Tacit Knowledge in the Process of Innovation[1]

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Introduction

A primary goal of innovation is to maintain and/or improve company's revenue by increasing its competitiveness. Many organizational changes possess, however, a strong tendency to cause reductions in personnel. From short-term profitability calculations, a common practice of the externalisation of older employees was developed and workers over fifty are often deprived of the opportunity for innovative behaviour. Frequently, they are considered a hindrance to technological and process-orientated changes within the company. Globalization and E-business are areas which are predominantly occupied by younger workers with operational innovation frequently seen as application of new techniques.

Increasingly, however, enterprises are also confronted with the problems this youth-centred personnel development causes. For the further increasing the share of younger workers in the staff by new recruitment, there is insufficient personnel. At the same time an additional problem ensues. The loss of experience is a substantial deficit which enterprises have to face and overcome [7]. The realization that a stabilization of operational innovation ability does not inevitably require distancing the older generation begins to prevail - although somewhat hesitantly. The value of knowledge and experience in modern, flexible work structures increases. There are the employees, who generate with their (implicit) knowledge new understandings and create competitive advantages for the enterprise using innovation [13, p. 1]. Thus, experience is increasingly recognized as a special and important human resource [9, p. 4]. The holders of know-how are predominantly older employees who play a special role regarding this aspect in the innovation process. When knowledge contains, in particular, know-how, potential and topicality, it guarantees thereby – especially for older employees – a certain position of power, too.

This paper shows that education and the achieving of a knowledge-monopoly represent a crucial competitive factor in the course of a working life. Furthermore,

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it asserts that the promotion of the professional-theoretical development of knowledge as well as the development of a person's own expertise grants a crucial advantage for long-term job security.

In addition, it will be demonstrated that knowledge development does not only give additional security to the worker. Businesses' innovative potential can be also strengthened to a large extent through staff having high-levels of knowledge. It is, however, necessary to attach great importance to the aspects of *knowledge, knowledge transfer* and *knowledge extension.* Companies must, in effect, place *knowledge* as the basis of any innovation in the centre of their operational activities.

1. Knowledge

1.1. About Knowledge

A generally valid definition of knowledge is something that has been discussed at great length. According to Brockhaus, knowledge is the „epitome of knowledge and realizations in contrast to an assumption, opinion or a belief" [2]. Other sources describe knowledge as follows: *„Knowledge is a set of insights and experiences that are considered to be correct and true and thus it guides the actions and thoughts of people" (Liebowitz et al., 1998).* Other authors see knowledge as *„information that has been interpreted and processed in light of a persons own experience, needs and biases" (Ernst & Young, 1996)* [5, p. 14]. All definitions, however, assume one thing: knowledge alone does not possess any value. Only in connection with people who possess it and combine it with their previously-gained knowledge, experience and moral concepts, and develop it further, does it acquire its importance and becomes the cornerstone of intellectual/cognitive capital. Hence it follows that knowledge without the human element reverts back to a pure information.

For a further understanding of knowledge, it is first of all necessary to explain the connection between data, information, learning and knowledge.

