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# **From Knowledge-Driven to Learning-Driven -The Importance of Workplace Learning**

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## **Abstract**

Workplace learning is not only essential for the operation and development of the knowledge economy, but also an important factor in lifelong learning. Moreover, it is one of the most emphasized areas of adult learning. In recent decades, we have also witnessed the fact that school-based education and training lose their importance while individual learning becomes the dominant knowledge acquisition process and activity in adulthood. Our qualitative research is based on interviews with 23 IT companies operating in Hungary. This sector was chosen because the IT field belongs to the knowledge-intensive sector, so workplace learning processes can be well studied. The focus of the research is on the learning processes generated by the knowledge gaps in organizations. How does the need for arise? From what sources and in what ways do those working in the organization obtain the necessary information and knowledge? How will the acquired knowledge affect life in the organization? The results of the research enrich the fields of both lifelong learning and adult learning research, and they also contribute to some extent to knowledge management approach.

**Keywords:** *Workplace Learning, Adult Learning, Lifelong Learning, Learning-Driven Economy*

## **Introduction**

The technology-driven economic development of the industrial era has presented a strong demand for expert knowledge and skills, which has prompted the foundation of schools and educational and training institutions. In addition, the world of on-the-job training has also been present from the beginning, relying in part on guild traditions. In the post-Second World War period – another cycle of industrial development after the 19th century – we witnessed the appreciation of the human factor. The postmodern (post-industrial) period goes beyond this, supplementing and, with an increasing frequency, replacing on-the-job training with on-the-job learning. Thus, the workplace is given a new interpretation, and we can examine it as a learning arena. At the same time, learning becomes common as an interpretation of work activity, as Zuboff describes it: "Learning is a new form of work" (Zuboff, 1988, p. 395).

The age of technology-driven economic development has slowly shifted into the knowledge-driven period, ushering in a new era. As a result of new technologies, IT breakthroughs, external market mechanisms, and internal organizational transformations, the knowledge required in organizations and the paths leading to it have gained new significance (Evans et al, 2006).

Thus, an earlier finding that a significant portion of adult learning comes from the world of work has received further justification. The period we are focusing on, which lasted in the central regions of the world from roughly the 1970s to the 1990s, is being more and more widely studied and understood by economic professionals and researchers.

The necessity for radical competence development in the workplace has surpassed the approaches to training that have prevailed so far. This shift in attitudes has generally been well-suited to the paradigm shift in teaching and learning, and the phenomenon of work-based learning has been a very important catalyst for a comprehensive shift in attitudes across education. This shift is also reflected in the use of the term lifelong learning: although the concept of LLL appeared at the level of global policy as early as the 1970s, in that decade as well as in the 1980s it was still related to adult education and training (Guile & Young, 2003; Eraut, 2004; Evans, 2004). School-based education and training institutes operate in the traditional way provide an adequate response to new knowledge needs that are emerging and intensifying in the world of work, yet the traditional education and training could not give the appropriate answers to the current challenges. With the advancement of ICT, changes in organizational and market conditions, and a strong transformation of organizational culture, adult education and training are gradually giving way to adult learning in the workplace. The shift also leaves its mark on the approach of other the social sciences, as the concept of a learning society related to the concept of the knowledge-based economy is also due to this (Newton et al., 2015). The concept of a learning region, which has emerged since the mid-1990s, is based primarily on increased adult learning activities, the vast majority of which are manifested in the world of work. This shift has generated changes in a number of other areas as well. The concepts used in the international literature in this field have been supplemented with new content, or completely new concepts have been formulated such as recurrent education, which appears in the Swedish model. Its latest version is the "stop and go" model, which refers to the lifelong learning activity ("go") interrupted by occasional breaks ("stop").

