

Impacts of the Bologna Process and of New Public Management on the Academic Surveying Education in Austria

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Key words: Bologna Process, New Public Management, Austria, Surveying Education

SUMMARY

In June 1999 the Ministers of Education of 29 European countries signed the *Bologna Declaration to create a European area for higher education in order to enhance the employability and mobility of students, researchers and teachers and to increase the international competitiveness of European higher education*. In August 2002 a new Austrian university law was enacted to create the legal framework for the implementation of the *Bologna Process* and to establish principles of *New Public Management* at the universities. The mentioned activities at European and at national level had a huge impact on the organization and on educational issues of Austrian universities. The adoption of new curricula and organizational structures are results of these challenges. This paper focuses on the academic surveying and land management education in Austria: After a short overview of the new curricula and the new operational framework, the impacts, strengths and the weaknesses of the new system are outlined.

ZUSAMMENFASSUNG

Im Juni 1999 unterzeichneten die Bildungsminister von 29 europäischen Ländern die Bologna Deklaration zur Bildung eines gemeinsamen europäischen Hochschulraums. Damit soll die Arbeitsfähigkeit und die Mobilität von Studierenden, Forschern und Lehrenden verstärkt und die internationale Konkurrenzfähigkeit der europäischen universitären Ausbildung erhöht werden. Im August 2002 wurde in Österreich zur Implementierung des Bologna Prozesses und zur Realisierung der Prinzipien einer "Neuen Öffentlichen Verwaltung" ein neues Universitätsgesetz erlassen.

Die genannten Aktivitäten auf europäischer und nationaler Ebene hatten eine große Auswirkung auf die Organisation und das Ausbildungssystem an den österreichischen Universitäten. Die Anpassung von Studien und neue organisatorische Strukturen waren die Ergebnisse dieser Herausforderungen.

Dieser Artikel spezialisiert sich auf die akademische Vermessungsausbildung und die vermessungstechnische Ausbildung von Landmanagern in Österreich. Nach einem kurzen Überblick über die neuen Studienangebote und den neuen operationellen Rahmen werden die Auswirkungen, die Stärken und die Schwächen des neuen Systems skizziert.

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1. INTRODUCTION

“In our society nowadays the most important production factor is not labor, not capital, and not land – today the most important production factor is the knowledge of employees in our enterprises” (Drucker, 1993).

In several countries politicians and managers of enterprises recognized this finding of the Austrian-American economist Peter L. Drucker about the importance of the resource *knowledge*. Evidence of the increasing awareness of knowledge as an important economic and social element can be seen in the implementation of a huge number of life-long learning programs and by the efforts of the European Union to promote, to coordinate and to standardize education and training – the two most essential ingredients for the production of *knowledge*.

Research centers and education institutes - like universities - have a responsible role in the development and in the transfer of knowledge. They have to promote and deliver qualified education and they have to guarantee practice-orientated training. But these educational institutes also have to meet the challenges of a worldwide doubling of knowledge within five years (Rüttgers, 1999).

In the field of surveying a lot of new technologies, like GNSS (Global Navigation Satellite Systems), GIS (Geographic Information Systems), HRSI (High-resolution satellite images), and Laser Scanning Technology were introduced in the last two decades. The applications of all these new technologies require well-educated professionals. This fact and additional new tasks in the field of land management (e.g. risk management) led to an increasing demand on surveyors as well as to an extensive revision of study programs.

Austria has a long tradition in Surveying Education. The first course in surveying was started in the year 1858 at the Technical University of Vienna. Since that time the number of lectures and study courses in the field of surveying at academic level has increased. At present eight Austrian Universities and two Universities of Applied Sciences provide education on surveying in different extents (as specific study courses or as part of other technical studies).

Since the last five years Austrian universities had to cope with essential changes of the political, the administrative, and the legal framework:

- A new organization structure and a business-oriented administration structure were introduced.
- The implementation process of the Bologna declaration started to establish a unified European-wide academic education area.

