

Training to Technological Change

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Abstract

The main aim of this article is to introduce the role of the continuous, or professional development, training of the labour force in a computer-aided technology (CAT) context. Retraining is an important topic today because of the importance of optimising available human resources. In this line, we introduce a synthesis of the main competencies to guarantee the success of continuous training in terms of technological changes and obtaining expertise. Moreover, we consider some particular characteristics of the training process within the technological context. (Keywords: computer-aided technology, computer training, complex competencies, metacompetencies.)

Technological development is a key topic in the labour force. Today's industrial societies are addressing it by attempting to keep management competitive within the international economic context. Thus, the progressive introduction of improvements in the robotics, information, telecommunications, and telematic technologies is a common phenomenon. These developments involve new opportunities to improve the organisational processes and the labour life quality in companies (Child & Loveridge, 1990; Walton, 1989).

Moreover, it is important to realize that technological innovation has consequences on such labour-related areas as job performance, labour life quality, the meaning of work and motivation, attitudes about training, psychological well-being, interpersonal relations, organisational structure, management of people, organisational effectiveness, and the organisational climate and culture (Salanova, Grau, & Peiró, 2000).

All these effects of computer-aided technology (CAT) on the labour world may make us think that technological change has a negative influence. However, technological change cannot be considered as an immediate reason for those changes; rather, it is the result of the lack of balance between the new job demands and the workers' resources (Caplan, Cobb, French, & Harrison, 1975).

Thus, it is known that the relationship between technology and work is not of a determinist nature. Therefore, it is the sociotechnical system, which considers the technology and the social subsystem of the organisation, that is responsible for the organisational change.

In this setting, continuous training or retraining of workers and users of CAT is a vital component in coping with the changes or effects produced by the introduction of CAT systems in companies (Prieto, Zornoza, Orengo, & Peiró, 1996). The main role of retraining in this situation is to facilitate the development of transferable skills and increase positive attitudes toward continuous learning.

The use of CAT demands the development of high levels of complex competencies and higher-order cognitive skills in the users of these technological systems (Ford, Kozlowski, Kraiger, Salas, & Teachout, 1997; Ford

& Kraiger, 1995; Hesketh & Bochner, 1994; Tannenbaum & Yukl, 1992). Therefore, it is not unexpected that companies are beginning to consider training as a valuable resource to face technological change (Salanova & Cifre, 1998). They conceive of it both as an investment and an integrative service in the global management of the organisation (Quijano, 1993). A study of metal-mechanical sector companies in Castellón (Spain) shows that the companies that have introduced CAT have carried out a great number of training activities (Llorens, 1997).

Continuous training can be conceptualised as a process of active and continuous learning that is directly connected with people's work and that tries to improve their knowledge, abilities, skills, behaviours, and attitudes. It is characterised by being partially or totally financed by the organisation, and its objective is to improve or adapt the professional capacities of the workers, their knowledge, or their qualifications related to the activity or job they perform or are going to perform in the future in their own company (Llorens & Grau, 2000).

Furthermore, continuous training related to technological change must comply with many criteria to assure quality, including the following: (1) the changes in knowledge, abilities, and skills should be permanent; (2) training should produce an evident change in the three dimensions of learning (cognitive, affective, and behavioural); and (3) training should result in an improvement in the quality of the performance in the work context (Ford & Kraiger, 1995).

Moreover, successful computer retraining must follow a systematic and planned process and attend to all the following fundamental aspects of the training process: needs analysis, goal setting, training design, evaluation, and transfer (Buckley & Caple, 1991; Goldstein, 1993; Llorens, 1997). A constant feedback process that identifies necessary changes and improves the continuous training process is also vital. It is essential that CAT training focus on the development of flexible, generalisable, and transferable competencies. Finally, such training should produce experts (Hesketh & Bochner, 1994).

In this article, we describe the role of continuous training in the CAT context. We introduce a synthesis of the main competencies needed to guarantee the success of continuous training demanded by technological change. Some particular characteristics of the training process in a technological context are analysed.

THE ROLE OF RETRAINING: COMPETENCIES OF THE NEW WORKERS

To optimise available human resources, it is necessary to carry out continuous training activities or retraining during the workers' professional life (Salanova, Grau, Prieto, Martí, & Gastaldi, 1993). Moreover, to successfully introduce CAT and adjust for the particular speed of technological change, training requires a continuous and proactive base that guarantees the acquisition or development of complex competencies (multiskills) and metacompetencies (learning skills). All these competencies will help with the extraction of general principles, which will promote the transfer to other new situations (Hesketh & Bochner, 1994).

In this context of continuous change, the most relevant competencies and learning skills for the successful performance of the new labour role are detailed in Table 1 (Salanova & Grau, 1999). These competencies or learning skills must facilitate the introduction of CAT into the organisation and facilitate the adaptation to the technological change and its consequences.

Table 1. The Main Complex Competencies and Learning Skills to Change

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- Adaptability to change and polyvalence
 - Creativity and innovation
 - Empathy
 - Identification of opportunities in the given context
 - Effective management of time and aims
 - Potential for teamwork
 - High self-esteem
 - Mental flexibility
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Training may result in workers becoming experts or highly competent employees. This implies the achievement of a higher performance through the development of specialised mental processes acquired by means of experience and training (Chi & Bjork, 1991). Some of the competencies that characterise the expert and that can also be taught through suitable training activities (Ford & Kraiger, 1995) are shown in Table 2.