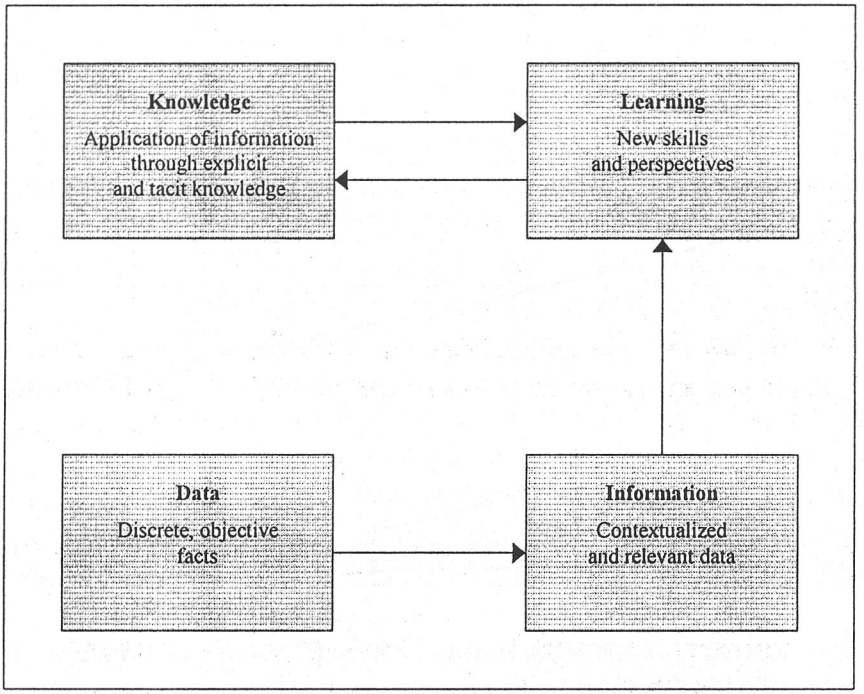
„Data can be thought of as a set of discrete, objective, structured or unstructured facts existing in symbolic form as text, interpreted images or pre-processed code that have not been interpreted" [5, p. 12]. Data is the raw material for information. If data is placed into a certain context, information develops, which can be already used as decision means.

Learning finally means that we ourselves acquire capabilities which were unknown to us before [15, p. 24]. Learning is, therefore, more than just the acquisition of new facts.

Figure 1 gives an overview of the relationships between data, information, learning and knowledge. Thus, knowledge is shown as the end result of the learning process.

Figure 1

Relationships Between Data, Information, Learning and Knowledge



Source: [5, p. 17].

There are two kinds of knowledge. On the one hand, *explicit knowledge* – the representable knowledge which can be well verbalized or visualized and is recorded in books, documents or data bases and is more or less easily accessible.

The second kind is *tacit knowledge.* Tacit knowledge is dynamic, personal knowledge which exists as behaviour, realizations, ideas, values, opinions and experience „in people's heads" [5, p. 14]. It can be described or documented, therefore, only with difficulty. Tacit knowledge is the experience-based knowledge of workers which is not directly in the possession of a company and is further developed on a daily basis and taken home every evening [13, p. 2].

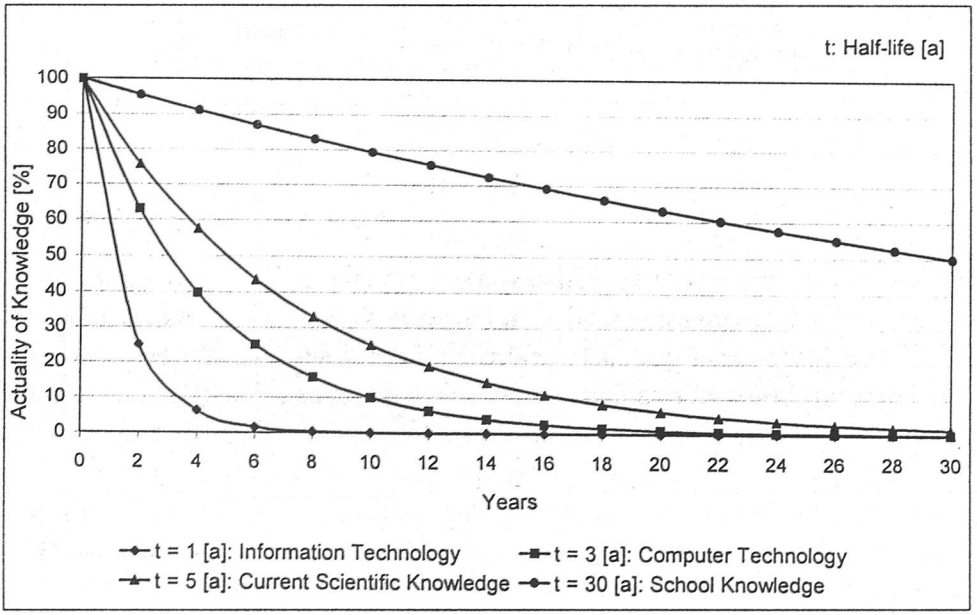
As Figure 1 shows, knowledge is more than only the sum of all available information. As structures are changed, so the knowledge itself changes. The ever-increasing speed of change in our information society results, however, in parts of the available knowledge rapidly aging.