- Mobilization programs of the European Union for teachers and students and the introduction of modern electronic teaching tools led to an internationalization of academic education.

The above-mentioned changes in the field of surveying and in the organization of academic education are effecting the surveying education in Austria, which will be discussed in the following chapters.

2. NEW CHALLENGES FOR AUSTRIAN UNIVERSITIES

2.1 Bologna Process

In 1998 the *Sorbonne Declaration* highlights the key role of universities in developing European cultural dimensions. The content of this declaration fits well to the general EU context of mobility and employability of European citizens. In 1999 the European Ministers of Education signed the *Bologna Declaration* to establish a European area of higher education with the following main objectives:

- Easy readable and comparable degrees
- A system based on two main cycles (undergraduate and graduate)
- A system of credits promoting student's mobility (ECTS-points)
- Mobility for students, teachers, researchers and administrative staff
- European co-operation in quality assurance
- European dimensions in higher education.

To guarantee a continuously support, a permanent supervision and necessary adoptions to the current needs the ministers agreed to meet every two years. At these meetings (Prague - EME, 2001; Berlin – EME, 2003, Bergen – EME, 2005) additional goals were defined and added to the above-mentioned list:

- Lifelong learning as an essential element
- Involvement of higher education institutions and students
- Promotion of the attractiveness of the European Higher Education Area
- The two pillars of the knowledge-based society are the European Education Area and the European Research Area
- Stocktaking
- Further challenges and priorities (e.g. the need for structured doctoral programmes).

The *Bologna Process* requires a restructuring of almost all study programs in most of the European countries until the deadline of 2010. Until 2005 the two-cycle degree system (bachelor and master) was already implemented in many European countries. Also the Austrian universities are on good the way to implement the new study course structure. Within the realization an essential bottleneck can be observed: There is not additional money provided for the universities to plan the new structures and to implement the new study programs.

In Austria many requirements of the restructuring process are influenced by neighbor countries. Germany has implemented the system of the “Numerus Clausus”, a performance-orientated allocation system for limited study places. As Austria has the system of “Open Access to Studies” a huge number of German students – with a dismissed application - are enrolling the study courses in Austria. Due to the unified European study area Austria has to allow these enrollments with the consequence of a reduction of study spaces for Austrian students.

Generally the *Bologna Process* can be seen as a “Success Story of European Integration” with an increased flexibility, higher mobility and a growing internationalization. Various bachelor and master courses of various universities can be combined in different intensities supported by new teaching methods.

2.2 New Public Management

New Public Management is a management philosophy used by Governments since the 1980s to modernize the Public Sector ... The main hypothesis in the New Public Management - reform wave is that more market orientation in the public sector will lead to greater cost-efficiency for governments, without having negative side effects on other objectives and considerations (Wikipedia, 2006).

In 2001 the Austrian Government took the decision to implement *New Public Management* at the Austrian universities by defining the following objectives (bmBWK, 2001):

- Modern performance-orientated public services law to improve the mobility of staff
- Guarantee of a high level of autonomy for the universities
- Global budgets for the universities without any binding (Reduction of cameralistic)
- Core competences for individual universities
- Enhancement of the competition between universities

By passing the University Law in the year 2002 (UG 2002) universities were constituted by the Austrian Parliament as legal entities of public law. The expression “legal entity of public law” indicates the government’s sovereign duty on academic education and research as well as on financing the universities. The autonomy of the universities means the unification of decision making and responsibility at university level.

Management and business models of the private sector, like project management, management by objectives, cost accounting, and quality management, were introduced to achieve a more efficient administration. The concept provides the transition of universities to business-, and customer-orientated service institutions. The administration at university level has to perform all operative tasks whereas the policy (government and ministry) has to define the strategic framework and to promote monitoring and strategic controlling.

