REVISITING CNC TRAINING – A “VIRTUAL TRAINING CENTRE FOR CNC”

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Abstract

CNC Training has been a scope of interest for vocational training centres for a very long time. Training on CNC should follow similar developments in the CNC machines and in particular in their programming capabilities, automation they offer and their technical capabilities. In addition CNC programming is becoming more and more automated through the use of CAD/CAM systems. This requires from the programmers to acquire CAD operation capabilities, on top of their CNC operation and programming knowledge. Therefore, CNC training is not only restricted to vocational training centres but also it is being taught within most of the technical universities. This paper presents the development of a Virtual Training Centre (VTC) to promote and reinforce Vocational Training in Computer Numerical Control (CNC) Machines.

Introduction

In the last 3 decades, a large number of vocational training centres and technical universities are giving priority to CNC Training. New developments on CNC machines are providing a continuous need for updated CNC training curriculum. Training on CNC should follow similar developments and in particular in their programming capabilities, automation they offer and their technical capabilities. In addition, CNC programming is becoming more and more automated through the use of CAD/CAM systems [1]. This requires from the programmers to acquire CAD operation capabilities, on top of their CNC operation and programming knowledge.

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This paper presents the development and promotion of a Virtual Training Centre (VTC), an Internet based e-learning facility, specifically based on Computer Numerical Control (CNC) training, within the framework of a European Project. This centre includes a virtual space (a CNC training portal) on the Internet, which allows the constant sharing of e-learning based CNC teaching tool created, and the further development of e-learning based CNC educational contents. New equipment, methods, curriculum and techniques currently used for CNC training by some European countries are observed, collected and evaluated to form a common curriculum [2-6]. It should be noted that almost every country in EU has its own training materials and methods for CNC training; quite often this is insufficient and this brings problems regarding the unification of workforce. Furthermore, the facilities for CNC training vary a lot and this has had direct impact on the experience that the trainee is acquiring during his/her apprentice. This virtual training centre aims at setting the standard CNC virtual learning in vocational training systems.

Development of the Virtual Training Centre

During the first stages of the project, the equipment, methods, curriculum and techniques currently used for CNC training by some European countries are observed, collected and evaluated. The selected materials are used to create a new and common curriculum. This curriculum is the core of target virtual training activity.

Then, depending on this curriculum, an interactive teaching program is being developed and put into a website to form a virtual training centre. The site, along with the interactive teaching program, is divided into four main areas, "News", "Exchange of views" "Projects and Networks", and "Information Resources". Users will be able to access a newsletter, a bulletin board, online surveys and survey reports, information on VET networks, an electronic library with references, a bookshop with downloadable publications and a number of databases.

![Figure 1. The Communication Website for VTC for CNC](image)

It should be noted that facilities for CNC training vary a lot and it has a direct impact on the experience that the trainee is acquiring during his/her apprentice. This has a direct impact mainly on SMEs which “in Europe account for 99% of all businesses and they provide employment for 74 million people” according to Mara Brugia (Eden 2005 Annual...
Lack of training is apparent within SMEs, since they do not possess appropriate training material except the one provided by the machine manufacturers and, in general, their training infrastructure for CNC training is minimal. Through the VTC for CNC they can get high level training guidance, training customised to the level and requirements of the trainee on top of the additional information described above.

In the long run, the VTC for CNC will be an interactive platform, a meeting point for policy-makers, social-partners, practitioners, researchers and all those with an interest in CNC field of vocational education and training. Experts in the field will be able to share and exchange knowledge and experience with associates within and outside the European Union. This will foster the viability of the project in the long run, even after the end of the project.

**The aims of the Virtual Training Centre**

This project aims to improve the skills and competences of people to promote and reinforce the contribution of vocational training to the process of innovation, with a view to improving competitiveness and entrepreneurship, also in view of new employment possibilities.