Of course, learning and personality development, which are gaining so much significance in the world of work, have also received a large amount of criticism, some of which has evolved into educational policy concepts. The concept of LWL (life wide learning) was formulated as a reaction to LLL, emphasizing that LLL is fundamentally about learning and developing oneself for the world of work (although it is not always the case). What LWL adds to this idea is that learning should be extended to other areas of life outside work, as these are also undergoing substantial change. However, this humanistic and liberal approach is adopted primarily by global policy-making organizations (such as UNESCO) who have little say in economy. Critics thus welcome one of Geertz's apt formulations describing today's society as masses of modern-day slaves constantly rushing after and serving technology in a constantly evolving, self-adoring industry (technology) (Geertz, 2000).

## **Organizational learning - learning organization**

### *The new economy*

The new economy, which developed in the central areas of the world by the 1990s, has many novel characteristics. Perhaps one of the most important changes, which is the result of change itself, is that we have moved from an industrial to a post-industrial era. This is mainly due to the advancement of the post-industrial services sector, which determines economic activity. However, this is only part of a fundamental transformation, which is accompanied by changes in many other economic and social phenomena. One is the expansion and widespread application of technological development, which strongly supports general development and change, leading to the transformation of market processes and globalization. The significant transformation of organizational cultures, of the organizational structure of enterprises and delegation of tasks as well as the expansion of powers and empowerment all set new directions. The changes have not left the HR philosophy of companies untouched but have resulted in a shift from training to learning (Brandt & Elkjaer, 2011).

The new economy is knowledge economy, where knowledge, either latent or manifested in school, research, workplace, network units, is put at the service of the economy. The role of innovation is growing, and the development of info-communication is redefining the image of work, jobs and working hours.

If knowledge economy is driven by knowledge, the question is where the required knowledge is (where it is available) and how it can be acquired. The next question is how to embrace, share and keep it. The third phase is about creating new knowledge.

The wealth of knowledge is growing in the new economy, where more and more knowledge is concentrated in devices that are able to create, transmit, capture and digitize information.

Under these circumstances, organizations are resilient, organizational boundaries are weakened to be able to absorb knowledge, connect to networks, and create such. Organizational hierarchies become flat, thus increasing organizational flexibility.

### *Knowledge workers*

Work processes have also become more complex, often requiring employees to manage them on their own. It is also important to be able to react to unforeseen situations. Responsibility is constantly increasing, whether it is individual or group work.

The new economy needs a new type of workforce, namely knowledge workers. The concept is linked to Drucker's name and has been widely discussed and interpreted in the international literature. Knowledge workers, in contrast to manual workers, perform their work with their intellectual abilities and qualifications, for which physical and other abilities are only necessary conditions and foundations.

It is characteristic of knowledge-intensive sectors that after acquiring basic knowledge, typically at a higher level, employees still encounter new knowledge, or more precisely, previously unknown areas while carrying out an economic and professional activity. To make the unknown familiar, a learning process must be implemented, in which learning dissolves the unknown to make it part of individual knowledge. An employee entering a knowledge-intensive sector can therefore be prepared for learning activities that do not end with graduation.

In addition to being highly qualified professionals in their fields, knowledge workers must have other skills and personality traits such as independence, openness, creativity, problem solving, flexibility, learning ability, developmental ability and motivation. They need to be able to identify knowledge gaps and locations as well as to acquire, apply and share the knowledge they need.

Informatics and related fields, which are undergoing rapid, turbulent and even explosive development, belong to the knowledge intensive sector, so in our study the majority of IT sector employees are clearly knowledge workers, whose day-to day work is set in a knowledge-intensive environment.

### *Learning organizations*

It is not our intention to review in detail the ontogenesis and evolution of the concept of learning organization; here we only mention the main steps. The concept of learning organization originated in the 1960s (Burns & Stalker, 1961) and was further refined and articulated in the following period. The concepts of action learning (Revens, 1982) and organizational learning (Argyris & Schön 1978, 1974) also appeared. The theory of knowledge-creating organizations was described in the 1990s (Senge, 1990; Marsick & Watkins, 1990; Nonaka & Takeuchi, 1995). The main difficulty of doing research on learning organizations was to examine the three main factors (workplace, learning, organizational performance) in a coherent way. As a solution to this question, researchers have also relied on the theory of social learning, organizational psychology, and organizational sociology. Building on previous research, Engeström used an approach to production-related social conditions and organizational learning (Engeström, 2008). In his view, according to the concept of extended organizational learning, the persons interested in production can solve the problems and difficulties with problem-oriented, innovative and creative methods and by pursuing goal-oriented learning activities.