1.2. The Half-life of Knowledge[2]

According to an OECD study in 1998, the half-life of the applied knowledge amounts only about 3.5 years in many areas of work. This means that in three to four years only half of the today's knowledge has any topicality. During the coming decade, around 80 per cent of the technological knowledge therefore becomes supplemented, replaced or recognized as new (see Figure 2) [4, p. 3].

Figure 2

Half-Life of Knowledge



The speed with which knowledge becomes obsolete varies from industry to industry enormously. For important literary works the half-life amounts to many centuries and normally forever regarding scientific principles. In the sector of the information technology, there is general acceptance of a half-life of about one year. Even knowledge gained at school keeps itself relatively fresh with an approximate 30-year half-life. Thus, a fifty-year old person can still use 50 per cent of what was learnt, or he/she was able to do as a high school graduate [8, p. 1]. The consequence for an employed person is to re-consider his/her attitude regarding any further training. Only through permanent training and purposeful development of knowledge can someone acquire the ability for the fulfilment of vocational requirements. On the basis of a forty-year period of employment, then

[2] Half-life of knowledge: time in which the half of the knowledge becomes obsolete.

up to a few decades ago the knowledge acquired from training programmes could be used profitably almost up to retirement age without any special measures for further training. Today, skills are already outdated to large degree after just a few years.

The curves show the actuality of different knowledge types as a function of the time. If these values are set, then, for example, the existing knowledge in the computer technology will fall to approximately 10 per cent of today's level within the next 10 years.

1.3. Experience and Routine

Individual activity is the requirement for gaining experience. With these actions one determines how far the learned knowledge deviates from real-life experiences [6, p. 8]. It is worth while to analyse these inaccuracies and build them into future actions. Thus, actions can be adapted and corrected to fit the changing situation. Thus, in the simplest of cases a gradual optimisation of the action occurs and the process becomes an „efficient routine". This means that actions are implemented without conscious thinking and a certain skill and efficiency is acquired [9, p. 14]. Routine is a solidified experience which also usually outlasts a change in a person's position in the company or personnel changes. In the case of routine, however, there is the hidden risk whereby excessive adherence to proven ways results in an incrustation of structures which can suffocate innovations that have just begun to be implemented.

Contained in the idea of a routine, based on the experience of daily life, it is estimated that its meaning decreases within flexible work structures. This point of view, however, puts the experience which has in turn become a routine into the foreground and ignores the complex and multi-layered character of the experience concept. Experience has a broad view and differs from the restricted viewpoint of the routine. Experience is made up of an accumulation of competencies and abilities for a complete „action mode, with which all potential and resources of human work capabilities are used. Particularly those which have no more place in an employer-employee relationship affected by rationality, predictability and planning, i. e. sensual physical perception ability, intuitive-feeling recognition, associative thinking, as well as feeling for organizational and social relationships in the company" [9, p. 16].

It is important to emphasize that experience represents less a contrast than rather an addition to the theoretical specialized knowledge. Experience-based knowledge bundles personal abilities (which go beyond just the specialist skills) and facilitates in a considerable way the conversion and application of specialized theoretical knowledge.

2. Knowledge and Experience – Changing Factors

A large share of the added value of technology businesses is based not on products but on the knowledge of the persons employed, their experiences and their creativity [14, p. 1]. In the foreground, therefore, is not only the explicit knowledge stored in data bases or libraries but also the tacit knowledge of the workers. It is important for an enterprise to find in all operational processes a balance between technical knowledge and know-how. This presupposes that it develops concepts of knowledge formation.