Another objective is to improve the quality of, and access to, continuing vocational training. This can be achieved through improving the qualifications and competences of the trainees in this field and it is directly related to the well-designed and programmed curriculum to be carried out on CNCs. In addition, considering that education is a dynamic process, it will be possible by this project, through its dynamic and continuous characteristics, to improve the quality of vocational and technical education, and accession to vocational training will be carried out.

Through the educational programme and new teaching methods to be developed by implementing CNC training content onto a virtually designed and served training centre, which is accessible over internet, e-learning will be realised as an innovation in this field.

The specific aims of the project can be defined as follows:

- Training the trainers, trainees, technicians and apprentices and all enthusiastic about CNC.
- Preparing technicians as intermediates having common measurable qualities the industry is seeking.
- Helping to form a labor force that can use current knowledge and technology, and thus, in search for life-long learning.
- Supporting the sectoral communication through the national centers in partners.
- Setting up a website to publish the data collected.
- Adapting the collected materials to enhance the new curriculum satisfying the requirements in a modern sense.
- Helping to improve and upgrade competences and skills of the involving institutions’ didactic staff and exchange experiences over the virtual training centre.
- Enabling the participants to extend the common educational qualifications of CNC technologies, the accreditation of the skills and knowledge of CNC technologies acquired within the network created between participating institutions and organizations.
- Increase the quality of employment through qualified workers.
Helping to increase active use of technology acquired and thus to increase the standards.

- Contributing to individuals by behaving through life long learning.
- Having a labor power in accordance with common design and production standards.
- Contributing to labor market by using the common technology and equipment effectively.
- Helping to enhance available potential of human sources.

**Expected results and impact**

A new and common curriculum in CNC training in participating institutions will be developed. In addition, a new training method, which is virtually served on the web and interactive simulation software, a user manual for both trainers and trainees will be the other products.

Target groups will be trainers, trainees, technicians, apprentices and all enthusiasts about CNC. The final and potential users of the project’s results will be the training organisations, the SMEs dealing with metal products by CNC usage, and the universities, colleges, vocational schools, training centres.

The results of the project will be used initially at the CNC training centres of the partners. This will also enable target groups, target sectors and potential users to be aware of the results. This valorisation is expected to be realised through the organisations for which they are members.

In the short term, trainers will have a tested common curriculum and training aid for immediate use; trainees and apprentices will have an easy access to a virtual training centre; technicians will be able to update their knowledge and find a source for immediate solutions to the problems faced in their workplace; CNC enthusiasts will have a new material served on internet to satisfy their curiosity.

As target sectors, educational institutions for CNC will have a common curriculum, training aid and partnership; the manufacturers utilising CNC will have a training centre virtually created for recruiting their programmers and operators.

As potential users, the training organisations, the SMEs, and the universities, colleges, vocational schools, training centres will have an opportunity to modify their way of CNC training. Vocational training systems and practices will be modified and updated according to proposed curriculum.

In the long term, trainers will broaden their training ability by means of communication over virtual training centre; trainees and apprentices will have better employment opportunities in their countries and especially in other partnering countries; technicians will be a subject to life long learning and e-learning as a member of modern society; CNC enthusiasts will be more creative by contributing their creative feedbacks. Thus, the VTC for CNC will serve to LLP, too.

The final results of the project will be used at the first stage at the CNC training centres of the partners. The simulations, practical exercises making it possible to apply what is learnt, and the final product will be tested in short training courses. The feedbacks of the implementation at these centres will be recorded and the training participants will evaluate the curriculum; this will be undoubtedly one of the strengths and recommendations on both form and content, which will be incorporated into the final version. Evaluation will cover content (topics, language used, modules), methods (progress, different levels of difficulty, and range of resources, situations and practical cases) and technology (ease of installation, interactive nature and use without a tutor). Testing of the resource in self-instruction, workplace and training centre
situations will be important. The experiences and knowledge gained during the process of this project can be used in developing and improving other training programmes in particular in the area of new information technology applications in related sectors.

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References