Workplace learning, like the concept of organizational learning, is constantly changing and being enriched, which results in a rich repository of concepts: "workplace learning" (Watkins, 1995), "work-based learning" (Raelin, 1997), "workplace learning" (Marsick, 1987), "learning at work." (Boud & Garrick, 1999). Whatever term is used, learning is generally accepted in the workplace, embodied by learning individuals and groups in a work environment where the main source of information and knowledge is informal (rather than formal) learning. There are three aspects of organizational learning to be examined: first, the process of learning as an individual action, second, awareness of personality development, and finally, learning as a social action (Elkjaer, 1996, p. 28).

### **Workplace learning**

#### *The workplace as a place to learn*

The heterogeneity of jobs creates different learning environments. With the transformation of a significant part of traditional workplaces and the spread of info-communication technology, significant changes have taken place in workplaces, and this has led to further changes in the interpretation of the workplace (which are further colored by different labor and labor law categories) (Hodkinson et al., 2008).

From an educational research perspective, the workplace is a physical space where learning can take place. Related to this may be the seemingly natural questions of why and how people work, what kind of work they do or how a work and school environment (or even a home environment) differ in terms of learning (Lave & Wenger, 1991). These questions motivated and enriched the theoretical study of the topic.

At the same time, a significant proportion of work has been physically separated from the workplace and new learning arenas have emerged. These changes have made the training and learning processes for traditional jobs more differentiated and more difficult to interpret. That is why the workplace as a physical space has been transformed and learning can take place anywhere from offices and libraries, to the canteen and even public transport, etc.). On the other hand, virtual space offers an extremely wide range of work opportunities (Engeström, 2008).

Forms of work-based learning take place in or are closely linked to the workplace and take many forms unknown in school-based education (Fuller & Unwin 2004) including instant-based learning, unstructured learning, supervised learning, unsupervised learning, situational learning, creative learning, problem-solving learning, project-based learning, group learning, pair learning, network learning, embedded learning, facilitative learning, autonomous learning and self-taught learning.

## **Research findings**

### *Research context and questions*

The focal point and the aim of the research required a quantitative research method. Applying this method, the research was conducted between 08. 2017 – 02. 2019. The sample included 23 IT companies. We conducted one interview per organization. The interviewees were managers or owners of the businesses. Our aim was to gain information about the following: To what extent do IT companies rely on higher education, adult education and training institutions?

What are the learning motivators for employees?

What are the typical forms of learning within an organization?

Where and in what form is new knowledge created?

What role does workplace learning play in shaping organizational knowledge assets?

### *Main results*

#### *Basic data on businesses*

The majority of the 23 companies surveyed were small and micro IT companies. The micro-enterprises typically focused on only one professional area, while small enterprises (with up to 30-40 employees) typically operated in a number of fields. Some of the micro-enterprises had split from small businesses earlier to operate independently, while others had not grown since their inception because the owner / manager had focused on a professional field without any intention to expand. In some cases, the impact of the crisis also contributed to the decline in the previously significant number of employees (from small to micro businesses). Another option was to set up 3-4 micro-enterprises for a professional activity, which meant a number of micro-enterprises instead of a small one.

The profiles of the examined companies were quite different, but even the activities within each company showed remarkable differences, despite the fact that they were still related to

each other, all belonging to the field of informatics. Our sample contained several IT companies whose activities included IT equipment trading, network development, development of other areas and programming. Thus, the differences in knowledge between professionals of each field were quite large. Significant differences were observed in the products, development activities and services. The range of markets and partners was also very wide from average users to US and Japanese gaming companies.

