E-learning and enterprise innovation

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Abstract: The purpose of this article is to present the essence and importance of e-learning in the process of organizational learning and the presentation of the model of the company innovation system, as well as to provide the concept of enterprise innovation capacity analysis. This model presents a concept of the analysis of relationship between determinants of organizational innovation and the level of innovation, taking into account the contextual variable that regulates the established relationships, i.e. e-learning. The following determinants of innovation potential and determinants of innovation capabilities have been characterized: knowledge management, modern IT infrastructure, competence of employees, external cooperation in the field of knowledge and information, organizational structures and processes. The empirical part of the article contains findings of the assessment of the degree of innovation of enterprises of the Małopolska, Silesian and the Subcarpathian Regions. It has been stated that the management of knowledge, modern technology and skills of IT workers determine the degree of innovation of the company. A great influence of contextual variable in relation to organizational innovation, i.e. e-learning, has been emphasized.

Key words: learning organization, knowledge management, e-learning, innovativeness, determinants of innovative capacity

1. Introduction

The main problem of most organizations functioning in the present century is the ability to adapt to changes in the environment and the ability to create changes. A contemporary enterprise must develop an entirely new model of acquisition and transferring knowledge based on modern information technologies.

The discovery of this new medium of communication and its application in social and economic life has always led to changes in the existing order. Such was the case with the invention of writing, the invention of printing, in more recent times, the telegraph and the telephone, and more recently the Internet, which along with other IT elements is an important component of the business model of a modern organization. It influences the structure of the organization towards implemen-

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tation of network structures, creates new patterns of behaviour and business contacts in which direct relationships exist together with remote contacts which are implemented via virtual co-operative networks. Moreover, it stimulates the formation of innovation within the organization and it has a strong positive impact on the quality and efficiency of operational processes.[1] The above mentioned vision of the organization is consistent with the one proposed by creators of a learning organization. The creation of a learning enterprise is seen as a strategic project being a reaction to the increasing rate of technological, economic and social changes. The following concepts are applied for the description of these phenomena: learning and creating knowledge, intelligent organization, network organization, or the organization based on the use of intellectual capital. In this conception it is assumed that people in an organization acquire knowledge through traditional learning which consists of a realization of a process of improving one's competence through training, lectures, classes, training sessions and self-education. Knowledge acquired in this way is applied in practice within the cycle of learning through experience, among others through engaging in activities. This cycle consists of planning, activities, observation and reflection which enrich the knowledge acquired during the process of traditional learning. Knowledge acquired from experience is spread within an organization through the process of traditional learning. Yet, despite the long-standing process of development of the theory of organizational learning with the help of information and knowledge, it continues to remain in the sphere of conception. It was only the emergence of the Internet and various telecommunication devices that contributed to its practical use on a large scale. Among the numerous uses of the Internet, it is e-learning that deserves special attention.

E-learning is a method of knowledge acquisition (a teaching technique and a method of study) with the help of electronic media. It can be briefly described as learning via the Internet. The thus conceived e-learning extends to nearly every type and method of studying with the help of the Internet. This seemingly simple, but capacious and interesting definition of e-learning also comprises studying in isolation from educational institutions, teachers, trainers, educational programmes and requirements, but the educational aims continue to remain the same: improving the organization and its employees in the context of increasing the efficiency of their operation.

In the context of the above-quoted broad definition, e-learning contains various forms of e-education, namely: academic e-learning, school e-learning and corporate e-learning; the latter has been described at more length in the present article.

In contrast to academic e-learning, corporate e-learning is focused mainly on practical objectives associated with raising the competitiveness of a company, through learning organizational skills, whereas the method of learning through the Internet may be detached from an educational institution; it may be spontaneous and therefore it could be referred to as extra-institutional education. Spontaneous learning, detached from educational institutions, is defined

[1] The concept of the learning organization was formulated in a brief and concise way by C. W. Wick and L. S. Lean in 1995. According to them, it is an organization that is constantly improving through the creation and use of conditions and opportunities to achieve success in the future (Kowalewski, 2004, p. 155). C. Argyris, D. A. Schon, and J. Brilman conceived learning more broadly, emphasizing the importance of this concept in self-education, development of the organization, creation and implementation of innovations (Argyris, Schon, 1996; Brilman, 2002, p. 413).

as ‘learning from others’, particularly from stakeholders. It results in taking advantage of their experience, skills, expert knowledge, as well as taking advantage of the knowledge concerning cooperation in the process of satisfying needs, both similar and complementary ones.

