initiatives aimed to establish and intensify cooperation in many fields, especially industry, innovation, agriculture, tourism, science, culture, and sports [*Gruchman, Walk,* 1997].

Later, after the efforts undertaken to meet the Copenhagen criteria as a prerequisite to join the EU, the accession process, and more than 10 years of being part of the EU, things have changed substantially, especially for Poland. In being a neighbour of Germany, one of the founding countries of the EU, Poland is the neighbour of an economically strong and relatively large country. This has its advantages and disadvantages. Unfortunately, we have found little evidence and very few robust figures related to the effects and consequences of Poland's integration into the EU, specifically along the border regions of both countries. However, on the Polish side, it is recognized that the Polish regions along the border

[12] Regulation (EC) No 614/2007 of the European Parliament and of the Council of 23 May 2007 concerning the Financial Instrument for the Environment (LIFE+).

[13] Regulation (EU) No 1293/2013 of the European Parliament and of the Council of 11 December 2013 on the establishment of a Programme for the Environment and Climate Action (LIFE) and repealing Regulation (EC) No 614/2007.

with Germany are rendered particularly attractive for foreign and local investments due to the historical development of this part of Poland and due also to the accession of Poland to the EU. The importance of border regions for the economic development of Poland remains a challenge for the eastern part of the country, where the lack of investors is easily recognised [*Cieślik,* 2004].

On the other hand, there is little evidence regarding workers' mobility, which started to be a challenge for Poland after its accession to the EU. Generally, the population of Poland is declining. After 3 years of membership in the EU, the number of Polish workers (especially qualified workers) looking for employment in EU15 countries rose from 1 million to 2.3 million [WPBS, 2012]. "Before Poland's accession to the EU, Germany (37% of all emigrants) and the United States (20%) were the most common destinations chosen by Polish emigrants. After 2004, Poles most willingly went to EU member states: the UK (30%), Germany (23.5%), Ireland (5.5%), Italy (4.5%) and the Netherlands (4.5%) [CSO, 2012]. At the same time, the rate of emigration to the US dropped to 12%" [*Kałużyńska et al.,* 2014, p. 197]. It has been observed in the past[14], that Polish migration to Germany was characterised by short-term, and back-and-forth mobility, without the will to settle down in Germany [*Anacka, Figel,* 2012]. As of 2011, Statistisches Bundesamt counted 468,481 Poles or 6.4% of all foreigners in Germany [Statistisches Bundesamt, 2011]. Their median age is 37.3 years and they stay for an average of 9.7 years. According to other estimates, the number of Poles with a migration background is about 1.3 million people and they mostly work in construction, manufacturing, healthcare, restaurants and trade [*Eichhorst, Wozny*, 2012, p. 4].

In the field of academic collaboration between Germany and Poland, an important initial step likely to impact collaboration both in science and the economy was the foundation of the European University Viadrina (EUV) in Frankfurt in the year 1992, one third of the student body is comprised of Polish students. On the other side of the border, in Słubice, the Collegium Polonicum was established as a part of EUV [*Gruchman, Walk,* 1997].

The founding of the EUV and Collegium Polonicaum, however, is not the starting point of German-Polish scientific collaboration. Glänzel and Wintherhager [*Glänzel, Wintherhager,* 1992] have found results of the collaboration in the realm of academic research between eastern European countries (Hungary, Poland and Czechoslovakia), Germany and other members of the EU in 1980-1989. German scientists (compared to other scientists of EU member states) played an important role as co-authors with the three eastern countries, particularly with Poland[15]. Nevertheless, they did not deal with the question as to whether this relatively strong link between the two countries was because of being in the same border area.

Later on, Braun and Glänzel [*Braun, Glänzel,* 1996] also identified increasing cooperation between Germany and Poland during the period of 1984-1993. In comparison with other EC members, Germany remains the main collaboration partner of Poland and other Eastern European countries, such as Hungary and Romania. Generally, they did not find a clear justification for the German-Polish scientific cooperation being due in large part to the spatial proximity of these two countries. On the contrary, they state that the two countries substantially increased international scientific cooperation as a result of an increase in contracts on basic research over the course of the transition during the nineties. Due to the economic problems that Poland was going through, international cooperation in research during the 1990s was mainly viewed as a channel through which academia could get financial support from outside the country [*Stefaniak,* 1998].

In the following, we will present the results of an explorative empirical study into the cross-border research relationships of scientists from the European University Viadrina and scientists from Poland. Our focus is the intensity of relations expressed in scientific co-publications.

Research cooperation in a Polish-German border region: the case of Viadrina

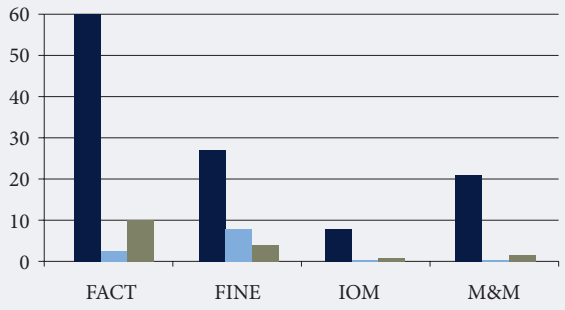
The persistence in increasing the depth of cooperation between Poland and Germany, especially after the foundation of the European University Viadrina (EUV), shapes our paper's focus. Since it is difficult to find scientific evidence about whether or not the impact of the foundation of the university is positive or negative, we carry out a small primary data collection and analysis.

Our interest was to identify the cooperation between Polish and German scientists on the example of the discipline of economics. Henceforth, we run an analysis based upon the available information

[14] Migration until the year 2006 was analysed by [*Anacka, Figel,* 2012].

[15] Glänzel et al [*Glänzel et al.,* 1999] have also measured the rate of citations impact of the three

Figure 1. **Number of Polish and other international employees by departments of the Faculty of Business Administration and Economics, EUV**



Note: Hereinafter in the figures the following acronyms of departments are used: FACT — Finance, Accounting, Controlling & Taxation; FINE — Finance & International Economics; IOM — Information & Operations Management; M&M — Management & Marketing. The figures compiled by the authors using data from the University Viadrina website (https://www.wiwi.europa-uni.de/en/lehrstuhl/index.html, last accessed 05.07.2016).

on the university's homepage of the four departments of the Faculty of Business Administration and Economics: Finance, Accounting, Controlling & Taxation (FACT), Finance & International Economics (FINE), Information & Operations Management (IOM) and Management & Marketing (M & M). Each department consists of at least two professorships (chairs) with a team of research assistants. We investigated the research of each professorship, i.e., the work of each chair of the Faculty of Business Administration and Economics. From the full list of publications, co-publications were identified, and from them co-publications with Polish co-authors[16]. The purpose of this is to identify the intensity of cooperation with different Polish co-authors, both before and after Poland's accession to the EU.

Firstly, we identified the overall number of Polish and international academic employees in each department in order to see the relationship of each one with Polish academics. Secondly co-publications with Polish co-authors were counted. Polish co-authors were identified as belonging to three groups: (i) Polish co-authors employed at EUV, (ii) Polish co-authors employed at research entities or in the business sector in Poland, and (iii) Polish co-authors employed at other than EUV German research entities. In the case of co-publications with 2-3 co-authors from different groups, they were assigned to each type of group. Therefore, the sum of co-publications with co-authors from the three groups mentioned above are not equal to the number of "All Polish co-publications". Polish co-authors and employees were identified based on the following scheme: first all Polish-written surnames were selected, then curriculum vitae on universities' website were analysed. If a person was born or educated (in the early stage) in Poland he or she was counted as Polish employee or co-author. The research entity with which the co-author is affiliated was identified using Scopus, Web of Science, or the text of publications when information about the authors are provided. In case of co-authors employed in the business sector, internet-based sources, such as LinkedIn, were used.

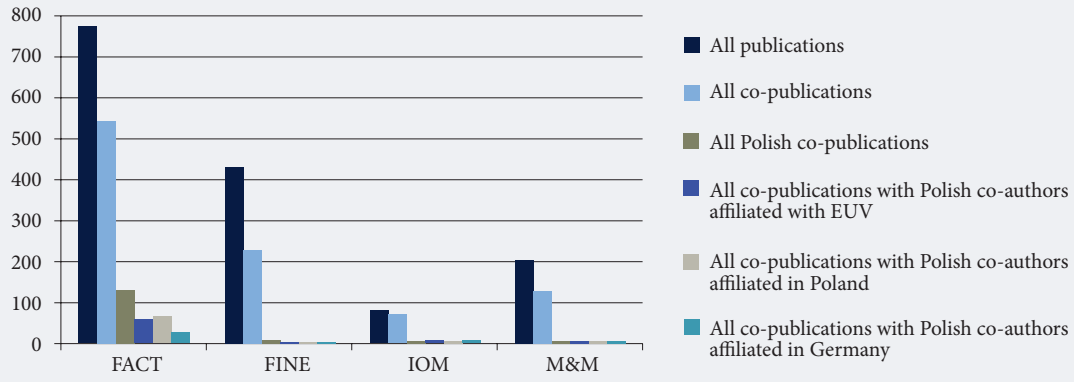
Based on this analysis, it can be stated, that every department employs international employees, most were employed by the department of "Finance, Accounting, Controlling and Taxation" (FACT). Out of the four, two departments employ Polish researchers. Here the FACT department can be named again, with three Polish employees out of 59 employees in total (i.e., 5%), and the FINE department with eight Polish employees out of 27 in total (i.e. 30%). The high share in the case of FINE is due to the "Professorship for Interdisciplinary Polish Studies", which employs seven Polish researchers, which is half of its team.[17]

Referring to publications with Polish co-authorships, we found, that two departments cooperate with Polish authors. Similar to the results of the employee analysis above, for the FACT and FINE departments it is possible to determine publications in cooperation with Polish co-authors as shown in Figure 2. With 128 co-publications with Polish co-authors, which is around 16.5% out of the entire number of the department's documented publications, FACT can be described as the most active department in cooperating with Polish authors. The largest number derives from the "Professorship in Taxation and Auditing", with 120 Polish contributions. For FINE, eight Polish co-publications out of 228 co-publications in total can be determined. Here again the largest part of cooperative activity is due to the chair of "Professorship for Interdisciplinary Polish Studies", to which are attributable six Polish co-publications.

[16] Authors focus in the text on Polish-German cross-border cooperation, therefore other co-publications were not detailed investigated in detail, although data about them were also collected.

