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# INNOVATIVE FORM OF TEACHING - "THE EDUCATIONAL COMPANY"

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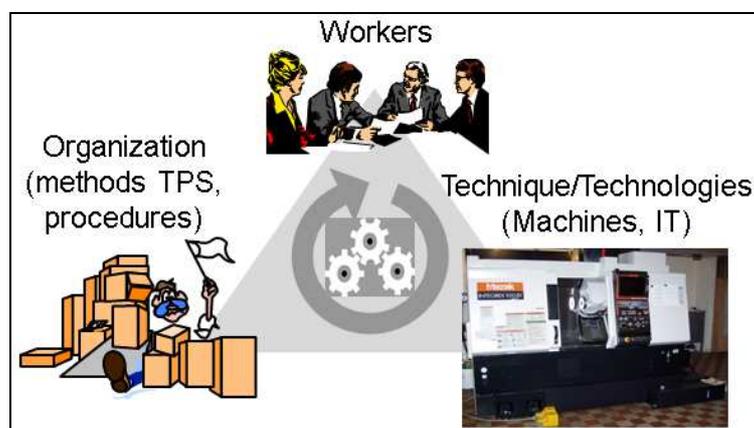
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## 1. INTRODUCTION

The modern age is marked by continual change and considerable pressure to forever improve corporate processes. Faced with fierce competition, success through mere “reorganisation” or the “purchasing” of new production technology is impossible. The main role is played by employees and stress on synergic effects – see Fig. 1.



*Fig. 1: Technology + organisation + human synergy*

No enterprise can survive without a qualified workforce. In addition to specialised knowledge, ever greater emphasis is now being placed on orientation on procedure.

What is known as procedural, holistic thinking has therefore become a requirement of the modern age. Enterprises require qualified employees that know their way around their own specialisation and that are able to take complex company ties into account in their work (Trade – Development/Design – Technology – Logistics – Production management). In other words, this means that they are able to carry out their tasks in

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continuity, i.e. with regard for the influence of previous and subsequent parts of the process.

Thinking in continuity – this demand of the modern age must be reflected in employee education and training and in the teaching provided at technical universities. We can no longer rely, therefore, on the traditional method of teaching “at the board”. The demands placed on graduates of technical universities require the introduction of other forms of teaching that use practical elements and effectively interconnect these with theory.

The Department of Manufacturing Systems (DMS) at the Technical University of Liberec has taken this requirement into account in its efforts to introduce an innovative form of teaching – the so-called “Educational company” – which introduces elements of problem based learning (PBL) and develops procedurally-focused thinking.

The system draws on the following motto (Confucius):

*“Tell me, and I will forget.*

*Show me, and I may remember.*

*Involve me, and I will understand.”*

The idea is for students to try as many activities as possible for themselves and to come as close as possible to real production conditions in their workshop and lab work.

## **2. THE “EDUCATIONAL COMPANY” AT THE DEPARTMENT OF MANUFACTURING SYSTEMS**

The innovative education system known as the “Educational company” simulates a real business and its processes. The system draws on the idea of interconnecting selected courses/subjects in a uniform education system through complex interweaving with a project in which students comprehensively deal with a task from idea and introductory marketing study, through product development to batch production proposal and its optimising, all within the conditions at departmental workshops.

Students gain specialised knowledge and skills in the technical preparation of production, logistics, production management and its optimisation and become familiar with company ties; for example design-technology, design-logistics, technology-logistics, logistics-production management, logistics-administration etc. They can, for example, practically try out how not taking logistics/procedural demands in design/technology into account is

manifested in an increase in logistics and production costs and in the profitability of production.

In contrast to the traditional approach, in which sub-tasks are often dealt with in isolation as part of individual subjects, the emphasis is placed on their interconnection and on tangible results. Students have greater motivation and get a feel for design, technology and ergonomics, not to mention the issues of organisation and production management. Given this comprehensive approach, students are better able to work with building, technical, organisational and other restrictions.

The education system in question is currently being developed with the support of the “EduCom” project, part of the Education for Competitiveness Operational Programme. One specific feature is close cooperation throughout the TU of Liberec, something which adds further possibilities to the abilities of the providing departments (see Fig. 2). Cooperation with the Faculty of Economics, for example, means that technical perspectives close to engineering faculties will be supplemented with economic perspectives. The teaching concept is also under intense discussion with experts in production practice.