Summing up this brief discussion concerning the very foundations of e-learning, one should add that it constitutes a major part of the process of learning; therefore the issue of making a distinction or choice between training and learning does not exist. It is also worth emphasizing that the pillars of an organization which is open to learning and its key instruments are: an organization’s eagerness to learn, education of its members and learning how to learn in the sense which is given to this concept by C. Argyrias. The last issue, the most important from the point of view of this analysis is contained in the assertion that the directional and methodical acquisition and use of knowledge is increasingly possible through the Internet, using e-learning technologies.

Without modern technology, and e-learning in particular, creating, expanding, and sharing information, especially in large, geographically dispersed organizations would not be possible. Therefore, according to Gartner Group estimates, up to 75% of expenditure on knowledge management is spent on computer equipment, software, and communication infrastructure, and only 25% of the expenditure is spent on developing the soft aspects of knowledge management (http://www.assecobs.pl/INCENTI/en/1682/,2010).

The purpose of this article is to present the analysis focused on the evaluation of e-learning as a determinant of potential and innovative capacity of a company and present the results of empirical research.

The problem which was presented in the article is the identification of the determinants of innovation potential and innovative capacity as a prerequisite for the development of innovative activity.

The following theses of presented concept were adopted:

– innovative capacity is a function and at the same time the criterion of enterprise innovation system, as well as the projection of the possibilities of expanding the innovative activity.
– innovative capacity can be analyzed in particulate forms (which correspond to the determinants of this ability) and can be included in the formula for the aggregate enterprise or across the industry;
– in light of the foregoing article, the innovative capacity was analyzed in particulate forms, i.e. the assessment was made in relation to the determinants of this ability, i.e. e-learning, which is considered as an adjusting variable, i.e. a variable moderating—acting in the context of enterprise innovation.

The scope of the research was limited to micro-economic and micro-social scale, paying particular attention to the problems of enterprise innovation and taking into account their proximal environment.

2. The concept of innovation companies—assumptions

Innovation is understood as any change (assumed as favourable) in different areas of the organization which brings progress in relation to the status quo (Kozioł and Karaś, 2013,

p. 136). This is often of an evolutional character aimed at correcting the status quo perceived favourably in the light of the criteria that are in force in a given organization.[2] Then again, this innovative activity (innovativeness) is understood as all the activities of a scientific, technical, organizational, financial and commercial nature, which really lead or are intended to lead to the implementation of innovation. Some of these activities can be of an innovative nature themselves, whereas others are not novel, yet they constitute an indispensable step towards its implementation (OECD, 2008, pp. 20–21).

Innovativeness in any enterprise is a function of the innovative potential that can be defined as a set of the social and economic features shaped during the development of a given enterprise; and these constitute the basis of its innovative activity. Particularly, these are the resources, processes, structures and factors that the enterprise has at its disposal. Those of them that are efficiently used as they arise during the innovation process and are commercially important, constitute the ability of the enterprise to be innovative.

This innovative potential is also determined by the sector, i.e. mostly by the market, namely by the enterprise along with its customers, competitors, suppliers and partners. Thus, this is a set of features of a given sector that are conducive to the innovative activity of the enterprise[3] (Figure 1).

Thus the efficiency of the enterprise to create innovations depends on the above mentioned resources (innovative potential) developed in the past, as well as adequate methods, skills and the ability to utilize them. In other words, innovative capacity is the ability to create new ideas, inventions, which are the result of innovation, the popularization (diffusion) of which is beneficial to the enterprise (Innowacje i wiedza, 2006). This ability is perceived as a driving force for the development of the organization and its economic growth, whereas e-learning[4] is the regulative variable (moderating variable, moderator).

[2] Similarly innovation is defined by Philip Kotler who writes: 'innovation refers to any good, service or idea which is perceived as new. An idea can exist for a long time, but may be innovative for a person who perceives it as new' (2004, p. 64). According to the *Oslo Manual*, innovation is defined as 'the whole of the scientific, technical, organizational, financial and commercial activities which really lead or are intended to lead to the implementation of innovation. Some of these activities are innovative in themselves, whereas others are novel, yet they are necessary for innovations to be implemented' (OECD, 2008, p. 49).