The specialized theoretical knowledge acquired during training constantly loses topicality due to its half-life. Only with large efforts in the sector of knowledge development can the loss be totally or partly compensated. A study carried out in nine industrial countries shows that less than half of the population takes part in further education and training programmes [4, p. 3]. The success of these programmes is difficult to estimate and often it depends on peripheral considerations, which are difficult to influence, such as group composition.

Equally, just as the theoretical knowledge decreases in the course of the working life, a worker increases his/her know-how. Experience increasingly affects technical as well as personal and social competences. Here, organizations can intervene steering and promoting the development of know-how. These capabilities and knowledge become strategically important proficiencies for a company, if requirements increases at product, customer or organisational levels.

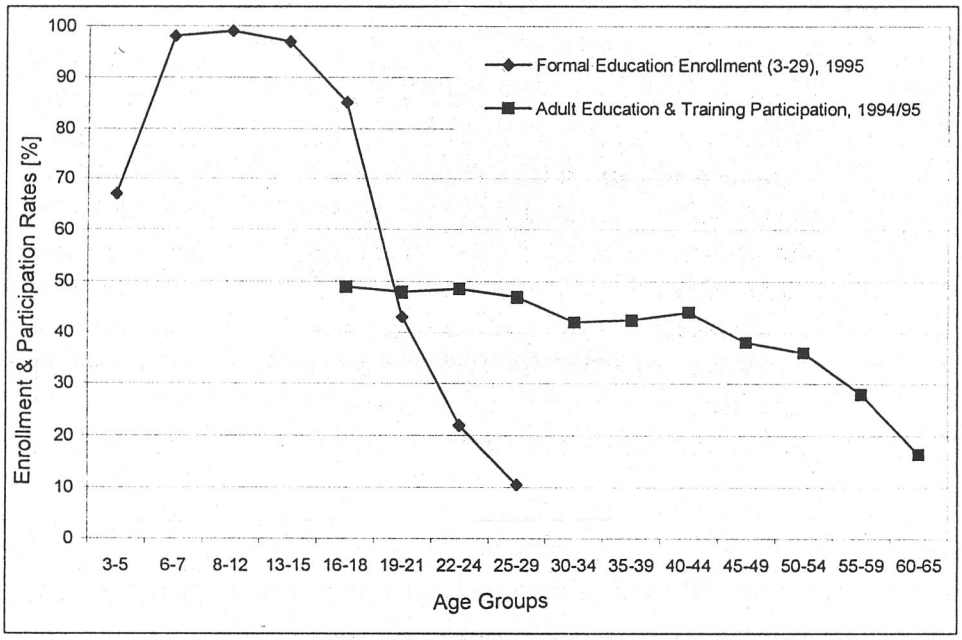
2.1. Formation of a *Personal Unique Selling Proposition (USP)*

Research results clearly show that innovation ability and performance depend only slightly on the biological age. A far greater influence is life experience as well as vocational and occupation processes. Older employees are also not an obstacle to innovation if they have adapted their specialized theoretical knowledge accordingly during their years of employment, and gained experience from innovations introduced during this time. Companies use the know-how of their workforce especially for estimating process assurance. This is particularly so if the theoretical knowledge is no longer of any help and, regarding process and operating procedures, knowledge and abilities are required [12, p. 4]. With this, experience-based knowledge should not be understood in the sense of a mostly innovation-hostile routine. Routine means quasi-automated actions which are implemented without conscious thinking whereby active and creative substances are missing. In order to work against the misinterpretation of each person's know-how, it lies in the hands of each individual worker to communicate the existence of special empirical values (*tacit knowledge*) and to formulate it as a *personal USP*.