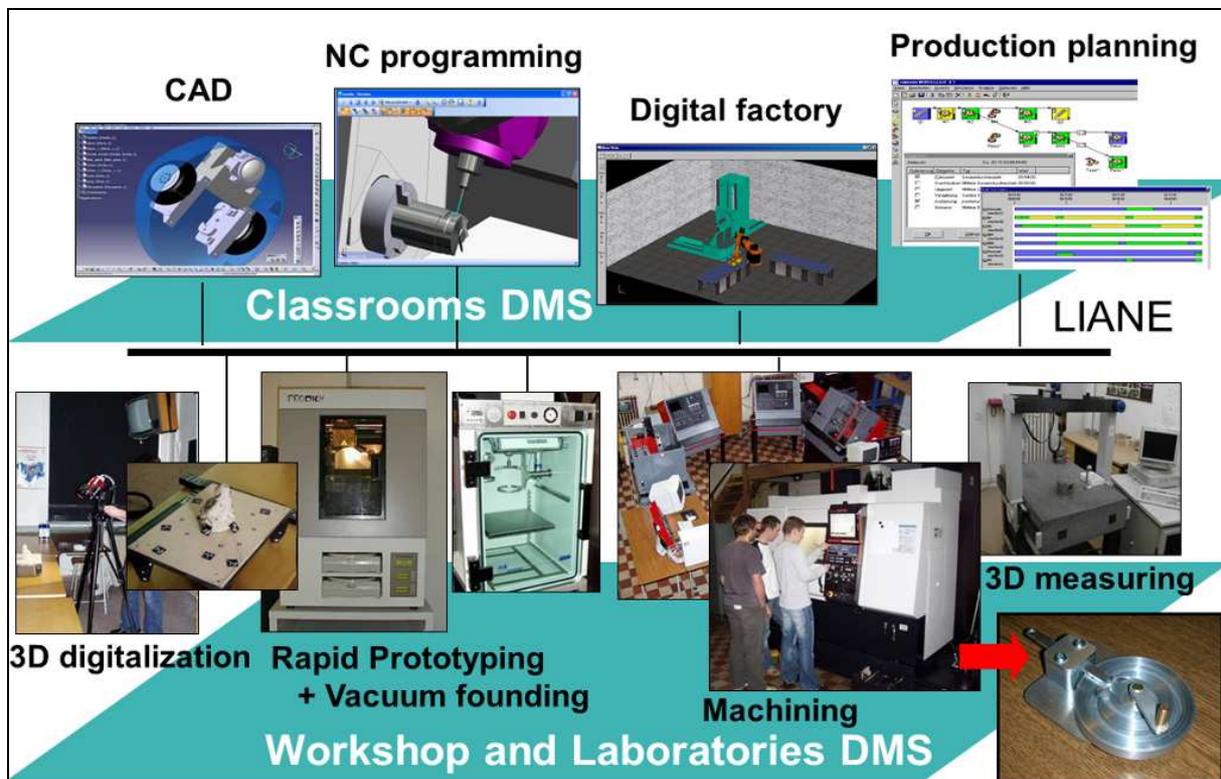


Fig. 2: Facilities at the DMS

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### **3. EXAMPLE OF A COMPREHENSIVE PROJECT AS PART OF THE “EDUCATIONAL COMPANY”**

The students do as follows as part of a comprehensive educational project:

- consider a business plan (for example, they compile a SWOT analysis, carry out a market analysis as part of, for example, brainstorming, estimate the price of the product - target costing - compile a project schedule, etc.)
- design a prototype in a CAD system (or check it using simultaneous engineering methods, e.g. QFD - Quality Function Deployment, FMEA - Failure Mode and Effect Analysis, or DFL - Design for Logistics, etc.)
- actually manufacture the product (using, for example, the Rapid prototyping method or a CNC machine)
- fine-tune production technology in a CAD/CAM system (e.g. define technological and installation procedure, generate NC programme, etc.)
- design batch production and logistics for the specific conditions in the workshop (e.g. determine the purchasing and stocking strategies, create a production layout, including the method of handling and storing, set standards, carry out an economic assessment of the profitability of production, etc.)
- plan parts for production using the corporate management information system (e.g. set out a production schedule for individual workplaces)
- optimise selected workshop activities under specific workshop conditions (e.g. carry out classic procedural analyses, use SMED, 5S, visual management, etc.)
- control processes and the accuracy of production (e.g. based on a compiled control plan)

Selected examples of the projects carried out by students are shown in Fig. 3.

