Values, attitudes, and goals of future Hungarian food engineers

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Summary

Over the last few decades Hungarian higher education has been radically transformed, and this transformation was implemented to counter the backwardness that previously plagued the education system. Agricultural education in particular was part of this transformation process, which included the disciplines of food science and related technology. This attempt at transformation yielded only a partial success; student numbers shot up, but there was no subsequent general improvement in the efficiency of higher education. This article is based on two surveys carried out in 1997 and 2007. The students' values can be characterised as pluralistic and heterogenous. Based on longitudinal research, a shift can be seen toward materialistic and hedonistic values. The motivation for choosing the Faculty of Food Science is varied in nature, mirroring the food industry's often critical current situation. High schools' professional orientation is weak. Although the Faculty's Budapest location is attractive, in the long run this is not sufficient to replace carefully planned promotional work. By structural equation modelling a significant relationship can be proven between the students' values, their types of knowledge, and their expectations for future types of work.

Key words

higher education policy, human resource management, food science education, social psychology, empirical research

Introduction

The Hungarian education system's current situation is generally hard to understand, and this is particularly true for agricultural higher education (including food science and related technology) without a rough historical overview in which it is possible to divide the last ninety years into three periods.

Between the two world wars the structure and functioning of universities and other higher education institutes mirrored the semi-feudal, highly centralised structure of Hungarian society (Berend, 1998). The overwhelming majority of students came from the thin layer of upper or middle-class families (Simkus and Andorka, 1982). The ruling political and social elite as well as the churches worked all out to maintain "traditional Hungarian" values in the universities (Ladányi, 1993). The institutes had a fairly rigid organisational structure and curricula system. The lack of real competition among the universities meant there was no pressure to increase the efficiency of scientific and pedagogical work, but the universities had close bonds with foreign universities (above all German ones) and this strengthened the development of education (Palló, 2000). This system was characterised by its excellent working high school and professional qualification system, which was based on competition within and between the secondary schools (Palló, 1984). Professional education was closely geared to the needs of the expanding industrial sector and produced skilled graduates from technical high schools and colleges (Kárpáti, 1995).

Agricultural higher education had a modest role within the higher education system. In fact, there were only three agricultural faculties, and education was mainly practically oriented. The food engineer did not exist as specialists working in food industry enterprises had veterinary or chemical engineer qualifications.

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The end of the second world war brought in the communist era and in the second half of the 1940s there was a rapid and profound transformation in higher education. Many cadres in the new political elite had no higher education which is why they were wary of the intelligentsia. The most important aspects of this period were as follows:

- The political sphere's absolute supremacy in determining each and every strategic aspect regarding higher education institutes which were transmitted by various organs of the Hungarian party state. (Litván et al., 1996).
- Direct control of students, admitted to universities and high schools. The Party stressed careful vetting when it came to "new members of the intelligentsia". Student admission was 5 to 10 fewer than available spaces in order to filter out "unreliable" students. Even as late as the 1980s, students were sometimes granted post-secondary degrees without even having completed high school (Hanley and McKeever, 1997).
- At each level of higher education and in each institute compulsory ideological disciplines were introduced (Péteri, 2005).
- The organisational structure of scientific life and institutional systems resembled those in the Soviet Union (Péteri, 1993; Rainer and Péteri, 2005).

The contradictions of this systems became obvious in the early 1980s (Palovecz, 1985). In the early 1980s a Hungarian Socialist Workers' Party task group pointed out that the major problems facing higher education were the low number of students, compared to the developed states, and the fragmented structure of higher education. Other major problems were the separation of research and higher education, and that higher education facilities were scattered all over the place (Palovecz, 1987). Moreover, the basic problems facing the Hungarian higher education structure had been obvious for more than two decades.

During the post-Soviet era, the supposed change in the social system entailed totally altering established paradigms in almost every aspect of society and economy.

Analysing the government post-Soviet era programmes, it is obvious that every Hungarian government insisted on the strategic importance of higher education, but according to the specialists who analysed and evaluated the last two decades of Hungarian higher education there is a consensus on only one thing: **the number of students in universities and colleges exploded** and-if one focuses solely on this indicator-Hungary has supposedly caught up with the developed countries. In the late 80s, young people between 18-22 only composed 15% of student ranks, but in 2007 they composed 48% (HCSO, 2007). Other than on student numbers, public and professional opinion is completely divided regarding higher education. A good example of this ambivalence is the title of a Hungarian book on higher education problems. "Knowledge Factory or Paper Factory?" (Polónyi and Tímár, 2001)

A cursory glance seems to indicate that early 1980s reforms produced precisely the opposite of what they intended (Table 1).