Although up-to-date knowledge becomes outdated very quickly, the readiness of employees to take advantage of training programmes is not very apparent. According to the already mentioned OECD investigation involving nine industrially developed countries, it was indicated that after the education only 40 per cent to 50% of the employees participated in further training schemes [11]. The results prove that the willingness to take part in further training after the age of 40 drastically diminishes and up to the age of 60, sinks to a value under twenty per cent (see Figure 3). In so doing, many employees deprive themselves of a substantial part of their employability – employability in this case refers to the ability of the employee to fulfil the requirements of the job. A reduction in the ability to do a job also means the partial loss of personal freedom and independence.

Figure 3

Education and Training Over the Life-Span (non-weighted mean form nine countries)



Note: The countries shown are Belgium, Ireland, Canada, Netherlands, New Zealand, Sweden, Switzerland, UK and US, 1994 – 1995. The first line gives the enrolment in formal education; the second line gives the proportion of adults undergoing some types of training in a given year, not including full-time students under 24 [4, p. 3].

Source: IPTS Report 38 [11].

In the medium-to-long term, a complete overhaul of the training culture is necessary. *Learn-and-Earn* could be the slogan, which could give a new stimulus to the training dimension. Continuous learning will become an integral part in people's lives as well as that of an organization.

2.2. The Necessity for Knowledge Extension

A trend to a knowledge society is clearly recognizable. Work activities and work requirements are undergoing increasingly faster changes similar to those in technical and economic areas. Knowledge has proven itself over the past few years to be the central characteristic of both a company's and individual's competitiveness and ability to survive in an economic environment. The importance of knowledge has clearly increased in all spheres of human interaction [1]. Permanent vocational further training is necessary more than ever before in order to meet the requirements of the workplace and to guarantee the job-acquisition chances of each individual during his/her entire working life. It is important that preventive measures are implemented i.e. ahead of time. The qualification process should be arranged in such a way that the achievement potential of the employee can be maintained throughout the entire working life, thus working to a large extent against qualifications becoming outdated [12, p. 7].

The necessity to learn exists not only for the individual within an organization but also for the organization itself. Many businesses do not know how they can replace the existing explicit (documented) knowledge by new and up-to-date knowledge, which is present as tacit knowledge in the heads of its workers. The new production factor *knowledge* is managed just as other factors of production are done. This means that companies must begin to operate systematic knowledge management and the activities should not only be limited to explicit knowledge. Rather, the core task essentially consists of the transfer of tacit knowledge to explicit knowledge thus making it generally accessible and available for the organization.

Basically, management in this context is not really an adequate term, since knowledge doesn't allow itself to be *managed.* It applies, however, in creating circumstances and basic conditions in which this knowledge can best develop. The task is now to convince the workers of the necessity for knowledge extension across the whole organization by knowledge sharing and to persuade them to actively take part. It is fair to say it is crucial that the workers recognize the fact that knowledge sharing can also make their own jobs easier and increase personal success. Consequently, the transfer of knowledge must not be depicted as a one-way street but, instead, offers each individual the possibility to benefit from the knowledge of others and using this knowledge in new ways and thus enriching the person's own know-how and expertise.

2.3. Generation of Experience-Based Knowledge

An experienced person has a much broader view of things, is also aware of connected areas and has a larger overview of the interaction of different sub-processes. This presupposes that he/she has had sufficient opportunity beforehand to

have experienced different points of view and taken the opportunity to analyse the consequences argue [6, p. 13]. Experience-based competencies enables a person to proceed integrally and the individual acquires a very special ability to act on his/her own account through the contribution of the person's own subjectivity [9, p. 22].

Know-how – usually developed over a long period and very closely connected with the personality of the individual – cannot be precisely formalized and communicated. In its complexity, it can accept a technical dimension as a competence (know-how) which is difficult to document, or a cognitive dimension in the form of a mental model [17, p. 5]. If it is to be passed on to someone, the entire context must be transferred by observation and imitation. Therefore, know-how (explicit knowledge) cannot be transferred directly. It can only be diffused over a longer period [3, p. 6].