The interviews revealed that the versatility of a company was due to opportunity and / or the force of circumstances rather than a well-devised and planned strategy. Thus, these enterprises were also larger and their professional scope was wider. It is difficult to maintain profitability in all areas, so companies often take advantage of profitable areas in a given period to finance the unprofitable ones. Of course, the diversity of activities keeps the company more viable, but professional knowledge must be provided accordingly. The circumstances described above apply to the countryside and Debrecen, as well as to other large rural cities. In contrast, the interview revealed that IT companies with 30-40 employees in the capital focus mainly on one profile, as opposed to rural companies of similar size, where they deal with 3-4 professional areas.

A high proportion of university graduates (70 to 100%) are present in the companies surveyed, mainly engineers and computer scientists. Companies where all employees have university degrees are mostly programming and development companies, while the higher non-graduate rate is typical of companies where the development of the infrastructure related to professional activities requires partial physical work (e.g. cabling). The current employment structure shows considerable generational diversity ranging from the 50+ age group, (the founders of these companies, mostly engineers) to the younger generation, who are predominantly IT graduates. According to the interviewees, IT has also expanded into a number of engineering fields and taken over engineering tasks.

Our respondents described competition in the industry as strong or even fierce. With respect to the geographical levels of the competition, some companies operate on the global market, while others have competitors only in the city or region. Companies with specialized knowledge might have some local and regional competitors but of the competition they face is international or even global. If a company's core activity is general, it can be found on the market easily, and competition is restricted to a local level. Special knowledge has a much bigger spatial radius, which means wider competition. Global knowledge is usually more valuable on the market.

#### Identifying the shortage of knowledge

The interviewed companies are active in a knowledge-driven branch of economy, and therefore their attitude to competition and capability to compete depend on not only the professionalism of the management but also on their potential for knowledge concentration and the utilization of acquired knowledge.

As IT belongs to the knowledge-and-technology-driven economic sector, the missing knowledge can be identified and located fairly accurately. For this reason, the act of identification itself can guide learners as to where and how to obtain the missing knowledge. Learning activities as responses can be realized in diverse ways. The various forms of learning have been listed before.

In most of the companies of our sample, there are no employees exclusively responsible for organizing education, training and learning, despite the fact that several interviewees indicated the need for such an employee. This task is typically performed by one of the senior staff in addition to their other duties. However, in several larger enterprises, the managers of each area are assigned this task. It is to be noted that knowledge and/or experience gaps are in most cases indirect. For example, a company that performs IT deployment and development in a number of large infrastructure investments as well as subsequent service tasks, is often confronted with common operational failures. In this case, there is a high probability that one of the employees has not performed their job well due to a lack of knowledge.

Thus, it can be stated that the acquisition of expertise related to emerging new technologies as well as continuous compliance with the customers' needs (especially in programming and development) generate new knowledge and the additional (new) learning that it requires.

The specific knowledge to be acquired might be unpredictable or small. Therefore, training and learning at the workplace are quite difficult to plan in advance, which leaves its mark on the learning that is actually done in organizations, most of which can be interpreted as instant learning.

#### Sources and ways of acquiring knowledge

The IT sector is a knowledge-driven sector related to technology. Thus, the trends of its development are determined by continuous innovations as well as market demands and government regulations. As our interviewees follow the development of the sector, the acquisition of new knowledge is related to technological services and innovative products. In other words, the agents of knowledge are the organizations that develop and produce it. Thus, developers (mostly global companies) count as primary resources of knowledge, which is accessible through contact with them.

IT companies rely primarily on higher education (IT or engineering courses) when hiring new workforce. Tertiary education serves as a basis and it is evident that companies will train and educate their new employees further to familiarize them with their range of activities. After the entry stage higher education is not the main partner anymore. Of course, there is a close working relationship between universities and companies in research and development; however, most of the companies of our sample cooperate with tertiary education only on a lower scale, for fairs, exhibitions, or in joint development projects etc. Nevertheless, companies in Debrecen definitely feel positive about having a higher education institute with an IT faculty in town. They occasionally collaborate with higher education institutions in development projects, professional events and exhibitions. Awareness of the fact that the majority of companies in Debrecen can rely on high-level IT training seems to provide a sense of security. However, higher education is typically no longer able to respond to companies' instant needs by offering short or long-term courses because of their different approach to knowledge.