[3] A comprehensive concept of the factors that form innovative potential was proposed by D. Samson who distinguishes: strategy, leadership, changes, orientation towards customer, pro-innovative organizational culture, alliances of knowledge, quality of processes, education, innovative orientation HR (Gloet and Samson, 2013, p. 3690). On the other hand, Tidd, Bessant and Pavitt (2001) concentrated on the in-house stimulators of innovative processes of which the most important are the following: visional leadership, suitable organizational structure, recruitment, willingness to participate in the innovative process, leadership skills in team work and readiness to learn and adapt new solutions.

[4] Moderating appears when the influence of independent variable (*X*) on dependent variable (*Y*) differs depending on the level of the third variable (*Z*), called regulative variable (Moderating variable, moderator), which correlates with the independent variable (Baron and Kenny, 1986, pp. 1173–1182). The moderator determines the direction and/ or strength of the correlation between the organization's innovativeness and its chosen determinants. The moderator qualifies the conditions in which the independent variable (resources) bears on the dependent variable (level of organization's innovativeness). In other words, the moderator determines the growth, lack of change or fall in the value of the dependent variable (Pichlak, 2011, p. 23).

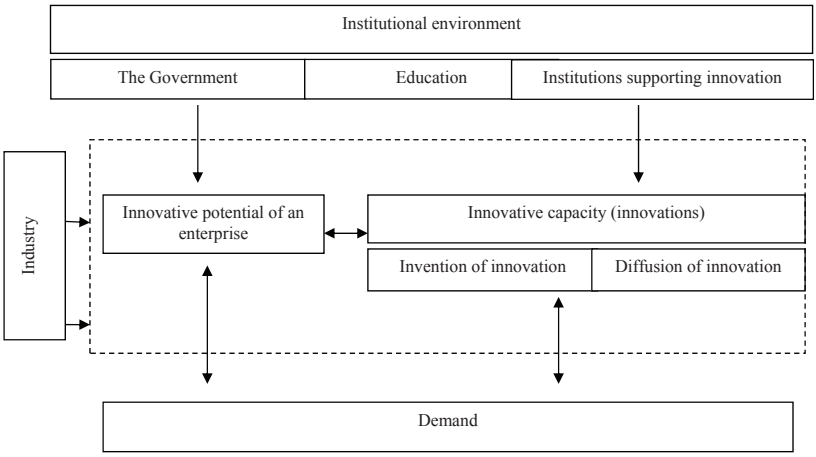

Figure 1. Innovative potential and innovative capacity within the innovativeness system functioning in the enterprise

S o u r c e: Authors' own elaboration based on (Kozioł, Wojtowicz and Karaś, 2014, p. 49).

Innovations are perceived more and more often as the result of an interactive process of the creation, diffusion and use of knowledge. The interaction of knowledge and innovation, and even the identity of both categories are underlined in the literature describing the areas of innovative environment, the expansion and transfer of knowledge. Above all, it is the knowledge collected by the enterprise during in-house training, knowledge of deliberate creation which allows utilizing its innovative potential (resources) for innovative activity, i.e. knowledge encapsulated in patterns and economic practice, which is the prime mover of profitable changes and progress and it constitutes the ability of the enterprise to innovate.

If we take the above mentioned statement into consideration, it is possible to formulate a rule of logical sequence of processes of organizational learning using e-learning in the aspect of reaching a high organizational capacity and high innovativeness. Organizational learning is a process that involves knowledge and information, it leads to a change in knowledge and can lead to a change in performance, it can also lead to innovative capacity of a company, which will lead it to a state of high innovativeness. Introducing e-learning into the process of organizational learning in the aspect of increasing the innovativeness induces, and even creates innovation.

The notion of the development of company's innovativeness is seen in two major aspects: innovative potential and innovative capacity, which mainly consists of creating novelties (innovation invention) and putting it into practice (innovation diffusion). Correlation factors of each aspect are the spheres of changes and development, i.e. the fields specifically linked to the sphere of innovativeness. The determinants of spheres of change and development of companies' innovative potential[5] are presented below (Table 1).

[5] This group of determinants of the innovation potential was chosen among many variables and companies' resources with use of the influence factors. They pointed to those of them that show vital cause-result relationships with innovativeness now and in the future. In the process of identification multiple sources of information were used. The ones that concern the environment are: statistical data, special reports, the results

The determinants of the sphere of changes and development of innovative capacity of a company are those among the determinants of innovative potential that are successfully and effectively used to create innovation. In this sphere, a characteristic group is formed by: product innovations, process innovations, organizational innovations, marketing innovations and above all the results obtained.