Table 1

Governmental goals and their realisation in higher education system

Declared goals of different governments	Reality
Integration of higher education system: decreasing the number of higher education institutes	Increasing the number of higher education institutes
Increasing the quality of higher education	Inflation of value of diplomas, issued by the higher education
Increasing the personal interest of teaching staff in upgrading of quality of teaching	Increasing alienation of teaching staff from teaching, increasing distance between personal career and teaching burden and quality
Increasing of practice-orientation of higher education research	Decreasing practice orientation of academic sphere

Source: interviews with nineteen specialists, holding key positions in the Hungarian higher education system during the last fifteen years

Around the new millennium, Hungarian universities were ill-prepared for new challenges such as competition for students, inter-university competition, a changing relationship with the economic sphere. An erratic science and higher education policy could not adapt to the new economic and social environment.

Adapting to the new challenges has been especially important for agricultural education. After the second world war, parallel with the development of agricultural and industrial food production, there has been a rapid increase in demand for agricultural engineers, due to growing technical and technological advances in agricultural and industrial food production. But this greater demand is also due to Hungarian agriculture's successful model which integrates small and large-scale agricultural production and food processing. In one aspect, this comprised systematic development of former agricultural faculties, universities or academies, but also the establishment of new universities and colleges. Along with the increasing importance of industrial food processing, in the late 60s and early 70s new institutes were established. These were the Szeged Food Industry College and the Faculty of Industrial Preservation within the Budapest University of Horticulture. At this time education of food engineers was focussed on practical knowledge and teaching different food technologies. In the 80s the curriculum changed: the associated food science disciplines of microbiology and food chemistry gained in importance, because the development of industrial food production necessitated that specialists be better versed in their field. In post-Soviet Hungary the food industry has faced new challenges. The collapse of the former export system greatly limited the possibility of selling large quantities of low quality industrial food products. Due to these processes, food industry companies needs tilted toward food industry engineers, but it is worth mentioning that even then the food industry lacked specialists.

During the1990s numerous new trends surfaced in the Hungarian food economy. The most important of these are as follows:

- increasing importance of food safety and quality, and product-traceability;
- profound changes in food industry ownership structure because of privatisation, driven by foreign direct investment;
- fundamental changes in the food distribution system, and the emergence of large-scale food trade enterprises, combining wholesale and retail functions.

Simultaneously, there were fundamental changes in teaching at traditional agricultural universities and colleges. Formerly, these institutions had focussed on agricultural production. Demand for agricultural engineers seemed to be saturating, motivating the institutes to diversify, but they continued to create food engineering graduates. Going beyond the two existing facilities of food science and technology, this trend gave birth to numerous other faculties at other universities.

The Hungarian food industry was facing new challenges in first years of the new millennium. The most important strategic questions are as follows:

- increasing value added content of products, because the value added production of one Hungarian food industry worker is only one half the EU(25) average;
- increasing import competition in domestic markets;
- increasing food safety, with special emphasis on modernization and the operation of product-traceability systems. Preparing the food chain for possible or deliberate food safety events;
- development and production of healthier products, physical fitness and consumer health;.
- development of post-harvest technology within agricultural production, enhancing integration between agricultural production, food processing, and trade;
- preparation for new challenges caused by global warming;
- reducing food processing's environmental impact;
- utilisation of bio-energy;
- expanding knowledge transfer, enhancing food processing systems in other nations, especially in Third World countries through dissemination of scientific and technological results;
- expanding the level of services linked to food production (e.g. consulting, integration of food products into tourist attractions);
- combining food processing and catering and HORECA (hotel, restaurant, coffee) sector;
- improvement of food logistics systems in line with "from farm to the table" concept.

Obviously there are numerous new challenges facing the Hungarian food industry.

Under these conditions, the organizational and financial problems of higher education have gained in importance, but only a few studies are available that analyse how students see themselves and the educational process.

Theoretical and methodological considerations

The basic research methodology was survey questions, based on a questionnaire with 180 items.

In 1997-98 a comprehensive survey was conducted in various faculties to gauge student values, attitudes and goals in Hungarian higher education. In the survey's first stage 256 responses were obtained from the Faculty of Food Science. Results of this survey were published in the year 2000 Hungarian Journal of Higher Education. Ten years later, in 2007, we conducted the same survey with students from the Faculty of Food Science. Educational reforms mean the education system entails eight (!) different curricula. In our research we focused on regular students and obtained 450 valid responses, derived from students in different stages of their education.

Values are ideas held by human individuals or groups about what is desirable, proper, good or bad. Varying values represent key differences in human culture. What individuals value is strongly influenced by the specific culture in which they live (Giddens, 1997).