Acquiring knowledge from competitors is not typical of the companies of our sample. Exceptions mainly occur when competitors are co-implementers in a large investment. In these situations, the professional knowledge of each organization is utilized (and compared to the knowledge of the competitors by each side).

Typical sources of knowledge include development and product demonstrations, professional exhibitions and trade fairs. Participation in conferences, seminars and workshops

is also common among our respondents. Similarly, membership in professional associations is also an important source of knowledge.

Companies that require higher-level knowledge also develop internal training materials. This is done out of necessity but is indispensable in the activities of businesses. The internet is also used continuously as a source of knowledge.

The acquisition of new knowledge affects IT companies that take part in significant infrastructural development, during which they get acquainted with new technologies and procedures. This way of project-based learning is one of the most important resources. The companies that mainly carry out programming and related development primarily acquire knowledge in fields related to the needs of the customer.

Only a small part of the learning relies on medium and long-term institutional training, which lasts for a few months or a few years, respectively. This is not typically required by the industry. The dynamics and structure of related knowledge require other forms such as development project discussions, brainstorming, and informal conversations.

### Knowledge management

New knowledge is shared with employees in a variety of ways. However, there are two basic methods to be highlighted. Either the employees with the new knowledge share it only with a narrow professional group who are working closely with them in the same field, group or project, or knowledge is shared with the entire organization. If an IT company is specialized in a single area, it is typical to share knowledge and information with everyone. In case of heterogeneous professional activity, there are significant differences in the wealth of knowledge between professional groups, which is also reflected in the prestige of various positions in terms of salary (often creating tension).

The IT companies of our sample – small and micro enterprises – are typically flat organizations. In this way, knowledge reaches employees more easily and quickly, strengthening the image of the learning organization.

Respondents typically do not measure organizational knowledge wealth. Since they operate in a dynamic marketplace, continuous and strong measurement of organizational knowledge is done by the marketplace.

Carrying out current professional activities and implementing new ones are only possible with an adequate workforce. Due to the labor shortage in the IT sector, operating businesses are extremely vulnerable. The departure of an employee in a key position can even completely jeopardize the activities of the given company (therefore these employees are in a favorable salary position).

### Organization and wealth of knowledge

The knowledge of new entrants to a company sometimes show considerable anomalies. Internal training, education and learning are thus essential. The majority of respondents indicated that the professional experience of a prospective employee entering a given company is often not fully relevant to the position to be filled. It has also occurred that new employees were unable to shift from one programming language to another.

Typically, the knowledge gap is reduced if new employees join a team or project with the support of an experienced colleague with sound knowledge (supported learning, controlled

learning). The length of the learning process depends on many factors but usually varies from a few months to 2-3 years.

Respondents have mixed opinions about the knowledge of freshly graduated professionals. Some say the level of knowledge they have achieved during their education is adequate, but their professional orientation does not match the needs of the labor market. For example, companies have programming languages that are not covered in education. At the same time, other employers complain about the professional level their new employees have achieved during their studies.

Most of the companies involved in our research do not have very specialized knowledge. Special knowledge is more common among larger, more versatile companies, but it is by no means highly specialized.

Respondents from each of organization mention that the knowledge assets of the organization are grouped around a few key employees, making the entire range of companies surveyed very vulnerable. The sector is basically short of manpower, so in the event of a shortage of highly knowledgeable, experienced professionals, it seems very difficult to replace them in most organizations, which can cause a very significant (even insurmountable) problem in the organization's activities. Although wages in the IT sector are well above average, there is still an exodus of professionals from the sector.

All the organizations surveyed, without exception, consider organizational knowledge to be their most important organizational asset.