Table 2. The Main Competencies for the Expert Condition

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- Sensitisation
 - Verbalisation
 - Skills automatization
 - Ranked mental models
 - Metacognitive and self-regulated skills development
 - Planning strategies
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Sensitisation is defined as the capacity for noticing minor differences in the work environment. It is a consequence of the practice and the development of a good cognitive mapping of the action, its determinants, and its consequences.

Verbalisation is the comprehension and internal assimilation of the working performances and processes of work. This competency facilitates the job process and the learning of new knowledge, abilities, and skills.

Skills automatization implies a quick performance of the task. It occurs because, with practice, the skills are routinised and they change from controlled cognitive processing to automatic processing.

The *ranked mental models* represent cognitive schemes of the task hierarchically ranked, based on structural principles, and with a vast amount of knowledge correctly proceduralised.

Metacognitive and self-regulated skills development are defined as the planning, monitoring, and revising of goals for appropriate behaviour and comprehension of the relations between the task demands and the appropriate strategies that facilitate the acquisition and implementation of additional knowledge. Highly competent workers anticipate future events with greater accuracy, spend more time in comprehending problems, have goals related to the tasks, address their actions to the achievement of the goals, ask more abstract questions, develop more hypotheses, plan their actions more carefully, and are less impulsive.

Planning strategies provide an active planning process and organisational plan for the situation, including feedback. This competency distinguishes between highly competent workers and those who use momentary and situational strategies. It provides more effectiveness and quality in the work and less cost and effort when performing the work.

CHARACTERISTICS OF THE CONTINUOUS TRAINING PROCESS IN THE CAT CONTEXT

Within the context of CAT, the training process has distinctive characteristics. Because of the fast technological changes taking place in companies, training requires techniques aimed at continually providing employees with a number of skills. This raises a critical question: How can this training be sequenced within this changing context?

This question involves taking into account other normative aspects, which, despite being fundamental, are sometimes overlooked. These aspects include (1) how to carry out an appropriate analysis of the training needs and (2) how to evaluate the training in a technological innovation process.

The training needs assessment and the training for later needs have a vital importance for the success of the training (Llorens, 1997; Llorens & Grau, 2000). This is the first step in the training process and one of the most important elements of that process. However, it is also considered to be the most complex and neglected aspect (Ostroff & Ford, 1989). This analysis involves determining where changes are needed and whether the training can meet the requirements determined by the technological implementation carried out in companies at any given moment (Dipboye, Smith, & Howell, 1994).

Cognitive theory offers a new and promising approach for developing a training needs assessment for technological change. This methodology deals with the notion of the expert (Salanova & Grau, 1999). It establishes the required competencies and metacompetencies and assesses how these competencies are performed by experts. Additionally, it is essential to analyse the immediate needs and to delay the possible changes taking place in the companies in the short or medium term. These changes may alter the organisation, the jobs, and those competencies required for effective work performance.

Another demand of the training process is the evaluation of the effectiveness or success of the training programme. This step is of vital importance for the improvement or redesign of the implemented training activity, although it is rarely included in the evaluation (Llorens, 1997; Llorens & Grau, 2000). The

evaluation of the training in the technology context must not only take into account the traditional approaches (evaluation of four aspects—reactions, learning, transfer, and effects) (Kirkpatrick, 1998) but also allow the continuous assessment of the degree to which the planned aims have been successfully reached. These planned aims refer to the acquisition of specific and generic competencies as well as metacompetencies or learning skills that help the transfer to the job.

Moreover, this evaluation must also take into account another essential aspect: *trainability*, that is, the capacity of an employee to carry out a continuous training process during his or her professional career, as well as his or her self-efficacy and training motivation (Salanova, Hontangas, & Peiró, 1996).

DISCUSSION

This article describes the role of the continuous training in the CAT context and analyses the competency training of workers, with consideration of some particular characteristics of the training process in that technological context. Despite the introduction of new university courses more adapted to the current labour market, this effort is not sufficient because the technological change rate is faster than the transformation the university can offer.

Thus, there is a need for continuous training offered by organisations to their employees that will allow them to deal with technological change, the globalisation of the market, and the flexibility of employment, all of which are characteristic of our society (Dipboye et al., 1994).

It is clear that the training process does not come to a halt with the achievement of an academic degree; instead, there must be continuous retraining during the employee's productive life. Furthermore, technological changes demand fundamental and generic skills and competencies, as well as learning skills in the labour force, that will allow employees to obtain those essential competencies for dealing with the complex changes resulting from the implementation of CAT. Moreover, this continuous training must generate positive attitudes, avoid instilling opposition to change, and fight against the lack of motivation that can penalize employees when implementation of new technologies in their jobs is a concern. To accomplish all these goals, companies must have greater involvement in continuously training employees. Training should offer opportunities for building complex competencies and metacompetencies in the following areas: adaptability to change, creativity and innovation, empathy, identification of opportunities in the technological context, effective management of time and aims, potential for teamwork, and increased self-efficacy and mental flexibility.

The worker's perspective should be considered when planning continuous training for professional career development. Organisations should define training as part of an integrated system in the management of human resources. It should be designed with a permanent and future orientation. To do so, forecasting for future technological change is necessary in a continuous and proactive way.

Evaluation of the effectiveness of the training is essential. The evaluation should give suitable feedback for improvement in training performances. This

will guarantee the continuous development of skills in the labour force and will also allow employees to acquire new competencies and accept new technologies that are implemented in relation to their jobs (Hesketh & Bochner, 1994). ■

Contributors

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