[17] The "Professorship for Interdisciplinary Polish Studies" is closely connected to the centre for Interdisciplinary Studies on Poland (ZIP). The chairman is the head of ZIP.

Figure 2. **Number of co-publications and co-publications with Polish authors by departments of the Faculty of Business Administration and Economics, EUV**



In Figure 3, it can be seen that in the FACT and FINE departments a large number of the Polish co-publications are in collaboration with EUV-affiliated Polish authors. However, the number of co-authors affiliated with Polish organisations is even larger in both departments. The smallest number are publications with Polish co-authors affiliated with other German research organisations. For the departments "Information & Operations Management" (IOM) and "Management & Marketing" (M & M) neither Polish employees nor Polish co-publications were reported.

To further analyse the Polish co-publications (as many as 136 in total), we run a network analysis to show the intensity of cooperation between EUV (represented by the Faculty of Business Administration and Economics) and other selected institutions. In Figure 4, the number of co-authors affiliated with a given research entity is represented by the size of the node, and the number of co-publications with the given institution is represented by the width of the links. For example, EUV has 51 co-publications with the Warsaw School of Economics (the width of the link), and one co-author affiliated with the Warsaw School of Economics cooperate with EUV (the size of the node).

It can also be shown in Figure 4 that there is strong co-authorship activity within the EUV shown by the width of the link which is attributable to the number of co-publications (62) with Polish EUV-affiliated employees (14 co-authors). Scientists from EVU are also co-publishing with Polish authors from institutions in Poland, such as the Warsaw School of Economics and others, although the number of co-publications is often very small. Several Polish co-authors are affiliated with research entities in Germany other than EUV (6 co-authors) or with the business sector in Poland (7 co-authors).

Conclusion

The system breakdown in 1990 triggered a deep transition and restructuring process in East Germany and Poland. While in East Germany the EU accession took place automatically with the German re-

Figure 3. **Number of co-publications with Polish authors by departments of the Faculty of Business Administration and Economics, EUV**

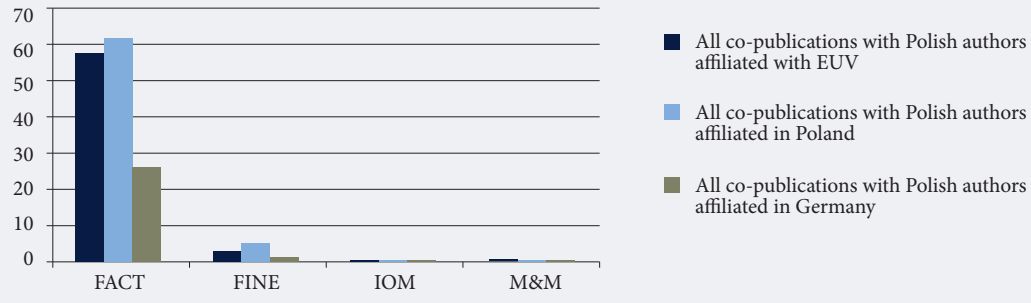
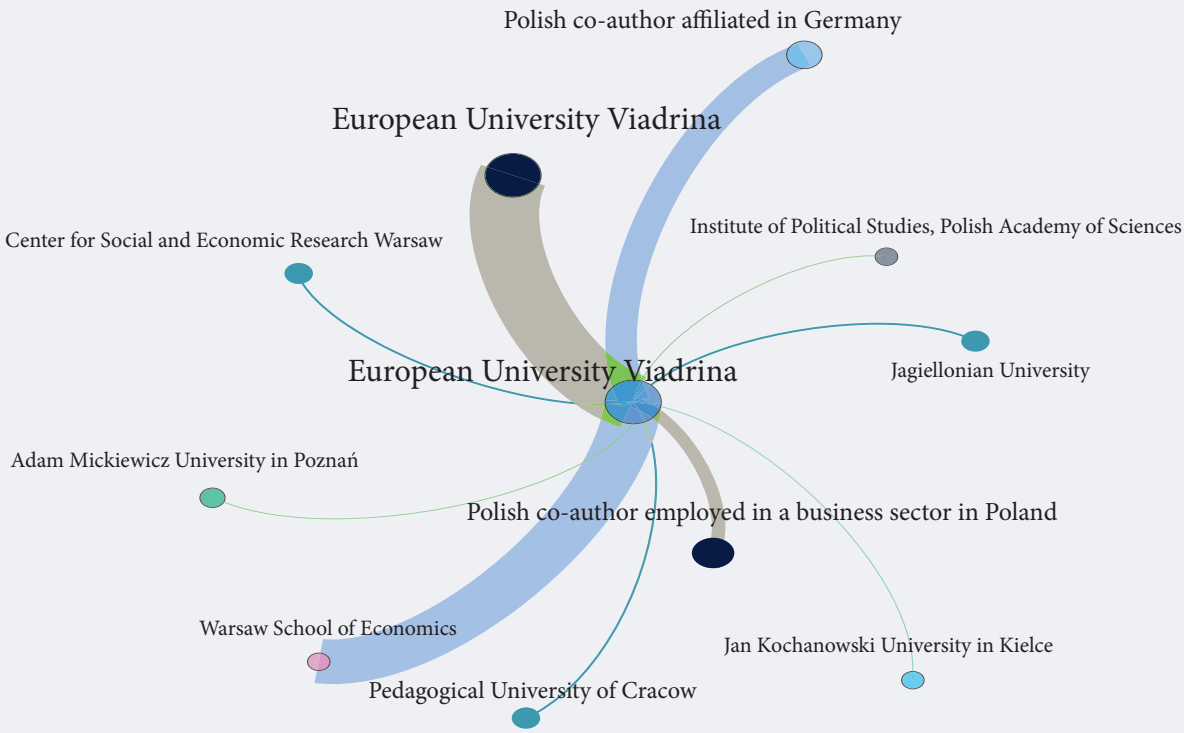


Figure 4. **Network analysis of cooperation of the Faculty of Business Administration and Economics, EUV with Polish co-authors**



unification, Poland became a member of the EU only much later in the year 2004. In the early stage of the transition, both countries (or region, in case of East Germany) were strongly occupied with the restructuring and reorientation in nearly every field of economic and scientific activity. However, the EU supported cross-border activities in order to integrate the regions and people working and living there from the very beginning. Cross-border activities related to closer economic integration appear in many areas and forms, among them research cooperation. We focused in this article on research cooperation in the German-Polish border region in which a new university was founded after the changes of the year 1990, not least with the objective to strengthen regional and overall scientific integration between Germany and Poland. The European University Viadrina (EUV), located on the German side of the border in Frankfurt/Oder, is thus a unique case together with the Collegium Polonicum, located on the Polish side of the border in Słubice. As many as one third of the student body at EUV are from Poland, which represents a large share and expresses the success of the cross-border-oriented university. In this paper, we also shed some light on the question of scientific cooperation which needed to be established with the foundation of the university and the overall re-orientation process in the early 1990s. Scientific cooperation can take place in many different forms, reaching from the very informal and implicit activities to formally institutionalised projects. To get a first impression as to whether joint German-Polish activities have been established at all and to which extent, we looked at co-publications. The co-publications express an already advanced stage of research cooperation since they go beyond just informal contacts and document a clear scientific product. In our small-scale empirical investigation for the Faculty of Business Administration and Economics of the EUV, we identified quite a number of co-publications between EUV staff and Polish colleagues. Most of them take place within the EUV, and many relate to cooperative work with research entities in Poland. A network of scientific contacts has been created since the early 1990s. The intensity and frequency of cooperative research activities is, however, much broader than the publication analysis shows and offers opportunities for further integration with possible positive spillovers for economic development as well.

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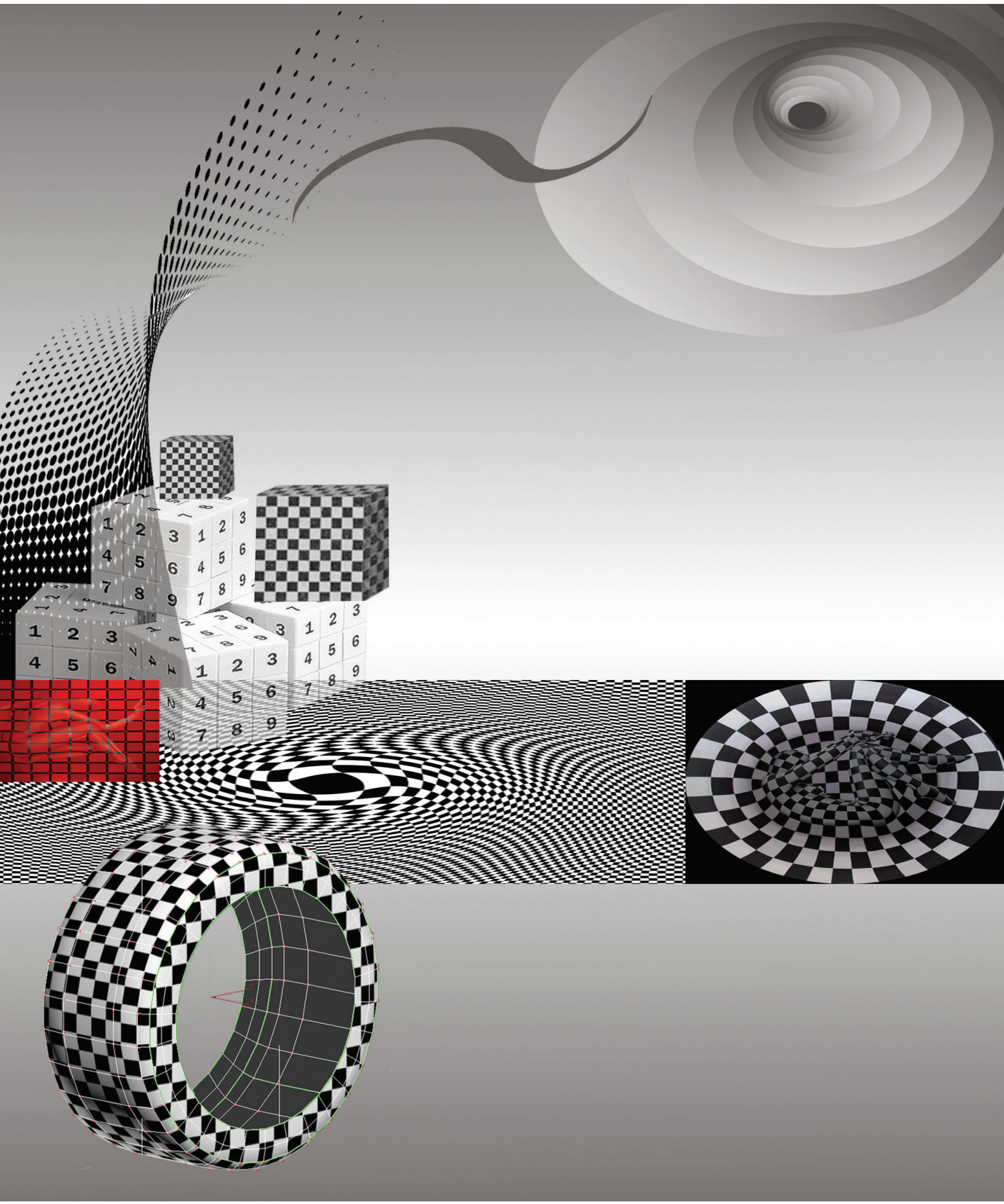

Approaches to Defining and Measuring Russia's Internet Economy

Sergey Plaksin [a]

Deputy Director, Expert Analytics Office, splaksin@hse.ru

Gulnara Abdrakhmanova [a]

Head, Centre for Statistics and Monitoring of Information Society, Institute for Statistical Studies and Economics of Knowledge (ISSEK), gabdrakhmanova@hse.ru.