### **Learning in networks**

Our research, besides workplace learning, has tried to find out more about network learning. In dynamic, knowledge-driven economic branches knowledge becomes outdated very quickly, and therefore networks are more and more frequently utilized as sources of knowledge. Spatially intensive learning organizations typically come into contact with each other beyond their organizational boundaries. If this connection becomes regular and closer, networking may start. Network learning can bring significant added value to the organizations involved. Our research allowed us to gain insight into the learning and knowledge sharing processes of an IT network (cluster). The results only gave partial insight, mainly because few (only 6) cluster members were interviewed; however, we were able to fully outline the learning processes of the cluster.

Based on the answers received, we formed three categories. The first group included those cluster members (3-4 organizations) who collaborated on several projects, taking part in joint development and production. The second group contained those who were occasionally active and only cooperated in large tenders or development projects. The third group consisted of those who, despite being cluster members, did not really cooperate.

As described above, the system of relations between the cluster members is heterogeneous. There are strong ties between companies with a significant common past and those with common professional and economic interests.

New knowledge appears among those who maintain an intensive relationship. Development and new products from joint projects have clearly generated new knowledge. Among efficiently collaborating members, it is primarily horizontal relationships that promise to create more new knowledge.

The members of the IT cluster we examined do not learn more from each other than they would if they merely collaborated without networking. Thus, innovation and knowledge is not linked to the cluster.

### **Spatial distribution of knowledge sources**

The IT sector is one of the most globalized sectors, which means that as the applied knowledge is mostly from a global source, and likewise, new knowledge is also mostly from the global world.

Of course, there are differences, as is illustrated by two IT companies one of which is a supplier to global partners (e.g. USA, Japan), so it is only related to a locality in that it is physically located there, and the other company, specialized in trading in IT products, is based on local needs. In the former case, the knowledge of the organization is continuously measured on a global scale, which means global competition and the necessity of up-to-date knowledge and dynamic development, while in the latter case a thorough knowledge of products and assets is sufficient to cater for the needs of the local market, which is at least as important.

Knowledge workers, among others those in the IT sector, are aware that the sector is one of the most turbulent branches of economy and continuous learning is a must; therefore employees have a favorable attitude towards learning. However, it seems that organizations provide them with considerable independence in this respect. Altogether, learning has become an essential part of the life of organizations.

### **Depreciation of knowledge**

The IT sector is characterized by the continuous creation of knowledge, which is a fast but cyclical process with alternating phases of knowledge becoming obsolete and being created. However, depending on the subsector, the creation and erosion of knowledge could happen in 4-5 months. According to the interviewees, IT companies operating in the social sector (e.g. mobile phone) are under much stronger pressure than those in an industrial environment.

The sector in general is also characterized by very rapid obsolescence of knowledge, which, at least in some sub-areas, happens in as little time as 4-5 months. The speed depends on the field of informatics, the development processes and new technologies, since after a period of development, technologies reach a static phase, which lasts for a few months or even 1-2 years, and then development accelerates again.

Knowledge related to technological and product development and to the emergence of new tools is the most valuable asset. If an organization does not adopt new technologies emerging in the market and does not acquire related knowledge, they will be at a market disadvantage. That is, following technology-driven innovations is a fundamental task in an IT organization. If these trends are not followed by companies, they will be constantly pushed out of the market.

The lack of necessary knowledge – as already mentioned – has adverse consequences with regard to the competition, market orders and the success of the implemented development.

### **The market position of organizational knowledge**

The companies surveyed consider accumulated knowledge to be important or very important for their competitive position. Although companies that rely primarily on local IT services and commerce consider knowledge important, they experience that market loss is less frequent due to a lack of organizational knowledge than due to business relationships and/or price offers. In contrast, companies with multiple portfolios find that the experience and knowledge they possess are their primary business assets, essential for their existing position in the market.

According to the respondents, the most important factor from a market point of view is the name of the company (which consists of the trust, credibility and accumulated professional experience behind the name), followed by the professional qualifications and the knowledge of the employees in the organization.

### **Managing and financing the acquisition of knowledge**

The sector is knowledge-intensive, so each organization can be interpreted as a learning environment or a learning community. Of course, the need for learning as well as its level and intensity are strongly influenced by the specific professional activities of enterprises.