Thus, tacit knowledge is presented as deeply personal individual knowledge which is not reproducible in its whole complexity. However, it can be partially acquired by observing, copying, learning-by-doing and so on.

In empirical investigations it could be proved that more and more work situations occur where, due to their complexity, uncertainty and indeterminacy, the recourse to specialist knowledge is no longer systematic. Non-technical qualifications are required in order to be able to react flexibly to constantly changing situations. Essential deciding factors of this qualification type are contained in the competencies for experience-led and subjective work practices. Experience-based expertise enables employees to take a holistic approach [9, p. 22]. Therefore, it is of primary importance for an enterprise to ensure that the experience--based knowledge of its workers is accessible and transparent for others.

The transfer of tacit knowledge to other persons becomes difficult. Since each content of a message is based on earlier experience, it cannot be guaranteed that the receiver accepts the message in the way it was originally meant [5, p. 15]. Often, existing ambiguity of terms can lead likewise to the fact that the transfer of tacit knowledge to explicit knowledge is beset with errors.

Based on the distinction between explicit knowledge and tacit knowledge, I. Nonaka and H. Takeuchi derived four basic patterns for creating knowledge. This model is often referred to as the SECI-Model [10].

Socialisation

In the socialisation process, one person shares his/her tacit knowledge with another person whereby ideas or images are transferred directly to colleagues without using language through observation, imitation, practice and shared experience.

Externalisation

In the process of externalisation, tacit knowledge articulates into explicit concepts which can be communicated to other members of the organisation. Tacit knowledge takes the shape of concepts, hypotheses, analogies etc. which are expressed using language. Because the expressions are not always adequate, numerous deviations can arise. According to Nonaka & Takeuchi, externalisation is the central mode of knowledge conversion.

Combination

Combination is the process of systematisation or standardisation of concepts into a knowledge system such as by adding the new knowledge into the companies' manuals and workbooks.

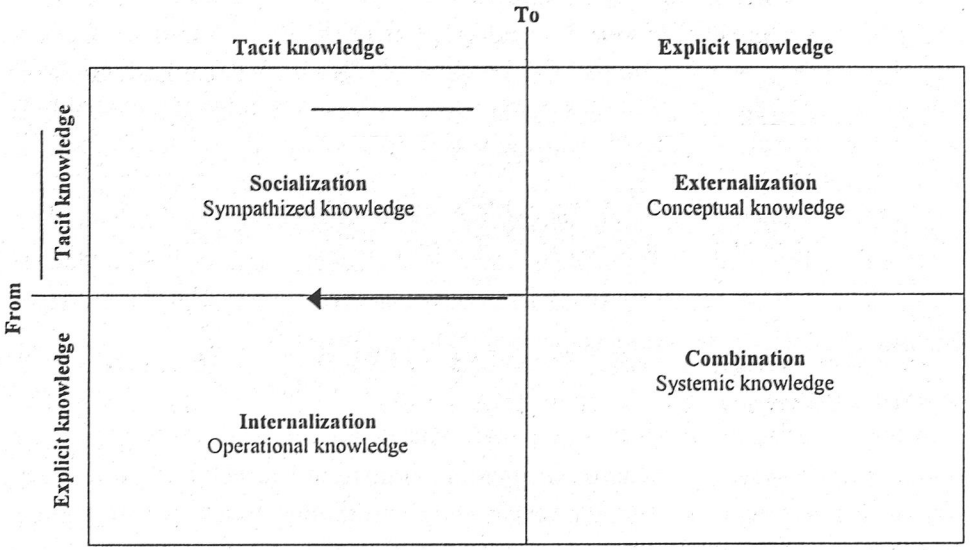
Internalisation

Internalisation is the process of embodying explicit knowledge into tacit knowledge. As soon as new explicit knowledge is shared with others, other employees begin to internalise this new knowledge and to extend in such a way their own tacit knowledge.