The above mentioned specific components of the sphere of change and development of the company's innovativeness are also the criteria of assessment of the above mentioned spheres (Stabryła, 2013).

Table 1. The determinants of the sphere of changes and development of a company's potential for innovation

Determinants	Individual elements
Modern IT technologies	Composition, structure of the information system Use of IT infrastructure Company employs its own IT specialists E-learning systems Database systems
Employees' competence	Employee innovativeness Realization of the competence development programme comprising external and internal training sessions, courses, conferences, seminars and symposia Use of modern training techniques Participation of employees using IT technologies Company makes use of methods which enrich qualification potential (innovation abilities) of employees
Structures and organizational processes	Existence of R&D department IT infrastructure supports information and decision-making processes Information processes support internal communication Team problem solving Flexible labour organization forms are used which facilitates exchange of information and knowledge
External cooperation in the sphere of knowledge and information	Common databases shared with cooperating parties Cooperation with clients, suppliers and cooperating parties Obtaining knowledge from competitors Academic institutions and universities as sources of knowledge Trade fairs, exhibitions, seminars and other sources of knowledge
Knowledge management	Company has a system of knowledge management Employment of people responsible for knowledge management Use of information and communication systems for spreading and popularization of information Knowledge management is a strategic issue which constitutes an important part of the realized mission Exchange of information between employees takes place through informal contacts

S o u r c e: Authors' own elaboration.

of other researchers and experts' opinions. In relation to the companies' resources the opinions of the managers and specialists were used. Information gathered in this way was the basis to choose the determinants of the development of companies' innovative potential.

In the process of evaluating the organizational capability, a standardization of the type of point aggregation was applied. It was assumed that for each sub-criterion of the evaluation process (each component element), the model score will be 1 (positive scale) and 0 (negative scale). If the score of two sub-criteria (component elements) of a given determinant is positive (positive scale, i.e. 1), the qualification of this determinant of the company's innovation potential will be regarded as positive.

3. Comparison of innovation potential of companies using e-learning and those operating in a conventional way—results of empirical studies

In the research 166 companies from the Małopolska, Subcarpathian and Silesian provinces participated. The study was carried out on the basis of a survey method. The survey consisted of two parts. The first one contained questions concerning the character of the conducted economic activity, whereas the second one contained an assessment of available resources and degree of innovativeness of the organization and the assessment of its sector environment. The analyzed companies belong mainly to small and medium-sized enterprises. From the point of view of the number of employees, small companies (from 11 to 50 employees) and so called micro-companies (up to 10 employees) were dominant. Altogether they constituted 79% of the total of examined organizations (131 companies). The remaining 31 companies (18.7%) were medium companies that employ more than 50 people. In four cases the number of employees was not specified.

While analyzing the scope of business, 61 declared it to be the local market, 57 companies pointed national market, and 41 companies to international market. The companies were involved in production, services and trade. Almost half of them declared their financial situation to be good.

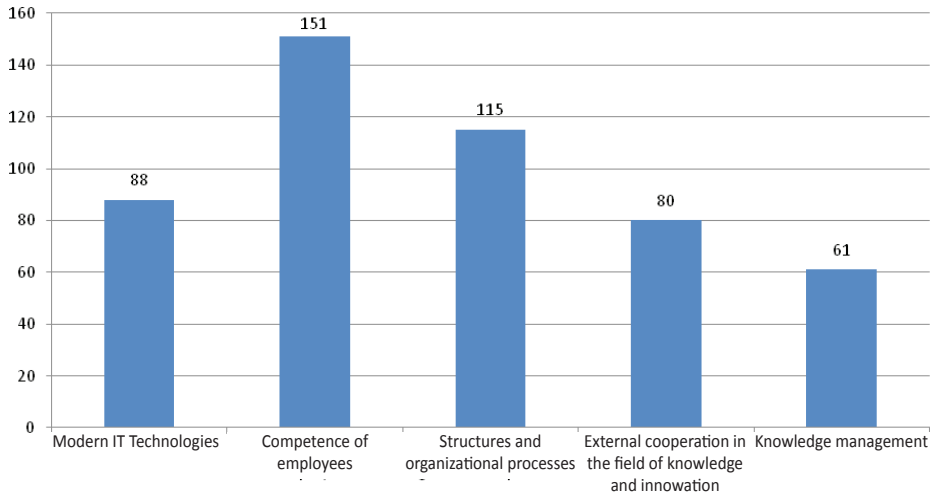

Figure 2. Determinants of innovative capacity

S o u r c e: Authors' own elaboration.