New Public Management means high personal responsibility, mobility and flexibility of the public servants. The old employment system of university staff with long-term or permanent contracts without any performance-orientated remuneration seems to be a contradiction to the modernized administration system. As most of the employed persons at the university are still in the old system, an incentive wage system can be realized only gradually.

3. PRESENT STATUS OF ACADEMIC SURVEYING EDUCATION IN AUSTRIA

Academic Surveying education is provided at many different universities in Austria with various intensities. Specific surveying study programs are offered at two universities. But at many other universities surveying specific contents are delivered to students of other study programs. The content of the lectures provided by the universities covers the whole spectrum of surveying education: geodesy, land surveying, engineering surveying, cadastral surveying, land administration and land management, surveying law, photogrammetry, remote sensing, and geoinformation.

3.1 Study Courses in Surveying

In Austria Study Courses in Surveying are provided at two universities: at the University of Technology in Vienna and at the University of Technology in Graz. Both universities have already changed their surveying study programs from the traditional *diploma study system* to the *bachelor* and *master study system* following the guiding principle of the *Bologna Process*. Only in one issue Austria did not adapt the European-wide concept: the final degree of the master study programs is still *Diplom-Ingenieur* (in the English translation given as Master of Science, however).

3.1.1 University of Technology Vienna

The university was founded 1815 and is the home for 2.000 lecturers and scientists, and 16.600 students. 20 per-cents of all students are coming from other countries.

This huge organization is structured in eight faculties that are:

- Mathematics and Geoinformation
- Physics
- Chemical engineering
- Informatics
- Construction engineering
- Architecture and land use planning
- Mechanical engineering and science management and
- Electro- and information technology.

Following the Bologna principles all study courses got re-designed until summer 2006 (structured in bachelor & master).

Especially the study course “Surveying and Geoinformation” was adapted in summer 2005 and includes one bachelor and three master programs. The bachelor program splits at the 3rd semester either to *Geodesy* or *Geoinformatics*. The three master programs are Land Surveying & Cadastral Surveying, Geodesy & Geophysics, and Geoinformation & Cartography (Figure 1). The change to the new system was accompanied by an increase of beginners up to a number of 60 students.

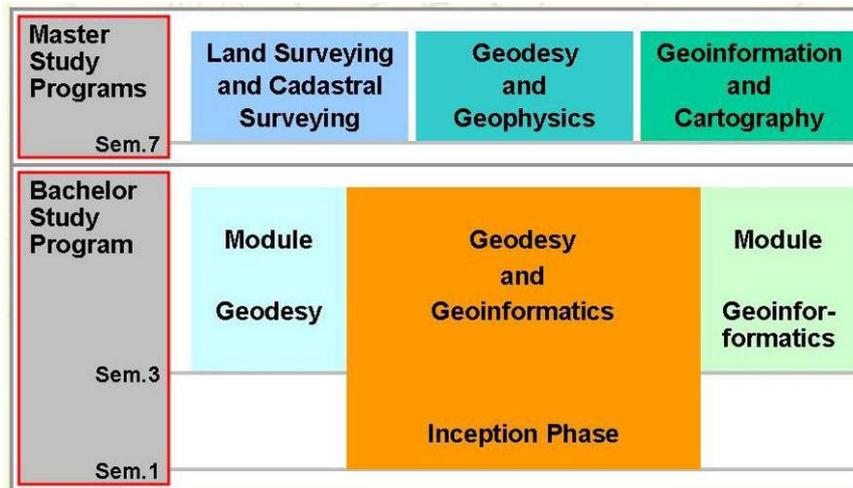


Figure 1: Structure of Study Courses in Surveying and Geoinformation at the University of Technology Vienna

3.1.2 University of Technology Graz

About 9.000 students (15 per-cents international students) are educated by approximately 1.000 academic staff members of the University of Technology in Graz. Currently the students can take choice of 13 traditional diploma study programs, 7 bachelor study programs and 4 master study courses.