The knowledge creation according to the SECI-Model is a continuous, never ending process where the different modes on knowledge conversation interact (see [10]).

Figure 4

Nonaka-Takeuchi Learning Cycle (SECI-model)



Source: [16, p. 4].

The innovation, i. e. the generation and using of knowledge, refers to the socialisation and externalisation steps. However, individuals usually have little interest on passing their knowledge since this equals a power loss in certain way and they would rather use their knowledge at a time, which is advantageous for their career.

Apart from the willingness on the part of the workers to transfer knowledge, there is an additional need for an appropriate environment which offers sufficient opportunity for the interchange. With the increase in tele-working, however, many possibilities for personal contact will be lost and it is a challenge for the operational management of knowledge to re-establish these links.

According to SECI model, humans also move firmly into a central position as knowledge holders. Therefore, it is becoming increasingly more importantly for companies to organize knowledge and knowledge production systematically and methodically. Each enterprise wants to ensure that a maximum of each worker's know-how is available and accessible for others in the organization. On the other hand, the individual is keen to obtain as high a level as possible of tacit knowledge and from these different goals a process can develop which wins increasingly in dynamics and further promotes the structure of a knowledge basis in the enterprise. In such a way, knowledge management becomes a core function within the business itself.

However, the conversion is not without problems because the development of know-how presupposes that situations are created in which the existing knowledge is extended though new combinations. Inevitably, experienced workers are often moved from a function they perform extremely well and entrusted with new tasks. This situation can cause a loss of know-how if the organization has not succeeded in making the existing knowledge transparent and accessible beforehand. In this case, it is a challenge for the management to find and implement a meaningful compromise.

Conclusion

Know-how, a qualification culture as well as work-accompanied learning have become strategic competitive requirements for enterprises as well as for the employees. For many this situation is a new challenge and a change of thinking is necessary from both businesses and employees. Increasing demands are made on a workforce to perform in a more business-oriented manner and adapt themselves – their abilities – to the permanently changing requirements of the workplace through qualifications gained from appropriate training programmes. A special importance is attached to the sustaining of the innovative ability by way of flexibility.

Through the individual planning of the professional process in which the receiving of the latest knowledge is taken into consideration, an individual's personal competitive advantages in the job market can be established. A skilful combination of theoretical basic knowledge attained in education, job-related theoretical further education and know-how acquired on the job create unique competitive advantages particularly for the older members of the workforce due to their experience. In this sense, an individual worker carries out a process to improve his/her personal competitive ability – more or less a personal innovation process.

This opens up interesting vocational perspectives for the holders of the know--how in that they are also the holders of the experience-based knowledge. The value of these workers for the enterprise increases and, additionally, the chances in the external job market increase with the development of these core and key competencies. For the older and more experienced workers, too, new career chances are available. Nevertheless, a permanent qualification initiative is necessary in which an employee must participate actively even if he/she has not initiated it.

The innovative behaviour of an enterprise increasingly falls back on the theories of knowledge-based management but, at the same time, it is important that not only general accessible explicit knowledge and its distribution are the focus of attention. Rather, basic conditions and processes must be created, as the know-how the staff possesses can be documented, systemized and be made accessible and usable for others. Alongside of this, sufficient time for exchange, thinking and learning should be allocated and, at the same, each enterprise must co-ordinate the proposed methods and systems with the special operational situation.

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TACIT KNOWLEDGE (IMPLICITNÉ ZNALOSTI) V INOVAČNOM PROCESE

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Pre mnohé organizačné zmeny v posledných rokoch bola charakteristická tendencia znižovať počet zamestnancov. Najmä starší pracovníci sa pokladali za prekážku zmien spojených s technickým pokrokom a nedala sa im možnosť podieľať sa na inováciách. Zároveň si ale firmy uvedomujú skutočnosť, že veľká časť operatívneho know-how, ktoré je veľmi dôležité pre praktickú realizáciu inovácií, sa s odchodom starších pracovníkov stratila. Viedlo to k tomu, že rozvoj znalostí, a najmä znalostí založených na skúsenostiach, získal v organizáciách nové postavenie. Mnohé podniky sú nútené venovať oveľa viac pozornosti rozvoju ich znalostného kapitálu.