Galina Kovaleva [a]

Chief Expert, Centre for Statistics and Monitoring of Information Society, ISSEK, gkovaleva@hse.ru.

National Research University Higher School of Economics (HSE), 20 Myasnitskaya str., Moscow, 101000, Russian Federation.

Abstract

The rapid development of digital technologies is changing production processes and forms of interaction. It has encouraged growing interest in electronic content and created a new segment of the economy where all actors rely on the internet. These processes are most noticeable in developed countries. Russia is no exception. The development of the domestic segment of the internet economy — the economy of the Runet — is of particular importance due to the size of the country, the significant socioeconomic heterogeneity and the underdevelopment of the transportation networks in the Russian regions. A study of the phenomenon of the internet economy requires a reliable information base. It is hard to provide an adequate quantitative estimate of the size of the internet economy for the following reasons. First, the existing statistical indicator system was created before the internet and internet businesses were widespread. Secondly, this new segment of economy is much more heterogeneous than traditional sectors and industries and thus difficult to measure. This paper summarises the results of a review of international and Russian approaches on how to measure the internet economy. It also introduces a new way to measure the size of Russia's internet economy that is based on the principles of the System of National Accounts (SNA), using officially available statistical data, thus making this approach different from the previous recommendations. This new approach ensures a stable reproducibility of calculations, reliability and comparability of results as well as compliance with the standards of government statistics. The evaluation of the dynamics of economic processes that drive the internet economy was not in the scope of the study. This requires a separate study, including an analysis of how indices of constant quality that neutralize the effect of changes in consumer product properties and deflators are created The authors stipulate that these research areas hold independent interest.

Keywords:
internet economy;
online and offline business;
internet;
System of National Accounts (SNA).

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The rapid growth and wide proliferation of services provided via the internet and of related technologies have been a major development in recent decades. The Federal Statistical Service's (Rosstat) data for 2005-2015 show more than three-fold growth of gross value added (GVA) created by computer and IT companies, compared with less than 30% growth of GDP during the same period. New communication formats and business practices turn into structural elements of the new, network technologies-based economy — the internet (or in our case, the Runet) economy. Usually it is seen as including internet service providers and companies making use of it.

The goal of our study is to identify approaches to measuring the Runet economy using statistical analysis, sociological research, and institutional design techniques. The proposed methodology takes into account international experience and meets scientific validity and practical applicability requirements.

International studies of the internet economy

Although no standardised methodology for measuring the internet's impact on the economy and social sphere has yet been developed, numerous studies were devoted to this topic. The better-known and respected ones include research by the Organisation for Economic Cooperation and Development (OECD) and by several consulting firms [OECD, 2013; McKinsey, 2011; BCG, 2012]. All previously conducted studies in this area can be divided into two groups.

Studies in the *first group* focus on the factors affecting the internet economy and on measuring its potential. Various indices are applied to evaluate the internet's penetration, specific technological infrastructure characteristics and economic indicators of how this infrastructure can be accessed, levels of internet use, and indirect characteristics, e.g., human capital [BCG, 2011, 2013, 2014; McKinsey, 2011]. The *second group* of studies includes research on of the internet's direct [Deloitte, 2011; OECD, 2013; McKinsey, 2011; BCG, 2012] and indirect impacts on the economy [*Stiglitz et al.*, 2009; BCG, 2010] and social sphere [OECD, 2013; *Shah et al.,* 2001; *Morton*, 2006; *Greenstein, McDevitt*, 2011].

Factors affecting the internet economy's growth

Researchers distinguish between supranational, national, and regional factors affecting the development of the internet economy. James Agarwal and Terry Wu [*Agarwal, Wu*, 2015] discuss importance of supranational factors such as (1) the development of free trade, (2) companies' willingness to do business in other countries, (3) information and communication innovations providing competitive advantages to companies all over the world, and (4) the development of infrastructure for international transactions and their security. The authors include government support and promotion of innovation and investments, rule of law, and the availability of the adequate technological, financial, and social infrastructure in the national-level group of factors. According to the researchers, the main barriers hindering the growth of the internet economy include the technological gap between developed and developing countries and the latter's inability to guarantee the rights of consumers who buy goods and services on the internet.

Stephen Knight's study [*Knight*, 2015] is based on Australian data and is focused on the analysis of regional factors affecting the growth of internet economy. He states that predominantly agricultural states lag behind in this area due to a lack of broadband internet access. Therefore, relevant infrastructure is necessary to overcome the gap between agricultural regions and other parts of the country. Apart from broadband networks, it also includes access to major informational, educational, and other internet resources. At the same time, the author stresses that ICT infrastructure is not the only factor affecting regional economic growth and it certainly does not guarantee it.

Desirée van Welsum and her colleagues note the strong correlation between economic growth in the EU and advances in the development and proliferation of ICT [*van Welsum et al.*, 2013]. By the mid-2000s, this factor has no longer remained among major growth drivers due to several reasons such as the reduced investments in ICT, infrastructure, and production of innovative high-tech products as a result of the economic recession; a lack of an integrated regulatory system, and shortage of skilled personnel. The proliferation of mobile broadband internet, Big Data, and cloud technologies can help ICT regain its former influence.

Eric Labaye and Jaana Remes [*Labaye, Remes*, 2015] name specific conditions required for further growth of the internet economy:

- The creation of a system of incentives encouraging productivity growth and innovation. A good example is the rapid growth of productivity in the US during the 1990s due to the competitive environment, which was stimulated higher market competitiveness than that in Europe or Japan. Deregulated markets and low entry barriers for new businesses created favourable conditions for the ICT industry.
- The funding of ICT-related research: basic studies by the government, applied ones — by interested private companies;
- The development of human capital by promoting educational programmes that develop competencies required in high-tech industries (e.g. initiatives in natural and engineering sciences, ICT, and mathematics are being implemented in the US on the federal, regional, and local levels);
- The development of mechanisms providing access to open data sources;

- The promotion of foreign investments in ICT infrastructure; eliminating barriers hindering the flow of products, services, and human capital.

Measuring the internet's impact on the economy

The internet affects the economy directly and indirectly. The direct impact includes the combined contribution of all sectors of the internet economy to GDP [BCG, 2012; Deloitte, 2011; OECD, 2013; etc.], while indirect impact affects all industries, even those that are not directly related to the internet. For example, the worldwide web's impact on the transportation industry can be measured via revenues of companies and entrepreneurs who make use of aggregator services such as Yandex.Taxi, Uber, Gett, etc., and "conventional" carriers whose revenues drop due to the proliferation of online economic mechanisms [*Stiglitz et al.*, 2009; BCG, 2010].

The method based on end-use of revenues is most frequently used to assess the internet's direct impact on the economy. Essentially quite homogenous, such calculations significantly vary in terms of expenditures included in the "consumption", "investments", "public spending", and "net exports" groups. Data for calculations was taken from publications by national statistical services, Eurostat, the OECD, Gartner company, and surveys conducted by Google and IAB Europe. Also, in the absence of official statistics, analysts occasionally use specially designed proxy indicators. The internet economy measurement formula suggested by BCG [BCG, 2012] seems to be best suited for the purposes of our study:

$$\textit{Internet economy} = \textit{Consumption} + \textit{Investment} + \textit{Public Spending} + \textit{Net Exports}$$

Consumption includes expenditures on buying products and services on the internet; internet access costs; payments to internet service providers; and the procurement of equipment. Internet access costs include landline and mobile access, and partially the purchase of computers, mobile phones, and network equipment (e.g., wireless routers). *Investment* includes investments made by companies, specifically by those in telecommunications, in capital assets required for landline and mobile internet access, except software development. *Public ICT-related spending* includes the procurement of computer hardware and software and payments for telecommunications and related services. *Net exports* are defined as the difference between the value of exported and imported products and services procured or provided online, and expenditures on ICT equipment, calculated on the basis of e-commerce and hardware sales data.

Certain individual researchers also apply this approach. For example, Dale Jorgenson and Kevin Stiroh [*Jorgenson, Stiroh,* 2000] calculate ICT production potential and the impact on economic growth in the US during the 1990s as combined investments in computer hardware, software, and communication systems and expenditures on ICT-related consumer products. The *production-based* technique for the calculation of the added value created by the internet sector companies [Deloitte, 2011; OECD, 2013] is used less frequently. The main problem with this approach is insufficiently detailed statistical data available through the UN System of National Accounts (SNA) and the Standard Industrial Classification of All Economic Activities (ISIC). Moreover, there is a lack of data on companies' operations on the internet. Another limitation is due to the fact that these classifications do not distinguish between the sectors' online and offline activities in all spheres. This leads to type I and II errors related to identified boundaries of the internet economy and the amount of online operations. In other words, with this approach, activities totally unrelated to the internet are inevitably included in the internet economy calculations, or ignore certain online activity that is not recorded as official statistical data.