The focal points of this university are shown by their seven faculties:

- Architecture
- Civil Engineering
- Mechanical Engineering, Economics
- Electrical Engineering and Information Technology
- Mathematical and Physical Sciences
- Chemistry, Chemical- and Process Engineering, Biotechnology and
- Computer Science.

In the study year 2001/2002 the new Bologna-adapted study program *Geomatics* was offered for the first time. This surveying study program is structured in two parts according to the requirements of the unified European area of education:

- Bachelor program *Geomatics Engineering* and
- Master program *Geomatics Science*.

The bachelor program (six semesters) is orientated to “Geo” and “Informatics”. It is followed by the master program. The main focus of this part is multi-disciplinarily cooperation. It is scheduled for four semesters and covers main subjects, as geoinformation, satellite geodesy, navigation and engineering surveying. Depending on his/her individual profile of education every student can choose between a lot of optional subjects.

3.2 Surveying lectures as part of other technical study courses

3.2.1 BOKU-University of Natural Resources and Applied Life Science Vienna

BOKU is a teaching and research institution that focuses on renewable natural resources. 5000 students – of which 15% are international – are educated in various courses to achieve competence in fields, like:

- Land and water management,
- Environmental Sciences,
- Agricultural, Forestry and Wood Sciences,
- Biotechnology and Food Technology.

In order to fulfil the requirements of the EU's Bologna Agreement with respect to curriculum development, the university has redesigned the study course (curriculum) structure from five diploma courses to 9 bachelors and 19 master study courses (curricula) within the last four years.

Within the courses the Institute of Surveying, Remote Sensing and Land Information (IVFL) offers education in geomatics for several study programs on bachelor and master degree (*Figure 2*). The whole spectrum of geomatics - including field and cadastral surveying, photogrammetry, remote sensing, GIS and GPS - is provided to approximately 450 students per year in 6 bachelor and in 10 master study programs.

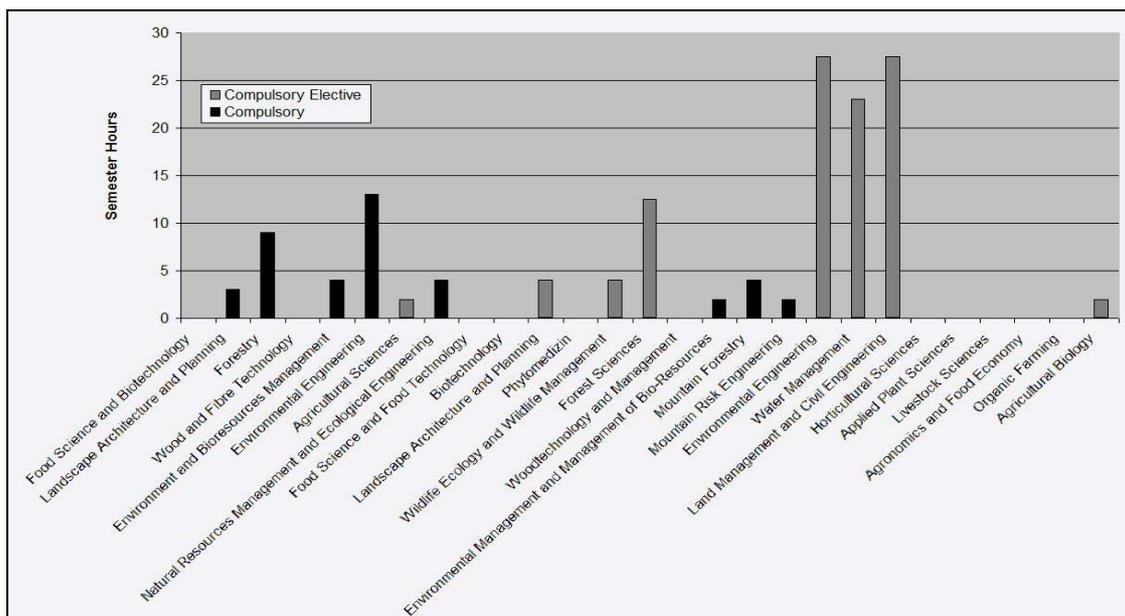


Figure 2: Courses provided with geomatics education at BOKU (in 2005/2006)
(1 Semester hour = 1 lecture unit of 45 minutes per week during one semester)