In our sample, the majority of learning activities take place within the organization during working hours, in connection with professional activities, during work, project discussions, and brainstorming sessions. The knowledge required for professional activities is acquired as quickly and efficiently as possible. Organizations do not tend to anticipate the knowledge they need to acquire, but when it emerges, they can identify it well, and its acquisition usually goes smoothly, albeit some obstacles may be encountered.

A student contract (tuition reimbursement agreement) is a common way of supporting employees in obtaining a new higher education degree. Participation in the necessary professional training and various courses is financed by the enterprises without exception. In these cases, no apprenticeship contract is concluded with the employer. However, one of the companies has produced an employment contract that incorporated certain sanctions in the event that a trained employee leaves the company. The companies surveyed seem to be fully aware of the training required, which employees can complete without having to contribute to its costs.

The vast majority of investments in education and training are results of rational decisions, i.e., participation is well justified.

Respondents do not feel that it is the duty and responsibility of the government to meet the training needs of workers, although several people would welcome such support. The situation of IT programmes in higher education is considered to be problematic, and the lack of technical qualifications available at secondary level in was considered to be even more so. It has also been noted that there are few well-trained young professionals on the labor market.

Given that learning, education and training are prerequisites for work, it is essential that the new knowledge is measured in the context of work and outside of it as well. If the goal is to obtain a licence, the licensing organization (often foreign or multinational) will administer an examination at the end of the training course.

By implication, the employee is the holder of the new knowledge after the learning and training process. However, if this one-off knowledge development is rarely or not utilized in practice, the previously acquired knowledge will disappear.

The peculiarity of the sector is that a significant proportion of the training is related to the specific tasks that arise during work. These are mainly short-term courses, which are paid for

by the companies. In some cases, employees are helped to obtain a new degree, in which case the parties typically draw up a study contract.

### ***The implementation of training***

The organizations of our sample do not typically participate in school-based adult education. The nature of the required knowledge is not compatible with courses which are structured in advance and take several months or even years to complete. IT companies also attend the lectures, presentations, professional days and courses held by other companies that provide the new technology. Customers and those involved in quality assurance are other circles from whom up-to-date knowledge is acquired. Learning, education and training in the companies surveyed mainly focus on professional training but may also involve organizational development, team building, communication training and coaching.

The dynamic learning environment stimulates internal education and training. It is usually considered the best option to organize training relying on the companies' inner resources. However, if they are unable to provide expertise on their own, it will be provided from the external market. In some cases, if completely new knowledge is needed, they first try to obtain the necessary information by starting internal learning processes, but if this fails, they provide the knowledge from external resources.

### **Conclusion**

The most important research findings are the following:

1. The organizations involved in our research mainly rely on young, freshly graduated employees. However, it is not expected that higher education can serve companies' needs regarding the specific knowledge or skills they apply. What is required from higher education is to provide students with a solid and wide knowledge base for further development. After the entry stage, the knowledge expected from higher education substantially shrinks. However, companies which are intensely involved in some R&D&I projects – only a small fraction of our sample – are in close cooperation with universities.

It is also important to mention that higher education plays a lesser role in IT workers' further training than special training companies do, which, however, cover only some specialized areas of the IT industry.

2. Generating (partly) new knowledge mainly depends on the following external environmental factors. 1. The knowledge of the technology a company works with. Products and technology themselves require continuous professional development. 2. New projects also generate new knowledge and skills. 3 Cooperating and/or competing companies trigger additional learning. 4. Clients are also important knowledge creating agents. However, – according to the interviews – many of the clients expect a lower knowledge level from technologies than developers offer.

3. The most common sources of necessary information and knowledge include manufacturers of the technology used by companies; knowledge acquired during the fulfilment of orders; partners, emerging knowledge, qualification-related courses, professional exhibitions and trade unions.

4. The generation of new knowledge is related to work processes, e.g. embedded learning.

5. At the moment, network learning has far less significance than what is outlined in the theoretical literature. In our sample, we were able to identify a minimal amount of network learning.

