Development of information technology for advanced vocational education in agriculture in the Netherlands

Ir. L.C.M. Timmermans
SHAO, P.O. Box 64, 6700 AB Wageningen, The Netherlands
Telephone (+31) 8370 84300, Telefax (+31) 8370 84612

J.W.J. Helmonds
STOAS-ID, P.O. Box 78, 6700 AB Wageningen, The Netherlands
Telephone (+31) 8370 72711, Telefax (+31) 8370 24770,
E-mail hhe@stoaswag.agro.nl

agro informatica 7(5) / december 1994

Abstract

In the Netherlands many programs for computer-aided learning have been developed with government subsidy in order to stimulate development and use of IT in advanced vocational education in agriculture. In this article the organization of advanced vocational education and IT in the Netherlands was discussed briefly. Examples were used to indicate how research models were converted for use in computer learning, one of the products resulting from the stimulation of IT.

Keywords: IT stimulation, Higher vocational education, models.

Introduction

At the end of the eighties, colleges of advanced education in the Netherlands were lagging behind in the development and use of information technology, and in learning supported by information technology. At the time IT in higher education was stimulated by government subsidies. Higher education in agriculture also benefited from these subsidies, which were intended to enable the institutions to keep abreast of market changes, and to prepare students to cope with these changes in future employment.

Direct government involvement in IT development in higher vocational education has now been discontinued. Colleges are required to keep up with IT developments themselves and to include IT in the curricula. Innovation programs are now focusing on other areas such as internationalization, sustainable agriculture and biotechnology. The structural approach developed in IT promotion has now been transferred to these programs.

In this article, first some background information on higher agricultural education in the Netherlands is given. Subsequently, the stimulation of IT is discussed, as are the structures which have been built for developing innovation programs for this type of education. Specific computer programs are used to demonstrate the approach adopted.

Advanced vocational education in agriculture

The amalgamation of many colleges, which was stimulated by the government during the eighties, reduced the number of colleges of advanced education in the Netherlands from 400 to 65. Colleges of advanced education funded by the Ministry of Education and Science, some of which number more than 15,000 students, serve diverse sectors, such as health care and economics.

There are six colleges of higher vocational education in agriculture in the Netherlands. These colleges are independent, funded by the Ministry of Agriculture, Nature Management and Fisheries, and cooperate within the Association of Professional Higher Agricultural Education (SHAO). In total, 9,000 students are educated for a wide range of jobs, which consequently results from the broad range of courses that is offered by the colleges. Courses can be taken in the following areas: agriculture, horticulture, food tech-

nology, environment, agricultural business management, agricultural teacher training, laboratory techniques, garden and landscaping, biological agriculture, agricultural accountancy, and forestry.

Higher agricultural education is part of the agricultural knowledge network that functions under the Ministry of Agriculture, Nature Management and Fisheries. There is a close cooperation with research and research institutes, and extension services. Like the colleges, these partners in the agricultural network have experienced great changes in their relationship with the Ministry. These institutes are in a process of privatization while government funding is being reduced. The colleges also have to develop other activities to make good the decreasing proportion of funds received from the government.

As a result the colleges are not only involved in education but also in applied research. Students in the last stage of their studies carry out research projects under supervision of one or more lecturers. In addition to their regular teaching load, lecturers provide external courses or do research. Many lecturers are offered the opportunity to work for private companies, with the goal of strengtening the ties between colleges and the job market. The SHAO plays a coordinating role in this, and also coordinates the national subject-matter groups and groups of course coordinators. National subject-matter groups are made up of representatives from the colleges. Course coordinators from the same and related disciplines meet regularly to discuss both subject matter and organizational aspects.

Various activities are preferably carried out collectively or centrally, rather than separately at each college, because it is more efficient and expertise can be shared. The sectoral organization that is responsible for these activities is STOAS in Wageningen. STOAS develops training material, supports management administrative programs, and carries out research on the national labour market.

Subsidy for IT development

IT in higher vocational education was not to receive government support before a careful analysis of the issues was done. This was carried out in 1989 and the findings were published in a White Paper. The Ministry of Education and Science made extra funds available for IT development. These funds had to be used on projects proposed and carried out by two or more colleges. On average, 25 per cent of the funds were spent on the purchase of hardware and software, 15 per cent on administration and 60 per cent on educational development. Education projects were further detailed according to a number of focal points, which are beyond the scope of this discussion.

A steering committee for reviewing project proposals was set up. After a recommendation from the committee the Ministry finally decided whether a subsidy should be allocated. The preparatory work for the steering committee was done by a project manager. When the potential for subsidy became known, many project proposals were submitted. It was clear that apart from the criteria to be met in each project proposal, a further quality assessment was required, if the steering committee was not to be accused of unfairness.