3.2.2 Other Universities

3.2.2.1 University of Innsbruck

At the faculty for construction engineering of this university a bundle of lectures with main topics in land surveying, photogrammetry and GPS is offered for students of the study programs civil engineering and architecture.

3.2.2.2 Carinthia University of Applied Sciences (Fachhochschule Technikum Kaernten)

One of the 9 bachelor programmes is *Geoinformation*, which was established a few years ago. This study is strongly orientated to practice and the students are doing most of their work in projects. The number of students is limited to 24 per year.

With the study year 2006/07 the university started in addition to the existing two master degree programmes five new ones – all in the field of information technology.

3.2.2.3 Co-operation of the University Linz and Graz University of Technology

In a co-operation the University Linz and the Graz University of Technology are offering two individual diploma studies in the city of Rottenmann/ Styria. One of these studies is *Geoinformation Technology (GTEC)* with duration of 8 semesters. The key aspects are geoinformatics, computer sciences, and business economics.

3.2.2.4 Other Universities

There are also some courses and lectures at the Universities in Vienna, Salzburg, Klagenfurt, and Graz, which are touching the field of surveying and geoinformation, especially in the studies of geography and cartography.

4. IMPACTS AND EVALUATION

As mentioned in *Chapter 1* the universities had to manage several essential changes within the last decade. Especially the implementation of the Bologna Process and the introduction of New Public Management at Austrian universities caused a number of adaptations in the administrative structure of the universities and in the arrangement of study courses.

The following chapters point out the impacts of *Bologna Process* and *New Public Management* on the academic education in general and on the surveying education in Austria in particular. The outlined strengths and weaknesses are based on the experiences of the three authors, representing the Vienna University of Technology (TUW), where full study courses in surveying are provided, and the BOKU University of Natural Resources and Applied Life Sciences Vienna (BOKU) delivering numerous surveying lectures for other technical study courses. The comments are based on the current status of the implementation of *Bologna Process* and of *New Public Management* at both universities being aware that the implementation process is not completed yet.

4.1 Bologna Process

4.1.1 Impacts

The adaptation from a two-cycle study system (diploma study, PhD) to a three-cycle system (bachelor, master, PhD) required a re-organization of all study courses. All universities providing surveying education in Austria had to adapt the curricula for professional education on a bachelor level and scientific education on a master level.

Simultaneously the contents of lectures were modularized to facilitate an increased mobility of students within the European study space, as the developed *European Credit Transfer System* (ECTS) enables an unbureaucratic mutual recognition of lectures.

The splitting of the diploma study courses caused a diversification of education in specific master study programs. At TUW the diploma master program (“Surveying and Geoinformation”) was replaced by one bachelor study program and three master study courses (“Geodesy and Geophysics”, “Land Surveying and Land Administration”, “Geoinformation and Cartography”). BOKU reorganized the five diploma study courses to 9 bachelor and 19 master programs.

As a consequence of the increased mobility of students and also of teaching staff due to EU-funded mobilization programs a number of lectures and practicals are nowadays provided in English language.

At TUW the rate of growth of first-year students (bachelor program) was approximately +60 per-cents. As the bachelor course is introduced at TUW since one year, it is not valid to conclude that the new system is more attractive for students. But the general trend that the new structure of studies is more attractive for national and international students is proofed at BOKU and at the Graz University of Technology (TUG) with an observation period of at least three years.