Hasan Bakshi [*Bakshi*, 2016] notes that there is no commonly accepted definition of the internet economy in the UK, while definitions provided in the early (50-year old) versions of the SNA apply to material production and are not valid for measuring the internet economy. Bakshi suggests distinguishing between the digital industry proper, which is comprised of producers of electronic products and services (i.e. companies for whom they constitute the main source of income), and the digital economy, which involves the use of software and hardware in other industries. Bakshi writes that companies using advanced technologies in industries such as healthcare or education, should not be included in the groups whose codes are attributed to hardware and software producers. He also points out that annual surveys conducted by the UK Office for National Statistics cover almost none of the micro-companies, many of which develop new technologies.

The study [*Bakshi*, 2016] pays particular attention to problems associated with classifying activities of companies like Amazon (online trade in e-books and physical products), Spotify (music streaming), and Airbnb (worldwide short-term renting of private dwellings) which do not match the ISIC "main economic activity" definition. Spotify, as well as Google, are included in the UK in the "Other business services not included in other groups" category, while the service's contribution to music industry statistics is not reflected — leading to obvious gaps in calculations. In addition to reviewing the classification of economic activity types, the adoption of various alternative calculation methodologies by the UK Office for National Statistics would help produce more accurate data about the size of the internet economy.

The US has the best toolset for the statistical measurement of e-commerce; relevant data are collected by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. Still, some researchers (see, e.g., [*Brynjolfsson, Saunders*, 2010]) note certain shortcomings of the BEA methodology which includes the activities of computer and other hardware manufacturers, companies providing relevant

maintenance services, and producers of ICT services (software developers, telecommunication operators, etc.) in the calculation of generated gross value added.

In order to estimate the volume of the internet economy on the basis of value added, Deloitte uses a methodology that accounts for revenues generated by internet service providers, search engines, data storage and processing systems, computer hardware dealers, IT consultants and software distributors, new media and podcasters, advertising agencies and web developers, and providers of public online services [Deloitte, 2011].

The OECD always recommended using the SNA for calculating the value added [OECD, 2010]. In 2011, this organisation initiated a series of studies aimed at developing a methodology for measuring the internet economy. The studies were based on existing projects and previously formulated statistical definitions [OECD, 2011]. Subsequently, it was suggested that ISIC criteria be used to standardise data and make international comparisons possible [OECD, 2014], but only the US (the annual BEA reports) and Australia (just once) followed this recommendation [Deloitte, 2011]. The OECD recommendations stress the challenges associated with applying this approach as the available data are limited.

The internet's impact on the social sphere

ICT has yielded a whole range of next-generation products and services such as distant learning, telemedicine, cloud file sharing, etc. At the same time, the internet's role is not limited to activities of relevant market players: its impact is much broader, directly affecting the social and consumer spheres including the creation and application of social capital. The abovementioned effect is evident in emergence of e-health, e-learning, and e-government services [OECD, 2013; *Shah et al.*, 2001; *Morton*, 2006; *Greenstein, McDevitt*, 2011].

Speaking about the internet's impact on the environment, experts turn to "green economy" concepts. According to Carmen Ciocoiu [*Ciocoiu*, 2011], ICT advances have significantly transformed the environment, primarily through application of innovative technologies, the proliferation of electronic applications and e-commerce. Specifically, the reduced consumption of electricity and more efficient energy usage were noted. Distant learning technologies have allowed for reducing work-related travel and commuting, and accordingly, the amount of harmful emissions. The ICT-based green economy's growth is taking place in three major areas [*Ciocoiu*, 2011]:

- Increased energy and material efficiency, wide use of renewable energy sources, increased waste recycling, reduced toxicity of substances;
- Increased efficiency of production, distribution, and consumption of products and services due to the reduced costs of energy and other resources, and their partial or complete replacement by virtual equivalents;
- The continuous adjustment of consumer behaviour and values due to the promotion of various ways to reduce one's negative impact on the environment.

Measuring the internet economy: the Russian experience

Despite the large number of quantitative internet business studies published in Russia, there were relatively few attempts to measure the size of the Russian internet economy. Depending on the study goals, this research can be divided into several categories: the analysis of the audience and the structure of the Russian segment of the internet; the assessment of specific online markets and the study of the Runet economy as a whole.

The first group includes studies frequently cited by large think tanks that are focused on analysing various online market segments (see, e.g., [TNS, 2014; SSC Enter, 2014]). The most well-known studies of the second group include those conducted by the Association of Internet Trade Companies [AITC, 2014], Data Insight [Data Insight, 2014], and East-West Digital News [EWDN, 2013]. They summarise the authors', or other companies' quantitative assessments (volume and dynamics of electronic sales) for various narrow segments of the Russian online market, such as electronics and home appliances, clothes and footwear, car parts, video games, tickets, etc. The results of these studies s are highly reliable and discrete, because surveyed companies combine online and offline activities. However, such survey data are poorly suited for reproduction and comparison.

To date, the only comprehensive study of the Russian internet economy based on an original methodology is the annual reports by the Russian Association of Electronic Communications (RAEC) [RAEC, 2012, 2013, 2014, 2015]. The RAEC experts analyse structural dynamics of the Russian online market in several segments: marketing and advertising (media, context, video, mobile advertising, search engine optimisation (SEO), social media marketing (SMM)); infrastructure (SaaS, hosting, domains); e-commerce (retail, tourism, payments), and digital content (books and media, games, music, and videos)[1]. The study includes two stages: during the first stage, Foresight consultations are conducted with

[1] The sectors covered by the RAEC study have changed every year since 2011. Here and below, unless specifically noted otherwise, the methodology and data are described for the [RAEC, 2015] study.

leading industry experts and the second stage involves the survey of a wider range of industry experts. Data collected for each segment of the internet economy underpin the calculation of integral indicators measuring market size, growth rate, structure, external factors affecting its development, potential, and growth points.

Methodology

A methodology based on the SNA principles seen as a set of interconnected indicators can be used to assess the actual scale of the Russian internet economy segment. It is used to describe and analyse macroeconomic processes in more than 150 countries. The main methodological provisions of the SNA are harmonised with the balance of payments, GDP, and other key indicators. A comprehensive statistical toolset for GDP is available to capture patterns, growth trends, and interconnections. This approach has many advantages such as regular data collection, a clear calculations programme, and it meets scientific validity and practical applicability requirements. Although this approach is not completely free from minor drawbacks, we will not dwell on them here.

Two SNA techniques for measuring GDP can be applied to assess the size of the internet economy: production-based (value added) and end-use-based (expenditures). Data sources for the application of the aforementioned methodology included our own surveys and official data published by Rosstat, the Russian Ministry of Communications and Mass Media, the Federal Customs Service, and Bank of Russia, which was sufficient for making proper comparisons between various sectors of the economy. The proposed methodology takes into account international practices and the specificity of the Russian national statistics system.

Production-based measurement of the internet economy

The production-based approach for measuring the internet economy is based on the combined GVA produced by companies operating online. According to the SNA methodology, GVA is calculated at the industry and sector levels and is defined as the difference between their products' and services' output and intermediate consumption. The output is calculated as the combined value of products produced by resident companies during the accounting reference period. Intermediate consumption means the value of products and services transformed or fully consumed in the course of the production process during the accounting reference period [Rosstat, 2015].

The internet economy's place in the classification of economic activities

Three major economic sectors are considered based on the role the internet plays in companies' operations and include: (1) ICT infrastructure and its maintenance; (2) online business only, and (3) both online and offline operations. The first group comprises companies which create, implement, and develop ICT systems, resources, and components. The second includes typical internet economy actors that perform all their production processes on the web: they design and provide services, participate in e-commerce, etc. The third group is composed of companies that directly interact with clients, supplying them with products and providing services, both online and offline, in areas such as tourism, ICT infrastructure,banking, retail, airline and railway tickets sellers, and real estate.

In order to measure the size of the internet economy using the production-based technique, we should first clearly define the segment's boundaries in line with the All-Russian Classification of Economic Activity Types (OKVED) (the 1.1 edition valid at the time of the study)[2]. This version of OKVED allowed the authors to test our methodology using real statistical data but also led to certain limitations. For example, companies operating exclusively on the web can be classified as IT or retail e-commerce firms only. Online market players such as airline and railway ticket sellers, real estate agents, advertisers, marketing and banking companies are not present in the classification, so they can be counted only at the level of companies performing both online and offline business operations. International researchers also face similar problems with the statistical measurement of the internet economy using conventional classifications.

With a certain degree of approximation, the internet economy can be mapped on the basis of the OKVED edition 1.1 as follows:

- *The ICT infrastructure and its maintenance sector* includes telecommunication and information companies (codes 64.20.12, 64.20.3, 64.20.4, 64.20.5, 64.20.6, 64.20.7, 72.1, 72.2, 72.6);
- *The online business sector* includes companies engaged in retail e-commerce, data processing, the creation and application of databases as well as other online resources (codes 52.61.2, 72.3, 72.4);

[2] OKVED edition 1.1 was approved by the Federal Agency on Technical Regulating and Metrology, order of 22.11.2007 No 329-st (edition of 24.12.2012). In 2014, a new edition of the classification was approved — OKVED-2 (OK 029-2014 (NACE Rev. 2) (order of 31.01.2014 No 14-st), and came into effect as of 01.01.2017 (Rosstat order of 20 November 2015 No 560). We see a revision of the internet economy's structure and boundaries in line with the OKVED-2 as our future objective, but we can already note that the new classification will allow for overcoming various limitations encountered when the OKVED edition 1.1 was used.

- *The online and offline business sector* includes publishing, transport, and advertising companies, financial brokerage and insurance firms, production, distribution, and screening of films, radio and TV broadcasting, retail, and travel (codes 22.1, 52.1, 52.2, 52.3, 52.4, 52.5, 52.6 (except 52.61.2), 63.21.1, 63.21.21, 63.22.11, 63.23.1, 63.3, 65, 66, 74.4, 92.1, 92.2, 92.4).

The general breakdown of internet economy companies by economic activity type on the basis of the OKVED is presented in Table 1.

Measuring the size of the internet economy

When the size of the internet economy is measured, all GVA generated by companies of the first two sectors are counted, while the third sector requires estimating the share of online business in the companies' operations. The general formula for calculating GVA for all sectors looks as follows:

$$IE\ GVA = GVA_1 + GVA_2 + GVA_3 * K, \quad (1)$$

where *IE GVA* is the GVA generated by companies engaged in internet business activities; GVA_1 is the GVA generated by the ICT infrastructure and its maintenance sector; GVA_2 is the GVA generated by companies engaged exclusively in online business; GVA_3 is the GVA generated by companies operating both online and offline; and K is the share of their online business.