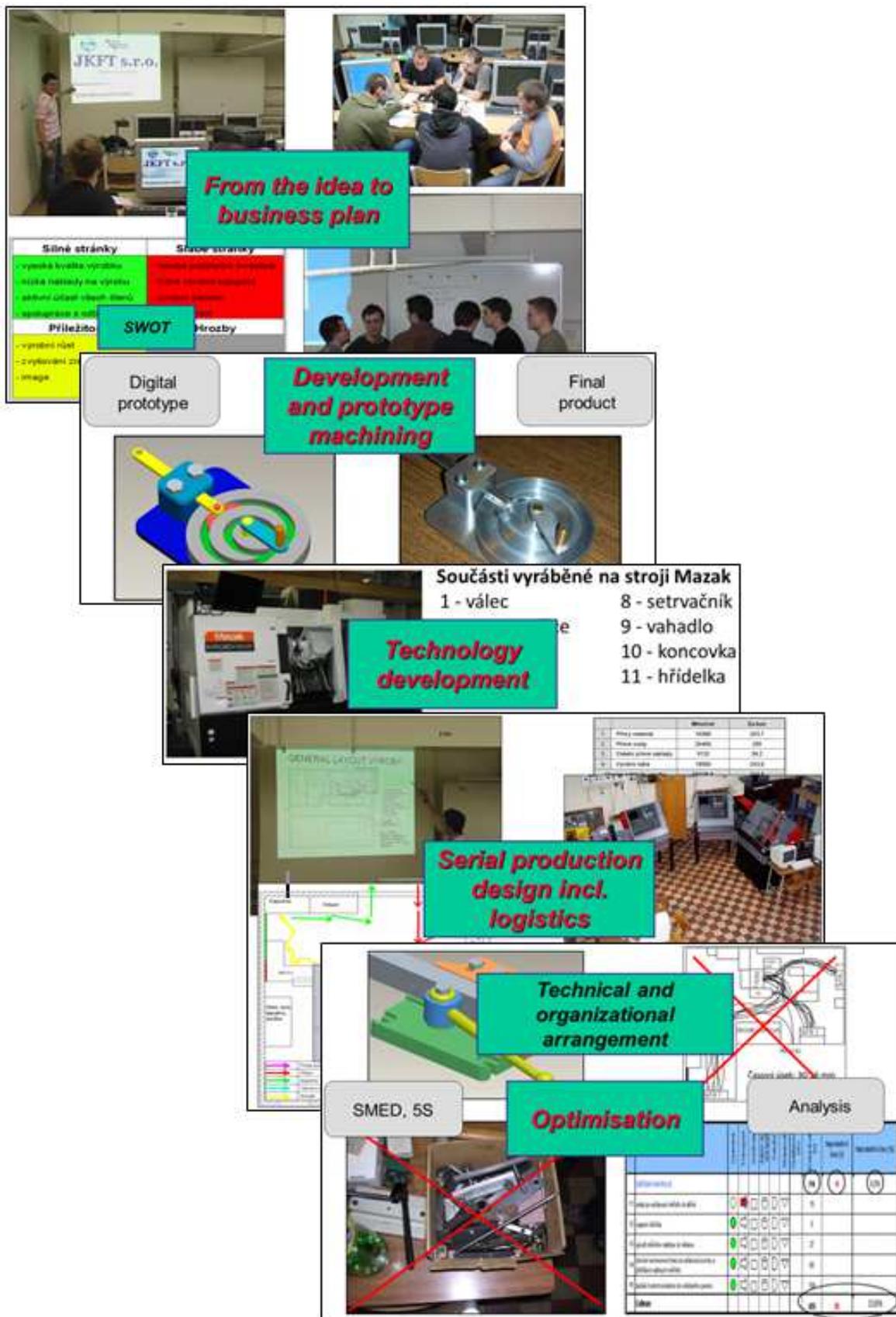


Fig. 3: Examples of students' projects

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## 4. CONCLUSION

The education system created reflects the current demands made of graduates in terms of manufacturing practice, in that they are able to handle problems in context and in continuity.

Students learn the following as part of a comprehensive project:

- to design and optimise production processes from the technical and organisational side of affairs (emphasis is placed on the synergy of technology, organisation and human resources);
- to find their way around the complex ties of the entire company process and to solve problems in continuity (i.e. taking into account the influence of previous and subsequent parts of the process - so-called procedural/holistic thinking).
- to work with various building, technical, organisational and other restrictions;
- to design, discuss and evaluate alternative solutions from the perspective of various criteria and professions;
- to work within implementation teams (they learn organisational skills, leadership and project presentation).

The main currency of the project is that students do not simply work through a model situation, but handle tasks under the specific conditions of the department's workshops, trying out their ideas "in practice".

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