In sociology it is a subject of debate whether values are measurable and interpretable at an individual level. In the opinion of Parsons (1968) values exist at the community level, and they are not interpretable at an individual level. However, Maslow (1959) argues that they are present in individual needs, and universal for all human beings. Weber's classic theory (1904-05) claims values are inherently individual and not collective, because they are linked to individuals' lifestyles. This interpretation allows a wide scope for the measurement of values. One of the most widely used value tests was developed by Rokeach (1973). This test consists of ranking 18 terminal and 18 means/values. The Rokeach test has resulted in successful field research. In Hungary using the Rokeach Test to measure values is an established sociological practice which is why there are longitudinal data for the evaluation of changes of values in Hungarian society (Hankiss et al., 1984).

For our research we applied a simplified variation of the original Rokeach test. From 18 terminal values we chose 10, omitting eight values: for example, national safety and peace. The respondents were asked to rank these values.

Values, when measured on a ranking scale, sometimes raise eyebrows in terms of mathematically analysing results (Bishop, 1999). Johnston (1995) contends that ordinal, ipsative data provided by the Rokeach Value Survey are not suited to factor analysis, but in the literature there are numerous applications of the factor analysis method for analysing value surveys. For example, in Hungary Füstös and Szakolczai (1994) applied a simple factor analysis approach to evaluate results obtained by this test. In line with Johnson's suggestions (1995) we applied the categorical principal component analysis (CATPCA) procedure with SPSS 15.0 integrated statistical software (Kooij and Meulman, 2001). It is always an important question as to how many dimensions to separate. To answer this question we applied Chronbach's alpha. Following the usual practice, we increased the number of dimensions up to Chronbach's alpha, the last dimension no lower than 0.6 (Stamm and Hudnall, 1996).

Determining the significance of different factors, influencing the choice of the Faculty of Food Science was based on preliminary focus group interviews with students. In a future research phase it seems more practical to separate the factors behind choosing higher education in general (as opposed to work, or vocational training) and for choosing the Faculty of Food Science rather than other universities or colleges, but we did not wish to alter the previous questionnaire to obtain comparable and relatively easily interpretable results.

During the years of social transition Angelusz and Tardos (1990) published an important paper on social distribution of different types of knowledge and styles in Hungary. In this paper they determined three basic types of knowledge: cognitive-instrumental knowledge forms the basis for material or mental creative activity. The central point with this type of knowledge is obtaining active results which are achieved by utilising this knowledge. This result can be practically any kind of work, from artwork via plans (e.g. a part of a machine) to material products. Another category of knowledge is knowledge for building relationships and self-representation. The central result of this knowledge type is the effect. The third knowledge category is based on symbolic power-representative knowledge, serving to distinguish and express higher social status. In Angelusz and Tardos's work mastering different knowledge types has been determined by an item-scale, comprising the different activities which are associated with different types of knowledge. It is our view that the disposition to perform different activities reflects an attitude toward mastering types of knowledge required by different activities.

The different items were measured on a 1-5 scale, because respondents were familiar with this technique If a respondent found a given statement totally acceptable, then the respondent awarded the statement a 5. If absolutely unacceptable, then the respondent awarded a 1.

For simplicity, we applied a one-way variance analysis to detect the significant differences between the two dates of measurement.

To determine a system of relations between values, motivational factors, knowledge types and the expected type of future activities, we tried to set up a structural equation model using AMOS (analysis of moment structures) software (Arbuckle and Wothke, 2005). It was based on the following logic: we determined the component loadings for different groups of questions. Based on these loadings, it was easy to determine the object scores for each respondent by dimensions Up to this point the research was analogous with factor and cluster analysis, which can be considered a general method in marketing research (Lehota et al., 2004). Utilising these object scores in different dimensions according to different groups of questions, we tried to determine a structural equation model.

Results and discussion

The values of students show a considerable variance between the evaluations for different values (Figure 1). This fact highlights pluralism of value systems, and – on the other hand – the relatively erratic character of values.

Due to significant standardized variances it was impossible to determine significant differences in value-ranks between the two surveys. At the same time, the tendencies of changes are important, and mesh with results of other research on values.