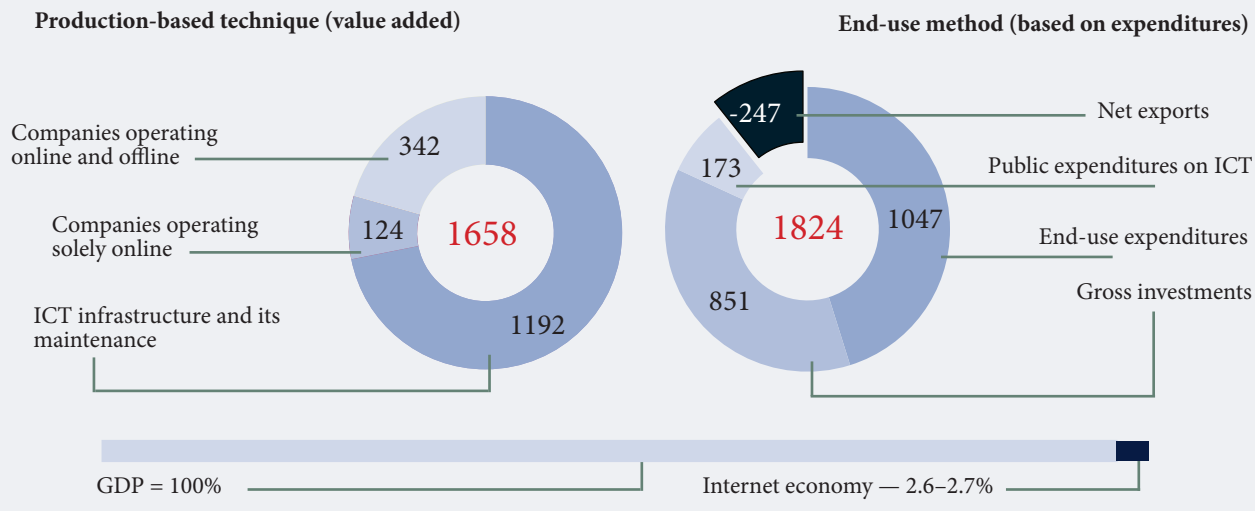
GVA_1, GVA_2, and GVA_3 are calculated for all economic activity types in each sector (see Figure 1), with Rosstat SNA data serving as the starting point. Direct statistics are available for publishing; production, distribution, and screening of films; radio and TV broadcasting; financial brokerage and insurance. Measuring GVA generated by companies specialising in other areas involves identifying the closest activity types in relevant classification groups. For example, the retail e-commerce segment can be measured via the GVA generated by such companies only on the basis of the composite group "Retail trade except automobiles and motorcycles; repair of home appliances and personal effects; retail sale of motor fuel" (codes 52, 50.5). GVA generated by the internet economy includes value added created by

Table 1. **Suggested structure of the internet economy based on the OKVED edition 1.1**

Sector	Economic activity types
ICT infrastructure and its maintenance	*Communication* • mobile communications (64.20.12) • intersystem communications (64.20.3) • data transfer (64.20.4) • telematics (64.20.5) • cable TV broadcasting, on-air TV broadcasting, cable radio broadcasting (64.20.6) • other telecommunication services (64.20.7) *IT services* • computer hardware consulting (72.1) • software development and related consulting (72.2) • other computer- and IT-related activities (72.6)
Online business	*Retail* • retail operations performed directly via TV, radio, by telephone, or on the internet (52.61.2) *IT services* • data processing (72.3) • the creation and application of databases and other information resources, including internet-based ones (72.4)
Online and offline business	*Publishing* • book publishing (22.11) • newspaper publishing (22.12) • magazine and periodic editions publishing (22.13) • sound record publishing (22.14) • other publishing activity (22.15) *Retail* • retail trade except automobiles, motorcycles, and specialised online trade (52.1, 52.2, 52.3, 52.4, 52.5, 52.6 (except 52.61.2)) *Supporting and supplementary transportation activities* • other support services for railway transport (63.21.1) • operation of terminals (bus stations, etc.) (63.21.21) • operation of sea ports, piers, locks etc., including passenger services at ports (63.22.11) • operation of terminals (airports, etc.), management of airports (63.23.1) *Production, distribution, and screening of films, radio and TV broadcasting* • production, distribution, and screening of films (92.1) • radio and TV broadcasting (92.2) • news agencies' activities (92.4) *Other services* • travel agencies' activities (63.3) • advertising (74.4) • financial brokerage (65) • insurance (66)

Source: [*Abdrakhmanova et al.,* 2016b].

Figure 1. **The size of the Russian internet economy: 2014 (*billion roubles*)**



Source: [*Abdrakhmanova et al.*, 2016a].

retail companies operating exclusively online (52.61.2) (GVA_2) and by offline retail companies except those selling vehicles and motorcycles (52.1, 52.2, 52.3, 52.4, 52.5, 52.6 (except 52.61.2)) which do both online and offline business (GVA_3).

A specific range of data sources was identified for each activity type, and GVA sub-indicators were calculated. In line with international practice (for example, the OECD's attempt to measure the US internet economy [OECD, 2013]), these calculations were based on a hypothesis about sales and revenue structures matching the GVA structure. Industry-specific and corporate statistics for the following indicators were used:

- GVA (except for small enterprises) disaggregated to the level of economic activity types such as retail (except e-commerce), IT industry, advertising, and news agencies' operations[3];
- (e-commerce) retail turnover;
- output (products and services) (transport, travel)[4];
- service-generated revenues (telecommunications)[5].

In terms of methodology and the collection of initial data, the biggest problem is identifying the internet share of GVA generated by companies engaged both in online and offline business operations. As with mapping economic activities, the estimates were based on the assumption that a structural similarity exists between sales and GVA. To measure the share of the electronic sales of financial, advertising, and transportation companies, firms engaged in the production, distribution, and screening of films, radio and TV broadcasters, and news agencies, we suggest assessing the level of their sales on the internet (and other global information networks) on the basis of orders received or placed on the website, in the extranet, or through electronic data interchange (EDI) systems[6]. For insurance, publishing, retail, and travel companies, the share of electronic sales was estimated by conducting a special survey which was comprised of in-depth interviews with representatives of each of the four industries and a telephone poll of insurance and travel firms [*Abdrakhmanova et al.,* 2016c].

End-use-based measurement of the internet economy

The end-use-based technique amounts to summing up households' consumption expenditures, gross investments, public expenditures on ICT, and net exports. The formula can be expressed as follows:

$$IE\ GVA = P_{ec} + P_{gi} + P_s + NE, \quad (2)$$

[3] Federal statistical survey form "Basic information about the organisation's activities" (No 1-enterprise), approved by the Rosstat order of 15.07.2015 No 320.

[4] This indicator and the previous one are both included in the federal statistical survey form "Information about production and shipment of products and services" (No P-1), approved by the Rosstat order of 15.07.2015 No 320.

[5] Federal statistical survey form "Information about revenues generated from communication services" (No 65-communication (services)), approved by the Rosstat order of 12.03.2015 No 95.

[6] Federal statistical survey form "Information about the application of information and communication technologies, production of computer hardware, software, and provision of related services" (No 3-inform), approved by the Rosstat order of 03.08.2015 No 357.

where *IE GVA* is the size of the internet economy calculated on based on expenditures; P_{ec} is end-use consumption; P_{gi} is gross investments; P_s is public spending on ICT, and NE is net exports.

End-use consumption expenditures include population's acquisition of ICT equipment, online purchases, and internet access costs. Gross investments include companies' expenditures on computer hardware, telecommunication equipment and software, capital investments by companies specialising in the creation and maintenance of ICT infrastructure, and by firms doing business exclusively online. Public ICT expenditures include the procurement of hardware, software, and related services. Net exports is the difference between the value of exports and imports of ICT products and services. Sources of data on relevant expenditures included the Rosstat's household surveys, structural statistics for enterprises, trade, information society, customs turnover, Russia's balance of payments, and information about ICT-related public procurement contracts (products and services).

End-use consumption

Expenditures on purchasing products on the internet can be measured either from the consumption side, or on the basis of online suppliers' data. The first approach offers certain advantages since it allows for the consideration of purchases made both in Russia and elsewhere. However, no relevant official statistics or survey data are available. The second approach allows one to measure the e-commerce market using retail turnover figures, specifically data about the share of online orders. Due to a lack of relevant statistics for food products, only retail turnover for non-food products was taken into account. However, as the analysis of consumers' structure shows, this did not significantly affect our final results. In 2014, the share of the population who have purchased food products on the internet was 9% of all people who made online purchases, and 2% of the total population aged between 15–72 [*Abdrakhmanova et al.,* 2016b].

A key methodological issue of measuring the e-commerce market is determining its scope: i.e., if it should include only products sold and delivered to consumer online (such as software, computer games, audio and video content, etc.), or also include a whole range of products ordered on the internet at a full price. Following the established practices [McKinsey, 2011; BCG, 2012], we have chosen the second approach, given that the purchase of digital or non-digital products on the internet is the result of online operations. Thus, people's expenditures on online purchases were calculated on the basis of retail turnover for non-food products and the share of online orders in the latter.

Households' expenditures on acquisition of ICT equipment include the procurement of personal computers, periphery, components, and other data processing hardware and spare parts[7]. Since some of these expenditures were counted under the heading "Households' expenditures on the procurement of products on the internet", the amount was adjusted to account for the share of online sales in the total sales of non-food products. Expenditures on internet access include data from the relevant household expenditures item[8].

Gross investments

Companies' expenditures on the procurement of computer hardware, telecommunication equipment and software include purchases of all kinds of computers, periphery devices (printers, scanners, backup data storage devices, additional monitors, etc.); TV and radio transmitting devices, electrical equipment, software, operating systems, design and software development tools, and other support and secondary products. Data for large and medium companies (except secondary and vocational schools[9]) includes information provided in the relevant federal statistical survey form[10]. Obtaining data on ICT-related expenditures by all companies would require recalculating their costs by comparing staff numbers of large and medium companies with the total number of those employed. The relevant expenditures of firms, players on the market for ICT infrastructure and its maintenance, and of companies doing exclusively online business were not taken into account because these amounts were included in the capital investments category, i.e., they had already been counted as part of companies' gross investments[11].