From the analysis of the gathered data it can be concluded that 151 companies employ qualified staff that have specific qualifications in the field of innovation (Figure 2). The second important determinant of creating the innovation, according to 115 companies, is the structure and organizational processes. 88 companies declared that modern IT technologies are important as a determinant of the innovation capacity, 80 companies pointed to an outside company cooperation as a source of knowledge and innovation and 61 companies declared that it is information management.

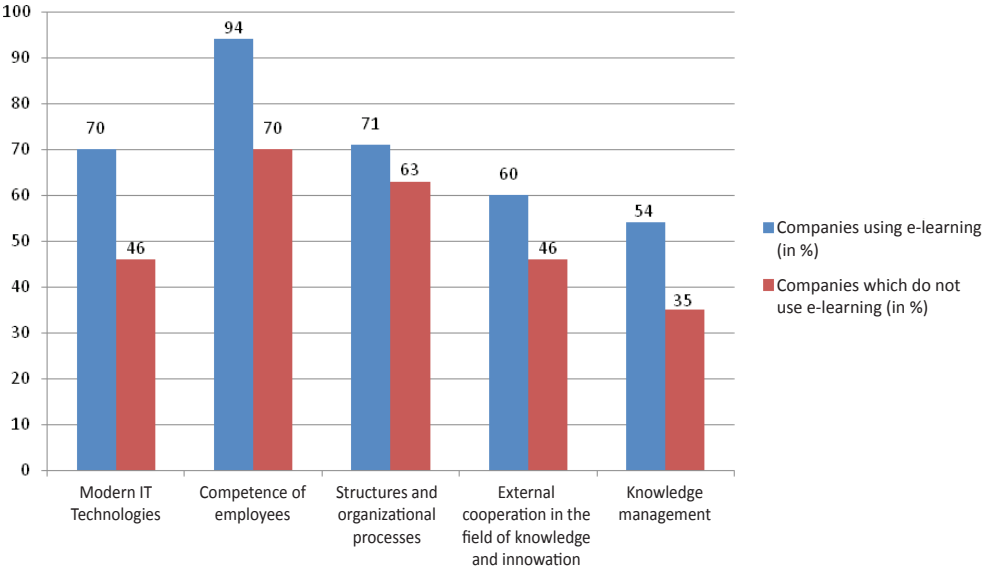

Figure 3. Determinants of innovation capacity of enterprises using e-learning and acting in a conventional way

S o u r c e: Authors' own elaboration.

Table 2. The effects resulting from the use of modern information technology and information technology by the company*

Specification (in %)	1		2		3		4		5		0	
Enterprises	A	B	A	B	A	B	A	B	A	B	A	B
Satisfying customers' needs in a better way	0	1.39	0	2.78	0	9.03	21.43	48.61	78.57	38.19	6.67	7.69
The increase in the number of acquired customers	0	5.84	0	8.03	21.43	32.85	21.43	28.47	57.14	24.82	6.67	12.18
Improvement of management methods	0	10	0	6.43	7.14	25	42.86	32.14	50	26.43	6.67	10.26
Improving communication within the company	0	5.63	0	4.93	21.43	21.13	21.43	33.8	57.14	34.51	6.67	8.97
Simplification of procedures	0	7.25	7.14	4.35	21.43	29.71	35.71	33.33	35.71	25.36	6.67	11.54

Specification (in %)	1		2		3		4		5		0	
Enterprises	A	B	A	B	A	B	A	B	A	B	A	B
The increase in efficiency	0	3.38	0	3.38	7.14	20.27	35.71	43.92	57.14	29.05	6.67	5.13
The increase in employees education	0	7.8	7.14	14.18	14.29	38.3	50	27.66	28.57	12.06	6.67	9.62
Improving relations with stakeholders	0	3.73	0	2.24	7.14	17.91	35.71	44.78	57.14	31.34	6.67	14.1

* On a scale of 1 to 5, where 1 means not very useful, 5—very useful, 0—no reply, A—enterprises using e-learning; B—companies which do not use e-learning

S o u r c e: (Kozioł, 2012, pp. 135–136).