4.1.2 Strengths and Weaknesses

The increased mobility of students and of education staff provides better cooperation conditions with other European research institutions and intensifies the internationalization of the Austrian universities and facilities. The *European Credit Transfer System* (ECTS) simplifies the mutual recognition of lectures between the European universities. But the scores for comparable lectures have to be standardized and harmonized.

The diploma study courses were scheduled for five years. Many of the students stopped their studies with an average duration of six to seven years without any final examination. As the bachelor study courses enable students to finish their studies within a realistic time frame of three years, the students will be motivated to finish the bachelor study courses. This expectation will meet one defined goal of Austrian politics, namely the goal of increasing the quote of academics.

Nowadays the bachelor degree is not really accepted as an academic degree in the professional life: Bachelors are not yet A-graded (academic level) in the Austrian public administration and up to now the Austrian Law regulating the profession of licensed surveyor was not adapted for the new bachelor degrees. At the Graz University of Technology (TUG)

almost all students of the bachelor study course “Geomatics Engineering” also inscribed the master study course “Geomatics Science”. The high quote of students pursuing the surveying education in a master course also reveals the lack of required bachelor graduates on the job market.

In the field of surveyors the knowledge has been multiplied in the last decades due to new data acquisition systems, new data processing software, and new tasks. With it the demand for an extensive education raised continuously. Shortening of study courses and reduction of lectures are a contradiction to this fact.

The intention to guarantee a professional education within the bachelor program (“*Employability*”) and a professional scientific education in the master course studies is a wishful thinking of politicians. In reality it is impossible to embed a full professional surveying education as well as a full fundamental education in natural sciences and engineer sciences into a three-year bachelor program.

Also the objective of a higher flexibility in combining bachelor and master study courses is still yet unfulfilled at Austrian universities in general and in the surveying education in particular. Surveying students at TUG as well as the majority of students at BOKU select the master program in the same field of science. This may be caused by the tradition of the former academic education system with a first and a second study phase. But it also can be seen as indicator that the present bachelor study courses are designed for the imparting of basic knowledge for a following master study course in the same field of science and as fact that for sophisticated study fields – like geodesy or other technical sciences - the bachelor degree is an intermediate stage for the master program.

In Austria the two-cycle approach is not yet accepted as a possibility for a broader education. The selection of a bachelor and a master program in two different fields of sciences is permitted in law but limited in reality: it is unrealistic to start a master program in geodesy with a bachelor degree in social sciences and vice versa.

The implementation of the *Bologna Process* led to a reduction of lecture hours in all study courses with the benefit of a reconsideration and clearing of obsolete contents. Additionally, the increasing knowledge in surveying requires additional lecture time. It was a compromise to compress contents. The effect of shortening technical contents was triggered by the instruction of the European Union to integrate soft skills into the first cycle of academic education. At BOKU the education of non-core subjects got reduced in favor of lectures of core subjects with the result that surveying lectures were shortened above average.

The need for students to write two scientific theses – a bachelor thesis and a master thesis – requires additional individual supervision by academic staff. As the universities cannot afford extra academic staff this benefit for students is faced by an additional workload for lecturers.

The level of implementation of the *Bologna Process* is very different in Austria. Four years ago BOKU adjusted the first study course to the new system. Within two years all the diploma study programs were adapted to the two-cycle approach with bachelor and master degree. At TUG the transition of the surveying study program to the requirements of the Bologna Process was done three years ago and at the surveying study program at TUW started in this year with its first bachelor study course.

The first phase of implementation was characterized by a lack of coordination and communication between universities at national and international level. This may be caused by the time pressure and by a former regulation that at least 70 per cent of the existing lectures of the diploma courses must be retained in the new study programs.