Public expenditures on ICT

Data about the procurement of products and services, or about ICT-related contracts are the main source of information on relevant public spending. The former has an advantage of legally established

[7] Federal statistical survey form "Household budget survey questionnaire" (No 1-V), approved by the Rosstat order of 03.02.2016 No 37.

[8] Ibid.

[9] Form P-2 "Information about investments in non-financial assets", approved by the Rosstat order of 17.07.2015 No 327.

[10] Federal statistical observation form "Information about the application of information and communication technologies, production of computer hardware, software, and provision of related services" (No 3-inform), approved by the Rosstat order of 03.08.2015 No 357.

[11] Federal statistical survey form No PM "Information about basic indicators of the small enterprise's activities", approved by the Rosstat order of 15.07.2015 No 320.

indicators and strict requirements for documenting budget execution; the latter are accounted for by the relevant executive agencies, local self-government organisations, and various institutions at all levels, in the framework established by the Federal Law of 05.04.2013 No 44-FZ "On the contract system for the procurement of products and services to meet state and municipal needs" An analysis of completeness and reliability of data from the above sources revealed that information about public procurement of ICT-related products and services presented as combined contract value is better suited for the purposes of measuring the Russian internet economy[12].

Net exports

The difference between the value of exports and imports of computers, periphery devices, and relevant computer-related and information services is calculated using balance of payments data published by the Central Bank of Russia. Computer-related services include services related to hardware, software, and data processing; information services include news agencies' operations, databases (from concept design to data storage and distribution, via online networks or on magnetic, optical, and printed media), and search engines. Exports of computers and periphery devices are calculated on the basis of customs statistics in line with the Product Nomenclature for External Economic Activities[13].

Results

The experimental calculation of the GVA generated by and combined expenditures of the internet economy on the basis of the methodological approaches described above yielded the following results. Calculated using the production-based technique, the GVA generated by the internet economy in 2014 amounted to 1.658 trillion roubles.[14] More than 70% of this amount was produced by the ICT infrastructure and maintenance sector, about 20% — by companies operating both online and offline, and 7% — by companies solely engaged in online business. Combined internet-related expenditures in 2014 amounted to 1.824 trillion roubles, the bulk of which were end-use consumption and investments (Figure 1).

The internet economy's contribution to GDP, calculated using both techniques, amounted to approximately 2.6–2.7% in 2014. To compare, the relevant figures for such sectors of the economy as production, transportation, and distribution of electricity, gas, and water were 2.9%; for agriculture — 3.9%; land transportation — 4.1%; and financial brokerage — 4.5%. Production-based and end-use-based methods yielded similar results, which confirms the validity of the estimates. When harmonised with international approaches, these methods allow one to compare across various countries. Therefore, our estimates of the internet economy in 2014 are comparable with the BCG forecasts for Russia for 2016 and the results of other international and Russian studies (Table 2).

In terms of the internet economy's development, Russia is ahead of Brazil (2.4% of the GDP) and Turkey (2.3%), and close to Argentina (3.3%) [BCG, 2012]. At the same time, the internet economy of Great Britain, the leader with a GDP share at 12.4%, is 4.8 times greater than that of Russia [*Abdrakhmanova et al.,* 2016a].

Conclusion

The analysis of international experience revealed that, despite the obviously increasing role of the internet sector of the economy, there is still no universally accepted methodology for measuring it. There is no consensus on this issue, not solely in Russia but also internationally. Organisations studying the internet's impact on the economy and social sphere use various approaches. The OECD and major consulting firms such as McKinsey, BCG, Deloitte, etc. continue their research, test various original methodologies, and are still getting ready to make generic recommendations. Each of these organisations is working on its own original methods and measurement tools; all of them calculate their own specific indices. Russian researchers tend to measure the internet economy's share of GDP by calculating relevant expenditures of all economic agents. The approach presented in this paper is compatible with the SNA methodology and international practices and is based upon the use of official statistics, thus ensuring the reproducibility and reliability of the final results.

The application of the suggested methodology (including classification) and data collection for measuring the size of the internet economy based on the production method and end-use methods demonstrates that these methods are preferable for such measurements. However, the production-based approach does have certain limitations, namely the notional division of the internet economy into sectors on the basis of OKVED, which leaves a significant proportion of companies in the classification's "blind zone". Other limitations include a probability of errors with the GVA measurement caused on the one hand by the

[12] The official website of the unified information system for procurement on the Internet: http://zakupki.gov.ru/ (last accessed on 01.12.2015).

[13] Approved by the Eurasian Economic Commission's Council, decision of 16.07.2012 No 54.

[14] Calculated on the basis of the Rosstat's SNA data and industry-specific statistics for 01.12.2015.

Table 2. **Comparative estimates of the size of the Russian internet economy**

Study	Conducted by	Year	Volume of the Russian internet economy	
			billion roubles	*% of GDP*
Structure and volume of the internet economy	HSE	2015	1658*; 1824**	2.6–2.7
Runet economy in 2014–2015	RAEC	2015	1570***	2.2
The internet economy in the G-20	BCG	2010	810**	1.9
		2016 (forecast)	—	2.8

Notes:
* Calculated using production-based technique.
** Calculated using end-use-based technique.
*** Since 2012, the RAEC has measured internet-dependent markets, i.e. conventional markets significantly affected by online technologies. These calculations capture internet access costs, investments in internet companies, and electronic B2B commerce [RAEC, 2014]. In 2015, the combined volume of these markets was estimated at 11.8 trillion roubles.

Source: [*Abdrakhmanova et al.,* 2016a].

level of detail of the OKVED-based calculations (to the fifth or sixth digit), and on the other — by using a limited nomenclature of economic activities and an incomplete sample of organisations to calculate the share of companies' online operations.

A more precise expenditure-based measurement of the internet economy requires the further improvement of the collection and processing of data on online purchases for consumption purposes (by individuals and households), excluding retail statistics. A methodology must be developed and the range of data sources should be expanded for measuring the population's expenditures on the procurement of services on the internet. Accomplishing these objectives will improve the quality of measuring purchases from international online suppliers. The current typology of expenditures on the internet activities also needs to be revised, e.g. by adding companies' internet access costs. Yet another task is the development of a mechanism for collecting data on public ICT-related expenditures, broken down by procurement and budget spending at all levels.

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The Development of an Intelligent Leadership Model for State Universities

Aleme Keikha [a]

PhD student, Department of Education and Psychology, aleme.keikha@yahoo.com

Reza Hoveida [a]

Associate Professor, Department of Education and Psychology, r.hoveida@edu.ui.ac.ir

Nour Mohammad Yaghoubi [b]

Associate Professor, Department of Management and Accounting, Nm.yaghoubi@gmail.com

[a] University of Isfahan, Daneshgah Street, Esfahan, Isfahan Province, Iran.

[b] University of Sistan and Baluchestan, P.O.Box, 98155-987 Zahedan, Iran.

Abstract

Higher education and intelligent leadership are considered important parts of every country's education system, which could potentially play a key role in accomplishing the goals of society. In theories of leadership, new patterns attempt to view leadership through the prism of creative and intelligent phenomena. This paper aims to design and develop an intelligent leadership model for public universities. A qualitative-quantitative research method was used to design a basic model of intelligent leadership. The opinions of pundits and experts with a purposive sampling method to achieve theoretical saturation was used to design a model in the qualitative phase. During the testing of the model based on confirmatory factor analysis, data indicated that the dimensions of intelligent leadership were placed in the four components: rational leadership, emotional leadership, spiritual leadership and collective leadership and classified in sub-categories. Rational leadership was classified into five sub-categories (strategic thinking, common targeting, planning, decision-making and monitoring and feedback); emotional leadership was classified into four sub-categories (self-awareness, self-management, motivation and social awareness); spiritual leadership was classified into seven sub-categories (vision, confidence in one's ability to achieve a goal, altruism, meaningful work, membership, organisational commitment and feedback); and finally, collective leadership was classified into the three sub-categories (communication, development of a communication network and an exchange of opinions between the leader and team). The results presented in the paper correspond with statistical logic. Finally, the test model and the Delphi technique were applied using the survey approach and the ultimate model was described, including 426 codes, 89 sub-categories and the four main categories (rational leadership, emotional leadership, spiritual leadership and collective leadership).

Keywords: intelligent leadership; rational leadership; emotional leadership; spiritual leadership; collective leadership

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Universities as social systems have been recognized as the driving force behind social awareness [*Mckeown, Bates,* 2013]. Universities bring in people to continue their work despite the different tensions such as the juxtaposition between universalism and nationalism, global culture and local culture, tradition and modernity, long-term and short-term plans, the need for competition and equality of opportunity, material and spiritual values. Their influence has touched upon the tension between the explosion in the population, the accumulation of knowledge, rising stakeholder expectations and the increase in competition in the educational space. In this context, universities are forced to increase their competitive advantage by constantly optimizing spending and raising the quality of education, which experts consider the key factor affecting implicit competition between countries [*Tofighi et al.,* 2012]. Sydanmaanlakka notes that leadership is seen as a driving force for implementing the main missions of universities. The next generation of academic leaders will live in a turbulent and chaotic environment where success depends upon detecting patterns of change, measuring and capturing opportunities. In this type of environment, leaders need many competencies for their survival [*Sydanmaanlakka,* 2003].

Over the course of the last decade, the importance of guidance and intelligent leadership in higher education has been increasingly seen in the process of structural changes. Leaders must act amid confusion, uncertainty and instability, meanwhile the complexity of this environment will only increase. Therefore, success in the current environment requires a different way of thinking about issues, including a farseeing approach to leadership, the exchange of views and a readiness to cooperate in order to realize joint strategies [*Sydanmaanlakka,* 2008].

Previous studies showed that the behavior of university leaders can affect the behavior and performance of faculty members [*Bass,* 2010]. The importance of intelligent educational leadership and their role in the success and improvement of the university is apparent. Based on this, researchers and educational policy makers have stipulated that leadership has been the main component of university progress and improvement. The interpretation of the term, "university leadership" demonstrates its unique features that set apart from leadership at other types of organizations [*Macbeath,* 2003].