The analysis of the data (Figure 3) shows that e-learning significantly influences the innovative capacity of the surveyed companies. The differences in the determinants of innovative capacity between the two groups of surveyed enterprises are very important. The highest ones appeared in the case of knowledge management and modern IT technologies, whereas small differences occurred in relation to organizational structures and processes. For example you can specify that 33% of the companies using e-learning can confirm that they have the knowledge management system, which includes collecting, storing, processing and sharing knowledge. In the second category of the companies, i.e. those which do not use e-learning, the percentage amounted to 2%. In 27% of companies using e-learning, staff in charge of knowledge management is employed, whereas the companies that do not employ e-learning specialists in the field of knowledge management represent 17%. The other detailed elements of determinants of knowledge management were significantly more favourable in the companies using e-learning.

Most of the surveyed business entities emphasized a significant positive impact of IT on their operations, implementation of changes, however, these opinions were expressed more often by companies in group A than group B. The collected data show that 93% of the companies in group A considered IT useful and very useful, respectively at 4 and 5 in improving the company's image. For group B this percentage was 78%. The positive influence of IT on satisfying the customers' needs in a better way was pointed out by 90% of companies in group A and 87% of companies in group B, the increase in the market share 86% and 58% respectively, the increase in the number of acquired customers 79% and 53%, improving the management methods 93% of companies in group A and 59% in group B. Similarly, these relationships are formed in relation to the increased efficiency at work, innovation and growth in staff education level (Table 2). At the end of the discussion on this important issue one should emphasize great importance and high efficiency of IT, especially e-learning in the learning process and staff training schemes, as well as external cooperation in the field of knowledge and information.

4. Conclusions

Studying the innovative capacity of the enterprise is a special area of analyzing the innovative business activity. It constitutes the field of research procedure, the purpose of which is to assess progress in all or selected areas of a business enterprise and promote the change and development of the activity.

The use of e-learning as a method of learning based on IT resulted in applying the concept of a learning organization and knowledge management in the business enterprise, knowledge which in the commercialized part is the innovation.

The article analyzed the innovative capacity in a particulate form, i.e. the assessment was made in relation to the determinants of this ability, which is e-learning, regarded as a moderation variable.

It has been stated that the implementation of e-learning as one of the most important methods of knowledge management (management in general) stimulates and creates innovations in the whole organization through the development of innovative capacity determinants of the enterprise, namely:

– knowledge management;
– modern information technologies;
– competence of employees; and to a smaller extent:
– external cooperations in the field of knowledge and information;
– organizational structures and processes.

E-learning can function as an autonomous system along with traditional systems and knowledge management tools; integrated with traditional instruments of knowledge management it creates a new quality of management, creates a synergy of organizational learning and even creates innovation in the whole organization.

In the light of the results of empirical studies mentioned one can formulate a thesis that companies compete on the level of created innovations and innovative capacity dependent today on the application of e-learning.

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Wykorzystanie e-learningu w procesie tworzenia zdolności innowacyjnej przedsiębiorstwa

Abstrakt: Celem artykułu jest przedstawienie istoty i znaczenia e-learningu w procesie organizacyjnego uczenia się oraz prezentacja modelu systemu innowacyjności przedsiębiorstwa, jak również propozycja koncepcji analizy zdolności innowacyjnej przedsiębiorstwa. W modelu tym przedstawiono koncepcję analizy relacji pomiędzy determinantami innowacyjności organizacji a poziomem ich innowacyjności z uwzględnieniem zmiennej kontekstowej, regulującej założone relacje, tj. e-learningu. Scharakteryzowano determinanty potencjału innowacyjnego oraz determinanty zdolności innowacyjności takie jak: zarządzanie wiedzą, nowoczesność infrastruktury IT, kompetencje pracowników, zewnętrzna kooperacja w zakresie wiedzy i informacji, struktury i procesy organizacyjne. Empiryczny fragment pracy zawiera wyniki badań nad oceną stopnia innowacyjności przedsiębiorstw regionu małopolskiego, śląskiego i podkarpackiego. Stwierdzono, że to przede wszystkim zarządzanie wiedzą, nowoczesne technologie IT i kompetencje pracowników stanowią o stopniu innowacyjności przedsiębiorstwa. Podkreślono przy tym duży wpływ zmiennej kontekstowej w odniesieniu do innowacyjności organizacji, tj. e-learningu.

Słowa kluczowe: organizacja ucząca się, zarządzanie wiedzą, e-learning, innowacyjność, determinanty zdolności innowacyjnej