## References

- Argyris, C. & Schön, D. A. (1974). *Theory in practice: Increasing professional effectiveness*. San Francisco: Jossey-Bass. ISBN-1-55542-446-5
- Argyris, C. & Schön, D. (1978). *Organizational learning: A theory of action perspective*. Reading, Mass: Addison Wesley.
- Boud, D., & Garrick, J. (eds). (1999). *Understanding learning at work*. Routledge, London. ISBN 9780415182294
- Burns, T. & Stalker, G. M. (1961). *The management of innovation*. Tavistock. London. 10.1093/acprof:oso/9780198288787.001.0001
- Brandi, U., & Elkjaer, B. (2011). Organizational Learning Viewed from a Social Learning Perspective. In M. Easterby-Smith & M. A. Lyles (Eds.), *Handbook of Organizational Learning and Knowledge Management*. Second Edition (pp. 23- 41). Chichester, UK: John Wiley and Sons.
- Geertz, C. (2000). Local knowledge: Further Essays, in *Interpretive Anthropology*. Basic Books, USA. <http://hdl.handle.net/2027/heb.31369.0001.001>
- Engeström, Y. (2008). *From teams to knots: activity-theoretical studies of collaboration and learning at work*. Cambridge University Press, Cambridge. 10.1017/cbo9780511619847
- Eraut, M. (2004): *Informal Learning in the Workplace*. *Studies in Continuing Education*, Vol. 26, No. 2, pp. 247-273.
- Evans, K. & Hodkinson, P. & Rainbird, H. & Unwin, L. (2006): *Improving Workplace Learning*. 1st Edition, Routledge. <https://doi.org/10.4324/9780203946947>
- Fuller, A., & Unwin, L. (2004). Expansive learning environments: integrating organisational and personal development. In Rainbird-Fuller-Munro (eds.). *Workplace learning in context*. Routledge, London. 10.4324/9780203571644
- Guile, D., & Young, M. (2003). Transfer and transition in vocational education: some theoretical considerations. In Tuomi, Gröhn & Engström (eds.). *Between school and work: new perspectives on transfer and boundary-crossing*. Elsevier Science, 63-81. <http://hdl.voced.edu.au/10707/91821>
- Hodkinson, P., Biesta, G., & James, D. (2008). Understanding learning culturally: Overcoming the dualism between social and individual views of learning. *Vocations and learning*, 1(1), 27-47. <https://doi.org/10.1007/s12186-007-9001-y>
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press, Cambridge. <https://doi.org/10.1017/CBO9780511815355>
- Marsick, V. J. (1987). *Learning in the workplace*. Croom Helm. London- New York. ISBN: 07099465979780709946595
- Marsick, V. J., & Watkins, K. E. (1990). *Informal and incidental learning in the workplace*. London, UK: Routledge.
- Newton, J. & Henderson, A. & Jolly, B. & Greaves, J. (2015): A contemporary examination of workplace learning culture: An ethnomethodology study. *Nurse Education Today*. 35(1), 91-96.
- Nonaka, I., & Takeuchi, H. (1995). *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford University Press. Oxford and New York. ISBN: 9780195092691
- Raelin, J. A. (1997). A model of work based learning. *Organizational Sciences*, 8(6), 563-578. <https://doi.org/10.1287/orsc.8.6.563>
- Revans, R. W. (1982). *The origins and growth of action learning*. Chartwell-Bratt, Bromley.
- Senge, P. (1990). *The Fifth Discipline: the Art and Practice of the Learning Organization*. Doubleday, New York. <https://doi.org/10.1002/hrm.3930290308>
- Watkins, K. E. (1995). Workplace learning: changing times, changing practices. *New Directions for Adult and continuing Education*, 68, 3-16. <https://doi.org/10.1002/ace.36719956803>

Zuboff, S. (1988). *In the age of smart machine: the future of work and power*. Basic Books, New York.  
<https://doi.org/10.1002/hrm.3930280215>

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