Osobitne to platí v podnikoch v oblasti informačných technológií alebo v odvetví počítačov. Polčas odborných znalostí v týchto odvetviach je nižší ako päť rokov a znalosti veľmi rýchlo zastarávajú.

Pokiaľ ide o možnosť prenosu znalostí, možno rozlišovať dva typy znalostí: *explicitné znalosti* – sú to znalosti uložené v knihách a databázach a sú prenosné; *implicitné znalosti* však existujú v mysli ľudí a je ich ťažko opísať, alebo sa nedajú opísať vôbec. Preniesť z jednej osoby na druhú ich možno iba vzájomnou interakciou.

Pre firmy je veľmi dôležitá vyváženosť medzi teoretickými špecializovanými znalosťami (explicitné znalosti) a know-how (implicitné znalosti). Kým teoretické znalosti možno „kúpiť" tak, že sa prijmú mladí, teoreticky dobre pripravení zamestnanci, implicitné znalosti, založené na skúsenostiach, sa musia odhaliť, klasifikovať, systematizovať

a urobiť prístupnými pre iných. Tieto znalosti založené na skúsenostiach nemožno stotožňovať s rutinou, ktorá nielenže nepodporuje proces zmien, ale ich brzdí. Skúsenosti zahŕňajú celý rad kompetencií a schopností pre komplexnú činnosť. Know-how nemožno vyrobiť, jeho vývoj si vyžaduje dlhší čas.

Výsledky výskumu ukazujú, že inovačná schopnosť a pracovná výkonnosť iba málo závisia od biologického veku človeka. Pracovník, ktorý svoje teoretické znalosti prispôsobuje v priebehu celoživotnej aktivity tak, že sa zúčastňuje rozličných tréningových kurzov a adaptuje sa na existujúce potreby, venuje pozornosť osvojeniu know-how, vlastne rozvíja svoje osobné USP (Unique Selling Proposition – jedinečnú schopnosť predať svoju prácu). To mu poskytuje nielen konkurenčnú výhodu na trhu práce, ale je aj základom určitej výsadnej pozície jednotlivca vo firme. Preto starší zamestnanci, ktorí svoje know-how rozvíjali v priebehu rokov, stávajú sa nevyhnutným prvkom v inovačnom procese.

Inovačné správanie podnikov sa čoraz viac opiera o teóriu manažmentu znalostí. Cieľom týchto podnikov okrem iného je urobiť know-how pracovníkov transparentný a prístupný tak, aby ho mohli využívať aj iní. Transfer implicitných znalostí na iné osoby je však veľmi ťažký. Na opísanie transferu takýchto znalostí sa často používa známy model SECI, ktorý zahŕňa štyri fázy. No stáva sa aj to, že jednotlivci často nemajú záujem preniesť svoje znalosti na iných a chcú ich využívať iba sami v záujme vlastnej kariéry.

Ak to máme zhrnúť, možno povedať, že znalosti majú veľký význam pre konkurenčnú schopnosť tak jednotlivca, ako aj firmy. Tvorba znalostí si vyžaduje značné úsilie oboch strán. Jednotlivec sa snaží neustále vytvárať nové implicitné znalosti, kým firma sa usiluje urobiť implicitné znalosti pracovníkov prístupnými pre iných. Z týchto rozdielnych pozícií sa môže odvíjať proces, ktorého dynamika sa čoraz viac zvyšuje a ktorý podnikom pomáha neustále rozvíjať nové znalosti. Podporovať a zabezpečovať plynulý priebeh tohto procesu je výzvou, s ktorou sa manažment musí vyrovnať, ak chce udržať svoju inovačnú schopnosť.