Without doubt a unified European area of education has a lot of benefits. The mobility of students and staff members and the flexibility in the selection of education sites supports the internationalization of academic education. But the step of harmonization involves also certain dangers and some of them were neglected in the first approach of the implementation:

- The structure of the European-wide three cycle study programs was adopted from the Anglican study system neglecting the existing first and the second educational system in Austria with the result of now overlapping professional education courses.
- Standardization and harmonization require strongly developed quality assessment systems. Even though politicians and university managers within the European Union are aware about this necessity (European Ministers, 2005), until yet a concept of quality assurance is missing.

At all Austrian universities the transition phase from the previous study system to the three-cycle study system is not yet finished. The new study courses are introduced step by step, beginning only with students of the first year. Continuously the programs are extended with the following study years. At the same time the students have the chance to finish their diploma course programs. Therefore the institutes have to provide lectures for the previous and the new study programs. Often lectures of the new system are recognized as an equivalent lecture for the still existing diploma study system.

The admission for a master study program depends on a successfully finished bachelor study course. As students are permitted to visit a limited number of lectures of the master program without any bachelor degree this requirement sometimes causes study delays for students in the transition phase from bachelor to master program.

Another problem must be solved by politics. In general the public scholarships for students are only planned for one study course. In the previous system the financial subsidies were at least five years for the duration of a diploma course. Nowadays the financial support in some cases will be stopped for students after having reached their bachelor degree.

4.2 New Public Management

4.2.1 Impacts

The decision to vest the universities with a higher degree of autonomy was taken some years ago. Since that time the transition process from a former *centralistic cameralistic system* to *New Public Management* took place at all universities with different speed and different intensity.

All universities were forced by politics to define their missions including their core research fields and they have to develop their own strategies at all levels of university administration (university level – faculty level – department/institute level). Additional university staff had

to create change management plans to guarantee the operative implementation of the developed strategies. At some Austrian universities the organizational structure was reconsidered and new administrative units were created.

The introduction of the new administration system, which gave the universities more flexibility in managing human and financial resources, caused an increase of administrative staff members at the universities.

Since the implementation of the new system the university employs staff in their own responsibility. However they are committed to public services law. As the previous contracts of university staff with a public employment (often in form of civil servants) could not be cancelled or changed due to the Austrian laws, the university nowadays has to manage several employment systems.

One objective of *New Public Management* is cost recovery. The managers of the university and the institutes have to involve public and private partners in expanding their project activities and to provide services to get revenues and to increase cost recovery. An additional goal of *New Public Management* is to focus increasingly on customer orientation. In the case of universities the customers are students as well as investors and partners of research projects.

Impacts of both mentioned objectives can be seen in the integration of research activities in the business plans of individual administration units as well as in a customer (=student) satisfaction survey in form of evaluations of lectures and lecturers.

4.2.2 Strengths and Weaknesses

In general the universities benefited from the introduction of New Public Management in the academic education. The increased autonomy allows more flexibility in the management of financial and human resources. Nowadays the universities receive from the Austrian Ministry of Science, Education and Culture a yearly budget consisting of fixed part and of a variable part based on predefined performance indicators. The universities are free in the assignment of this money.

The development of strategies and the elaboration of short-term and mid-term business plans were very time-consuming processes and both activities required a high input of human resources. From now on an additional workload for lecturers and scientists is caused by the required detailed documentation of activities for controlling purposes. It is beyond dispute that the authors of this article consider the business plans and the controlling processes as necessary management tools, but politics and university management have to be aware about the general shift of working capacities from scientific and educational tasks to administrative activities.

BOKU restructured its administrative units with the introduction of *New Public Management*. About 60 institutes of the former structure were merged into 14 new departments with own budgets allocated by the university management. As in reality most of the decision making is still done at the institute's level, currently the restructure process means more or less an additional hierarchic level in the administration. But a closer

cooperation of academic staff in the departments is evident and therefore the traditional barriers between the institutes will disappear in the future.