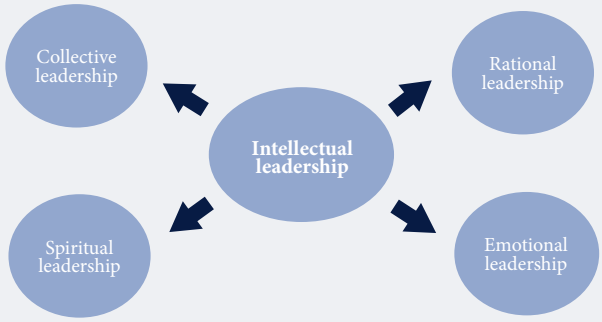
Compared to recent decades, the relevance of university leadership has notably increased. If in the past administrators had been able to move through official channels and hierarchies in order to provide effective solutions for the university, in today's conditions, this will not guarantee success. In other words, the roles of other management teams are not sufficient in the face of new educational challenges and in this context, when facing these challenges, managers need tools such as intelligent leadership skills [*Gronn,* 2002a]. When assessing the traditional approach to leadership, consider the impact of the leader-follower hierarchy. In this paradigm, the leader is the organizer and guides the team members [*Pearce, Conger,* 2003].

Most of the literature on leadership studies was based on the aforementioned approach and in most of the relevant studies, the behaviors, skills and personal attitudes of leaders are analyzed [*Bass,* 2010]. As a result of the complexity, a rise in the innovation flexibility of organizations, overall the literature has begun to consider leadership as a collective and common action and has started to move from the traditional roles to the new roles such as team building and group work [*Gronn,* 2002b].

One of the leading theories that researchers have begun to recently study more frequently is intelligent leadership theory. The understanding of intelligent leadership allows one to act effectively at various levels of management, from certain individuals to teams, organizations and society as whole. Intelligent leadership should help each member of a team in their comprehensive personal development and help them develop their self-sufficiency, it raises the intellectual potential of an organization and plays an active role in the creation of intellectual communities. The ultimate goal of leadership lies in the creation of a unique environment, in which economic and ethical aspects are balanced. The success of an increasing number of organizations today depends on making effective and timely decisions, which are based on sensible leadership. The ability to lead is one of the major challenges for the present and the future, because the way leaders think and the manner in which they act determines the development of the organization [*Soltani,* 2009].

Intelligent leadership is a constructive dialogue between leaders and followers, which facilitates bringing their efforts together to achieve a common vision. Such a process is possible if the organization supports certain corporate values and a culture formulated in an industrial and social macro-environment [*Rutkauskas, Stasytyte,* 2013]. The task of intelligent leadership is the creation of abilities, the generation of collective enthusiasm, the expansion of an organization's knowledge capital. The adoption of such an approach at universities provides a balance between the current activity and planning for the future. The key qualities of leaders include the ability to negotiate and make decisions, strategic and critical thinking, the management of talent and teams with account of values, personalities and personal principles. This study has attempted to investigate the characteristics of intelligent leaders through semi-structured interviews.

Figure 1. **Conceptual Model of Intelligent Leadership**



Source: compiled by the authors.

Method

The main objective of this paper was to design and develop an intelligent leadership model for managers, faculty and staff at public universities in Zahedan, Iran. The research used a combination of quantitative and qualitative methods. A review of the literature facilitated the formulation of questions for the semi-structured interviews. Using this approach, the authors made an initial list of questions addressed to all respondents, during the interviews, depending on the atmosphere and progress, additional questions were posed in order to allow for the collection of more comprehensive information. The respondents included 20 employees of the State University of Sistan and Baluchestan and the Zahedan University of Medical Sciences. The interpretation of the interview results was facilitated by the use of the MAXQDA 2007 program. This permitted the development and testing of a prototype of the model for the target sample. The purposive sampling method was selected. Sampling was continued until data saturation (20 interviews were conducted). In the qualitative evaluation, Cochran's formula was used and systematic sampling, 120 persons were selected. Definition codes, which make up a single concept, were divided into classes. As a result of the classification, four basic categories were determined as well as 19 sub-categories, 89 concepts and 426 codes.

Tools for gathering information were semi-structured interviews. After reviewing the theoretical basis, interview questions were developed. With this interview method, the researcher posed the same questions to all respondents in a predetermined sequence and with the same wording. However, when doing interviews, according to the conditions and the atmosphere of the individual interviews, more questions were posed so that respondents could provide broader and more comprehensive information for the researcher. The full text of the interview was recorded, transcribed and interred in software, MAXQDA 2007. This was done so that when using of, accessing the data would be more convenient. Codes that include a common theme were placed in the same class.

Results

A qualitative analysis of the data permitted the extraction of 426 original codes. After multiple revisions and code integration at several stages, 89 concepts were formulated, which in turn were divided by 19 subcategories and 4 main categories which include: rational leadership (5 concepts), emotional leadership (4 concepts), spiritual leadership (7 concepts) and collective leadership (3 concepts) (Figure 1, Table 1).

Test Model

The Kaiser-Meyer-Olkin (KMO) test was used to check the suitability of the data for factor analysis, the value of which will always fluctuate between 0 and 1. According to Table 1, for all aspects of intelligent leadership, the value of KMO is 0.7 (it should be more than 0.6), therefore, we can say that the data is suitable for factor analysis. To ensure proper data regarding the correlation matrix, which when used is not equal to zero, the Bartlett test was used. The data presented in Table 2 demonstrates the reliability of the data in the sample, because the results of the Bartlett test were statistically significant (sig> 0.05).

The testing of the model with the use of confirmatory factor analysis indicated the four intelligent leadership dimensions, which include rational leadership, emotional leadership, spiritual leadership

Table 1. **Schematic final model of intelligent leadership at universities**

Component of intellectual leadership	Elements
Rational leadership	Strategic thinking (10 indicators)
	Common targeting (4 indicators)
	Planning (9 indicators)
	Decision making (6 indicators)
	Monitoring and feedback (5 indicators)
Emotional leadership	Self-awareness (3 indicators)
	Self-management (5 indicators)
	Motivation (5 indicators)
	Social awareness (3 indicators)
Spiritual leadership	Vision (4 indicators)
	Confidence in one's ability to achieve one's goals (3 indicators)
	Altruism (5 indicators)
	Meaningful work (6 indicators)
	Membership (2 indicators)
	Organisational commitment (3 indicators)
	Feedback from leader (4 indicators)
Collective leadership	Communications (5 indicators)
	Development of a communication network (2 indicators)
	Exchange of opinions between group and leader (5 indicators)

Source: compiled by the authors.

and collective leadership. Rational leadership can be classified into 5 subcategories (strategic thinking, common targeting, planning, decision-making and monitoring and feedback); emotional leadership is divided into four sub-components (self-awareness, self-management, motivation and social awareness); spiritual leadership is classified into 7 sub-categories (vision, confidence in one's ability to achieve a goal, altruism, meaningful work, membership, organizational commitment and feedback); collective leadership is classified into 3 sub-categories (communications, development of the communications network and the exchange of opinions between the leader and the group) (see details in Table 3).

Confirmatory Factor Analysis

The confirmatory factor analysis of each of the study variables was obtained individually using LISREL software (Table 4). In order to reduce the number of study variables and consider them latent, the value of the obtained factor load should be greater than 0.3.

The results of Table 4 shows the appropriateness of the indices because according to the LISREL output, the Chi-square divided by the degree of freedom is equal to a number less than 3, and the RMSE is within the acceptable range (The allowed limit is 0.08).

The Kolmogorov Smirnov test was used to determine the normal status of the study variables including rational leadership, emotional leadership, spiritual leadership and collective leadership. Its results showed that the level of significance of all variables in accordance with the above table is larger than 0.05. The Friedman test was used to rank the components of intelligent leadership. The results showed that the average ranking of spiritual leadership is (3.85), rational leadership is (3.11), emotional leadership is (2.02) and collective leadership is (1.01). These results are due to the fact that in Iran universities are Islamic universities with a national and religious approach.

Table 2. **KMO and Bartlett's test results**

The name of component (hidden variable)	Summary symbol	The results of KMO	Bartlett test results
Rational leadership	RL	0.91	0.001
Emotional leadership	EL	0.89	0.001
Spiritual leadership	SL	0.90	0.001
Collective leadership	CL	0.92	0.001

Source: compiled by the authors.

Table 3. **Observed variables that characterize the various components of leadership and its indicators**

Observed variable	Concepts	Number of codes
Rational leadership		
Strategic thinking	• Recognition of environment related to leadership activity • Understanding the market • Recognition of customers • System, hierarchy, and people • Knowledge of products, services and technologies associated with the university • Awareness of financial affairs and credits • Creation of the motivating insight • Occupation is defined as a critical and permanent mission • Development of strategies with an emphasis on synergy • Successful tactical devlopment	42
Common targeting	• The beginning of comprehensive leadership and creation of common goals • Create practical plans • Setting goals based on the needs of the university • Trying to achieve the university's goals	24
Planning	• Recognition and determining strategies, prospects, purposes/missions, goals, policies, tactics/techniques, regulations, rules, programs, and budget	26
Decision making	• Data-based decision making • Having reliable courage • Rational decision making by combining intellect and intuition • Understanding organisational culture • Understanding the structure of power and hierarchy at the university for better decision making • Identification of the factors involved in decision making	33
Monitoring and feedback	• Determination of the criteria and methods for measuring activity • Monitoring performance and activities • Comparing the results of the performance measurement with criteria and goals • Action to modify or change function • Appropriate feedback on performance of individuals	11
Emotional leadership		
Consciousness	• Understanding your feelings • Emotional intelligence • Self-esteem	29
Self-awareness management	• Self-control • Reliability • Conscientiousness • Adaptability (ability to change one's leadership model) • Innovation	34
Motivation	• Creating motivation to achieve the goal • Tendency toward progression • Commitment • Initiative • Optimism	16
Social empathy	• Understanding and awareness of the needs and feelings of employees • Understanding the needs for staff development and concern for them (organisational knowledge) • Service-oriented or service	58
Spiritual leadership		
Vision	• Foresight • Identifying the functions of the university • Identifying the nature of the university • Create/select outlook	31
Confidence in one's ability to achieve goals	• Create an internal stimulus for oneself and one's employees • Doing one's duty • Responsibility	10
Altruism	• Trust • Loyalty • Forgiveness • Reception • Appreciation	19

Table 3 continued

Meaningful work	• Search for purpose and meaning in working life • Competence and skills • Commitment • Enthusiasm • The creation and provision of service • Value-based activity	18
Membership	• Gratitude for membership in the organisation • Social interaction	10
Organisational Commitment	• Emotional commitment • Continuous commitment • Normative commitment	14
Feedback from leader	• Unofficial observation of performance • Official visits • Feedback • Continuous improvement	11
Collective leadership		
Communications	• Creating common points • Exchanging opinions • Sharing information • Establishing communication standards • Right to be heard (encouraging employees to express ideas)	18
Development of communication network	• Encouraging interaction • Communication relating to educational activity	10
Exchange of opinions between the leader and the team	• Consultations • Delegating responsibilities • Using the experience and expertise of individuals • Empowerment • Shared leadership	12

Source: compiled by the authors.