The additional assessment was done to ensure that projects fitted into the existing structure as good as possible. This was built in through the process of request, approval and implementation, and assessment of the subject matter. This latter assessment was done by experts from departments and course commissions, where possible supplemented by experts from Wageningen Agricultural University, extension services and other expert centres. Not in all areas were there expertise groups. Therefore new expertise groups were established, also supplemented with external experts. The existing groups were, for example, information technology/science, agriculture, and food technology. New groups were established by people from telematics and geographic information systems. The project manager stimulated these developments.

Many parties are involved in the structure: Steering committee, Ministry, Institutes, Colleges, Branch organisations, Teachers, Teacher Associations and SHAO. All these parties have their own interests. Therefor, conditions must be clear. Arrangements were made concerning hourly rates and standards for duration of specific frequently occurring activities. Also a selection was made which activity was and which was not considered for subsidization. Finally, the products of the projects were made available to all colleges of higher education in agriculture.

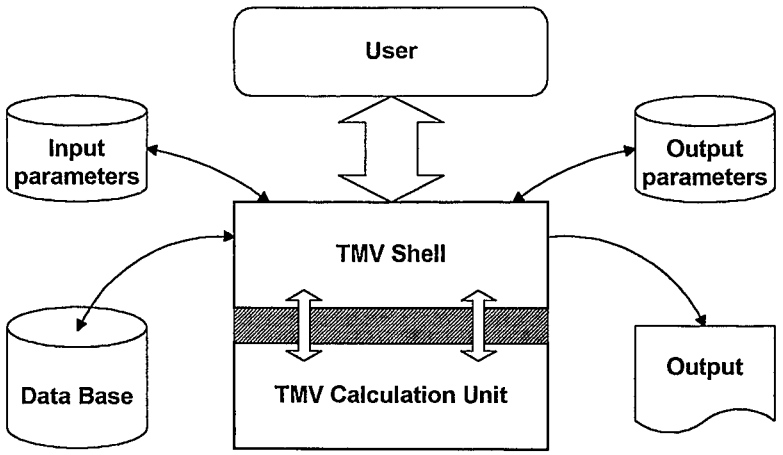
Practice

Products were developed for higher agricultural education with government IT subsidy in many projects. The goal for a number of these projects was to make models from research institutes accessible so that education could benefit from research results. These models are the outcome of extensive, multi-year research, and are published in journals, as for example, information and calculation models. Moreover, these models are mostly available as computer programs, which are generally the result of an incremental development process implemented by the researchers themselves for their own use. Such a program is characterized by a large number of input and output parameters with little structure, which make these programs not user-friendly, especially not for less-experienced users such as students. Furthermore, programs are tuned to the phrasing/wording of the researchers, which is mostly different from that of the students, extension workers or users in the private sector.

Approach in making research models accessible

A project approach is followed when converting research models into versions for education. The project team is made up of lecturers from two or more colleges, representatives from agricultural research and a

Figure 1 - TMV model: the education shell structure and the linking to the model.



user interface designer from STOAS. Efforts are made to involve extension and private enterprise as well, because they are also target groups for user-friendly research models.

Led by the designer, the project group analyses the target group/groups' need for information. In education, for example, comparison of situations and graphic output are important. The results of such analyses are translated into a design and a prototype of a shell around the computer model. The prototype is important for developing the interface. It appears to be an efficient instrument to communicate with potential users. During the design, the intermediate results of the project group are discussed by a "sounding board", ie, a wide group of potential users.

The shell has a number of characteristics that are common in user-friendly interfaces. It is standardized according to the IBM SAA-CUA (Common User Access) standard for Windows based user interfaces. It presents input and output parameters in a structured way, accessible from a main overview window. This access directly from the main window also makes it a responsive interface. It is consistent in the layout of the windows and the function of the controls. It does not require a sequence of activities from the user and it allows the user to cancel erroneous inputs.

Together with the user interface design, agreements are made about linking the shell to the calculation model. The aim is that the model communicates with the shell via an agreed collection of functions, the interface layer. The model functions as a calculation unit that exchanges data exclusively via the function interface layer. The research institute remains in charge, and will take care of further development. To increase flexibility for the researcher, a simple research shell can be developed around the model which can be expanded with the model. When over time a new stable version of the model has developed, the education shell can be extended or adjusted.

At this stage, the college staff in the project group can start preparing the handbook/manual with guidance training material for the program. This includes background information on the subject matter, instructions on program use, installation instructions and a number of cases with procedures accompanied by examples.