A weak point during the transition process was the software application for processing all the administrative data. The Austrian government provides country-wide the software package SAP (“Software, Anwendungen, Produkte in der Datenverarbeitung“) for public institutions with own autonomy. As the software was not fully adopted for the requirements of a university management at the beginning, the shortcomings of the application often lead to frustration and discouragement of staff members.

In general the new public services law allows only short-term contracts for academic staff. In the case of research and teaching assistants an extension of an employment is impossible. The missing perspective of an academic career leads to a decreased attraction of vacant positions. The consequence is a less choice of appropriate job applicants. A modification of the existing law is in progress.

5. SUMMARY AND OUTLOOK

The implementation of the *Bologna Process* and the introduction of *New Public Management* brought radical changes for the Austrian universities in general and to academic institutions providing academic surveying education in particular. All study courses in surveying or curricula with an essential part of surveying education were adapted within the last four years to the three-cycle educational system of the European-wide study area.

The increasing numbers of students in various surveying courses are indicators for the successful transformation from the previous diploma study courses to the current bachelor and master study courses. First experiences at TUG and BOKU identify little willingness of students to finish their studies after achieving the bachelor degree or to select a master study program in another field of science.

The transition from a centralistic administration to the more autonomic system of the *New Public Management* was time-consuming for academic staff at all management levels of the university. This inconvenience and the increased pressure of performance for staff members will be compensated by the increased flexibility of financial resources and the self-reliance in human resource management.

The process of the creation of a European study space and the transformation to a modern public administration system cannot be seen as completed. The above outlined weaknesses of the systems require a verification of defined objectives and some moderate changes in the operative realization. In Austria the study courses in specific fields of science have to be communicated and coordinated between universities and other relevant educational institutions.

High priority must be given to the introduction of a quality assurance system to guarantee the high level of academic education in Europe. The urgency of this requirement is enhanced by the increased time-independency as well as site-independency of students and lecturers due to the mobility programs of the European Union and new electronic teaching tools (e.g. “eLearning”, Virtual Universities”).

The next challenge of a unified global study area requires a lot of communication and coordination between politicians and educational experts. Additionally the necessity of an institutional body for supervising and the harmonization processes from a professional point of view is given. The *Joint Board of Geospatial Information Societies* is predestined to take leadership for this task.

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BIOGRAPHICAL NOTES

Reinfried MANSBERGER currently works as an Assistant Professor at the Institute of Surveying, Remote Sensing and Land Information at the University of Natural Resources and Applied Life Sciences, Vienna (BOKU Wien). In 1982 he obtained his Master's degree in surveying at the Vienna University of Technology. His PhD degree he obtained at the BOKU Wien. He is in the editorial board of Ashgate "Land Management Book Series" and involved in FIG as Commission 3 Vice Chair on Administration and Information. Reinfried Mansberger is an elected member of the European Faculty of Land Use and Development and Council member of the Austrian Society of Surveying and Geoinformation. His research

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Shaping the Change

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work is focusing on Land Use Planning, Land Information, Environmental GIS Applications, and Cadastral Systems.

Harald SCHUH, full Professor and Head of the Institute of Geodesy and Geophysics, Vienna University of Technology. Chair of the Study Advisory Commission and Vice Study Dean. Major areas of scientific interest are VLBI and other space geodetic techniques, analysis of Earth orientation parameters and modeling the excitation of Earth rotation. M.S., 1979, geodesy, University of Bonn, Germany. Ph.D., 1986, Univ. of Bonn. Elected member of the IVS (International VLBI Service) Directing Board and of the IAG Executive Committee. President of IAG Subcommission 1.4 "Interaction of Celestial and Terrestrial Reference Frames". Served as a member or consultant of various commissions and working groups in geodesy (IAG) and astronomy (IAU). Coordinator of the German Research Group on Earth Rotation. Authored or co-authored 62 refereed publications; editor of eight books or proceedings. Serves in the editorial board of Journal of Geodesy.

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