In accordance with the Friedman test, the ranking of components of rational leadership at public universities of Zahedan showed that strategic thinking has first place and common targeting has fifth place (Table 5). This demonstrates the importance of goal setting and its role in the success of academic programs. Given that the new management approach is based on objectives, it is better that the university directors pay attention to this.

As regards the ranking of the components of emotional leadership at public universities of Zahedan, self-management holds first place and motivation, social awareness and self-awareness follow (Table 6). The results revealed that the most significant characteristics of emotional leadership at universities are the creation of trust, loyalty, a readiness to exchange ideas and further, the creation of motivation and the understanding of social issues and the needs of employees.

Among the seven characteristics of spiritual leadership at universities, organizational commitment held first place and meaningful work held seventh place (Table 7). Based on this, university directors need to focus on increasing employees' loyalty to the organization, set targets for the organization, create a strategic vision, expand altruism, provide for the meaning in one's work, give feedback to employees, and imbue a sense of belonging in the employees regarding the organization.

The data in Table 8 demonstrate that in the era of communications, in order to succeed, university directors must devote a great amount of attention to the exchange of opinions between the leader and the team, the alignment of communications networks and feedback.

Table 4. **The results of the confirmatory factor analysis**

The name of component (hidden variable)	Chi-square	Degree of freedom	Chi-square ratio	P-value	RMSEA
Rational leadership	548.81	188	2.91	0.000	0.079
Emotional leadership	311.67	134	2.32	0.000	0.042
Spiritual leadership	618.97	228	2.71	0.000	0.061
Collective leadership	194.85	65	2.99	0.000	0.056

Source: compiled by the authors.

Table 5. **Ranking components of rational leadership**

Row	Variable	Average ranking	Rank
1	Strategic thinking	4.98	1
2	Common targeting	1.03	5
3	Planning	2.04	4
4	Decision making	3.94	2
5	Monitoring and feedback	3	3
Sig=0.000	X^2=464.40	df=4	N=120

Source: compiled by the authors.

Table 6. **Ranking components of emotional leadership**

Row	Variable	Rank	Average ranking
1	Self-awareness	4	1.30
2	Self-management	1	4.02
3	Motivation	2	3.50
4	Social awareness	3	3.32
N=120	X^2=238.06	N=120	df=3

Source: compiled by the authors.

Findings

Given that the significance of all study variables in this study did not exceed 0.05, this permitted the formulation of four hypotheses, which were characterized by the connections between the components and intelligent leadership (Table 9). Among the main variables of study (which served as the basis for the hypotheses), the most significant was the relationship between spiritual leadership and intelligent leadership (with an impact factor of 0.32 and factor of significance of 0.000) (Figure 2). University directors should consider this a priority. The size of significance between intelligent leadership and rational, emotional and collective leadership amounts to 0.26, 0.25 and 0.18, respectively; the level of significance in all cases was 0.000. Given that the impact of collective leadership and intelligent leadership is the smallest, such is indicative of poor communication and a lack of attention to communication skills when considering a leader's success, which must also be considered.

The structural pattern seen in Figure 2 illustrates the relationship between the studied variables; for example, the size of the connection between spiritual and intelligent leadership is equal to 0.32. Coefficients of significance were used in order to confirm or refute the research hypotheses. Given that the factor of significance for all components of intelligent leadership (rational, emotional, spiritual and collective) were equal to 0.000, the hypothesis was confirmed.

Discussion

Global competition and rising community expectations demand new management approaches [*Ardalan et al*, 2013]. Intelligent leadership has recently become one such approach [*Noralizadeh, Hajivand,* 2008]. Intelligent leadership consists of four components: rational, emotional, spiritual and collective.

The rational dimension of intelligent leadership is considered a style of management in which managers from all levels jointly define the organization's goals and set limits on the responsibilities and duties of

Table 7. **Ranking components of spiritual leadership**

Row	Variable	Rank	Rank mean
1	Perspective	3	5.12
2	Confidence in one's ability to achieve goals	2	5.32
3	Altruism	4	4.37
4	Meaningful work	7	1.16
5	Membership	6	2.43
6	Organisational commitment	1	6.68
7	Leader performance feedback	5	2.91
Sig =0.001	X^2=238.06	N=120	df=6

Source: compiled by the authors.

Table 8. **Ranking components of collective leadership**

Row	Variable	Rank	Rank mean
1	Communications	1	2.56
2	Development of communications network	3	1.08
3	Exchange of opinions between the leader and team	2	2.36
Sig =0.000	X^2=179.01	N=120	df=2

Source: compiled by the authors.

each person taking the expected results into account. Emotional leadership includes the management of feelings and emotions, accounting for all aspects of life of the individual and the organization's relationship with him or her as a valuable resource of the organization. The leader's ability to inspire enthusiasm and direct it towards problem solving is crucial for performance. Spiritual leadership brings work meaning and purpose, it provides employees with strength and energy, it prevents job exhaustion and vanity. The leader uses value-based approaches and models of behavior, both conditioned by his or her own motivations and those of the team members, which provides for the spiritual survival of all members. It therefore enables employees to develop a personal and professional understanding of the needs of all as a basis for agreement. The development of communication networks between the leader and the followers facilitates the bringing together of efforts, the leadership role is divided between the employees and the director, which guarantees the success of said leadership. Sydanmaanlakka [*Sydanmaanlakka,* 2008] stated that intelligent leadership is a constructive dialogue between leaders and followers on concrete issues, so that they are able to jointly achieve a common vision. The leader fosters the collective wisdom of the group and increases the commitment of his or her employees to the job.

The findings of our research are confirmed by the work of [*Cox et al.,* 2003]. Intelligent leadership opens the space for collaboration, consultations and cooperation among faculty members and makes them more tightly linked with the organization by integrating behavioral and professional skills into a single base of knowledge and abilities. In addition, Locke [*Locke,* 2000] states that wise leaders will grapple with uncovering the creative and innovative potential of their subordinates, these leaders will push them to critically evaluate assumptions, put forward new frameworks for questions and find new ways of solving problems. According to [*Bligh, Meindl,* 2004], conscientious refocusing plays an important role: this is when a director subordinates his or her own goals to those of the organization. In its turn, the emotional component of intelligent leadership is called upon to change the organizational culture in such a way that the opinions of all are taken into consideration. Meanwhile, employees gain the motivation to achieve both individual and collective goals. Furthermore Cohen [*Cohen,* 2003] asserts that the director, who claims emotional leadership, should be aware of how his or her behavior and mood impacts those around him or her. These leaders must know their emotions, understand the feelings of others and correctly evaluate the emotional climate of his or her organization. The spiritual aspect lies in the creation of such an influence, thanks to which, work is imbued with meaning for all [*Fletcher, Kaüfer,* 2003]. Spiritual leadership emphasizes the spiritual needs of all team members, increases commitment to the organization, raises the effectiveness of group work, and the employees strive to improve their work and share altruistic values.

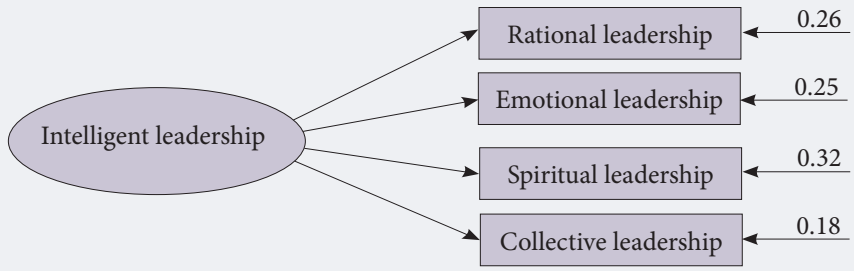
Finally, collective leadership is aimed at the development of professional and independent teams, increasing the spirit of teamwork. It allows for launching effective communication, developing communications networks and an exchange of opinions between the leader and working groups [*Pearce, Manz,* 2005].

Table 9. **Results of direct effects and significant coefficients of the final model hypotheses**

Row	Hypotheses	Correlation	Impact	Sig	Approved / denied
1	There is a significant relationship between rational leadership and intelligent leadership	0.96	0.269	0.001	Approved
2	There is a significant relationship between emotional leadership and intelligent leadership	0.95	0.251	0.001	Approved
3	There is a significant relationship between spiritual leadership and intelligent leadership	0.97	0.329	0.001	Approved
4	There is a significant relationship between collective leadership and intelligent leadership	0.93	0.187	0.001	Approved

Source: compiled by the authors.

Figure 2. **The final structure in the standard estimate of intelligent leadership model**



Source: compiled by the authors.

Accordingly, intelligent leadership focuses on the achievement of goals, the management of emotions and feelings, the search for meaning and the development of the spirit of teamwork, which can be effective in expanding the scale of activity at a university, and provide for its comprehensive development. The participation of the teaching staff in the creation of a motivation statement and in the setting of goals helps directors outline a shared vision.

It may be concluded that university directors need to provide a reliable foundation for their organizational status and improve the organization's standing in the eyes of its employees, which supports a holistic emotional climate, involving them in the organization's objectives. Spiritual leadership includes the identification of significant factors in the working process, finding meaning, the creation of conditions that allow teachers to find meaning in their work at universities. In addition, it is necessary to identify job trends related to the significance of work and plan preventative measures. Given that the recognition of the importance of an activity impacts its results, it is necessary to cultivate values that imbue meaning in the work of universities. As concerns collective leadership, there needs to be autonomous and self-managed teams at universities, the work of which may be done more effectively through the delegation of tasks earlier performed only by certain employees.

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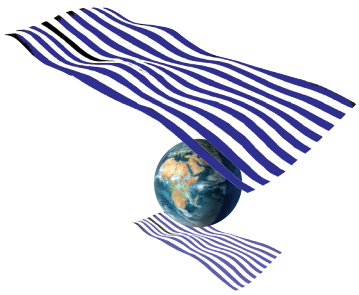

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