Examples of shells

Soil, water and nutrient simulation (SWAN)

SWAN is the shell for two simulation models, SWATRE and ANIMO developed by the Scientific Research Institute Staring DLO. SWATRE describes a groundwater flow system and ANIMO calculates the changes in the nutrients in the soil. The SWAN shell offers a large number of system parameters in a structured way, validates input and offers a number of graphic output features.

The program is available in Dutch and English.

Learning farm analysis (LerAn)

The programs LerAn Dairy and LerAn Sows are education shells around the models TVC-farm and TACT developed by the Department of Farm Management, Wageningen Agricultural University. These models simulate the fertility of dairy cows and pigs, and thus contain a large number of technical and economic items. LerAn is a learning program, in which these items are assessed with the help of number of examples. The user makes successive diagnoses of the items, analyses the problem and makes recommendations. With the model, the results are calculated and the user evaluates his/her own work. Both programs are available in Dutch and English, and will be obtainable in Spanish shortly.

Technical Model Pig feeding (TMV)

TMV is a model which calculates the effect of genotypical and environmental factors on growth, growth composition and the N and P (Nitrate and Phosphorus) excretions for pigs (hogs). By using this program, it is possible to make production more efficient. This can lead to a better meat fat ration and reduction of environmental pollution. The model was developed by several research institutes, cooperating in the TMV working group. A shell has been developed around the model for higher agricultural education. This education shell has databases of ani-

mal data, feed/fodder material and feed, water and climate schedules. The user can determine the simulation parameters and define output profiles. The shell presents output in graphs or tables. The shell structure and its linking to the model are shown in Figure 1.

It was decided to place the model in a separate software module and to have the TMV working group to manage it. This has the advantage that the software develops with modification of the model. When modifications require new input and output parameters, the shell also has to be modified.

To meet the needs of the developer, therefore, a simple research shell is available, which can grow continuously with the model. When a new and stable version of the model becomes available, the education shell can also be adjusted.

What is valid for teaching is also valid for practical applications. The research model will be used more effectively in practice if it has a user-friendly shell. Representatives from the mixed-feed industry and extension asked to implement a special practice shell around TMV, similar to the education project. At present a group of subject matter specialists are defining the criteria for the shell.

Final remarks

Development and stimulation of IT in higher agricultural education in the Netherlands has been sketched. The approach followed has led to good products for use in computer learning. In several cases, research models have been opened up for use in education. This has led to the formulation of a method for developing computer models for a wider target group.

ENTER 95, CALL FOR PARTICIPATION

2nd International Conference on Information and Communications Technology and GIS in the field of leisure time and tourism.

CONFERENCE OBJECTIVES

ENTER '95 is intended to be an international forum dealing with the use and development of information systems and communication technologies in the domain of tourism and leisure time. Information and communication systems embedded in a global net have profound influence on the tourism and leisure industry and will alter it considerably.

Geographical Information Systems (GIS), reservation systems, distributed multi-media systems, highly mobile working places and so-called "electronic markets" are the first noticeable results of this development. Advances in the use and development of tools, technologies and methodologies that have facilitated the efficient netting of information and communication systems in the tourism industry are to be presented and discussed within ENTER.

The ENTER 1994 conference had more than 1200 visitors.

Apart from scientific and technical sessions the conference offers additional tutorials, workshops and presentations for practitioners in the area of tourism. ENTER is directed towards two target groups:

system developers and researchers which are actively involved in the field of touristic information technology and methodology as well as system users and practicians interested in a further discussion of the subject. Both these groups will be offered presentations to facilitate and support communication. ENTER represents the first international forum of this kind and is intended to held in regular intervals.

SCIENTIFIC RANGE

The program committee with members originating more than 15 countries, has reviewed and selected about 30 papers of high quality. General Program chair: Prof. Dr. A Min Tjoa (University of Vienna, Austria).

The accepted contributions in the scientific and technical range cover the following areas:

- enterprise modelling
- decision support systems and expert systems
- distributed systems
- information system architectures
- reservation systems
- management information systems
- multi-media
- optimization and simulation models
- virtual reality and tourism

For more information about the scientific range you may contact Chris Meijs, Wageningen Agricultural Univeristy, Department of Computer Science, Dreijenplein 2, NL-6703 HB Wageningen, The Netherlands (e-mail: meijs@rcl.wau.nl).

LOCATION

The ENTER 95 conference is scheduled for 18-20 January 1995 in hall 2 of the Innsbruck Fairgrounds in Austria. For a full ENTER advanced program, please contact the Tyrol Board, Bozner Platz 6, A 6010 Innsbruck, telephone 43-(0)512-5320-218, Fax: 43 (0)512-5320219.