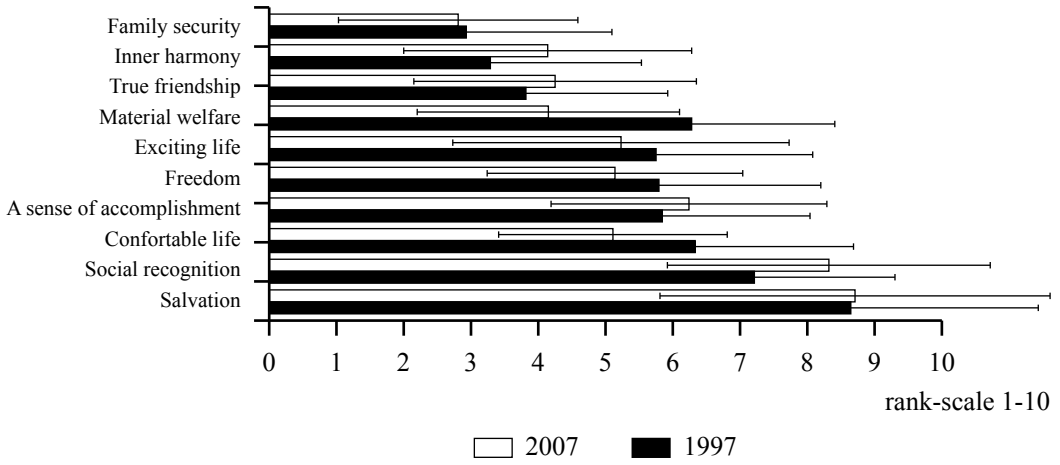

Figure 1: Results of simplified Rokeach-test

Source: authors' own research

According to Füstös and Szakolczai (1999) following the late 1980s change in social system there was a decline in the importance of traditional social democratic and socialist values, such as work and social esteem. Their results highlight the increasing importance of materialistic and hedonistic values. This corresponds with the rejection of the former collectivist values, supported by official communication of the former system, reflected by the growing popularity of a consumption

oriented lifestyle. In socialist times, those values associated with an individual's private life as family and human relationships were considered as opposing the official, collectivist values. A growing trend toward these values indicates that the respondents were retreating inside their private life to find refuge from an insecure social and economic environment. The trend detected by our survey regarding changes in values supports Füstös and Szakolczai's 1999 results and establishes that tendencies apparent during recent years' are still continuing. This trend can be perceived as negative because it indicates a departure from traditional (Catholic or Protestant) European values, which are work centered, and a a quest for harmonious relationships among individuals and society. (Esmer and Petersson, 2007)

The CATPCA method yielded three dimensions for ten variables (Table 2). In the first dimension the highest loading had the values associated with family and quality of life; in this dimension the traditional social-democratic or citizen values had negative loadings, which explains why in the structural model we labelled this dimension "family and comfort". In the second dimension the highest loadings were associated with traditional inner or socially related values, like friendship or salvation. After significant simplification, based on Weber's theorem (1904-05), we labelled this value as "Protestant". In the third dimension the only positive significant loading was associated with material welfare.

Table 2

Component loadings of simplified Rokeach Test, based on 2007 research (only the significant loadings are indicated)

	Dimensions		
	1	**2**	**3**
Material welfare		-0.287	0.806
Family security	0.746	-0.476	
Inner harmony	-0.530	-0.446	
A sense of accomplishment	-0.548	0.613	
Exciting life	0.654	-0.162	
True friendship		-0.468	-0.485
Comfortable life	0.693	-0.038	
Freedom	0.321	0.448	
Social recognition		0.678	
Salvation	-0.365	0.554	-0.382

Source: authors' own research

Students' basic motivation for entering the faculty mirrors complex Hungarian societal and food industry problems (Annex 1).

It is obvious that there is not one characteristic group of factors for choosing higher education in general, and that of the faculty in general.

Analysing the significance behind different arguments and motivations for choosing a given faculty offers numerous lessons. The most important of these are as follows:

- there was a definite increase in the importance of motivational factors connected to the general role of higher education, contrasting with the specific program available at the faculty. This is because numerous families deem higher education as the most important, and very often the only way of obtaining social respect and a secure job. One often hears: "first let's get a better diploma, then we'll take it from there...". Contrary to degrees (e.g. medicine, teacher, mechanical engineer...) the definition and scope of what a food engineer actually does is extremely difficult to grasp.
- Fundamental economic problems plaguing Hungarian agribusiness impact on students' desire to work in the food industry, and impact on their economic expectations regarding material and moral mobility stemming from a diploma. This can be considered a general trend throughout Europe. An indication of this is that the majority of former European agricultural and/or food science faculties define themselves as faculties of applied life-sciences, to avoid the "agricultural" or "food science" labels..
- An important factor governing the Budapest Faculty of Food Science is quite simply that it is located in Budapest as Budapest's central role in national economic, scientific, and cultural life is a major drawing card for students. In the short run, this offers an competitive advantage, but in the long term it means faculty might become complacent, too reliant on this geographical advantage.
- the glamour of student life has plummeted. The first survey indicated that, in the 1980s, students at the former University of Horticulture and Food Industry had fond memories of their student years, but in post-Soviet Hungary, every aspect of student life disintegrated.

The principal component analysis of motivating factors provides useful information (Annex 2). In the first dimension the highest loading has the motivational factors associated with strong professional orientation, with a high level of openness toward new personal relationships. In this dimension the positive image enjoyed by the faculty and its diploma have high loading values. In this dimension the "chance to meet new people" also held a rather high value. In the second dimension the most important factors were linked to studying in a higher education institute and obtaining a diploma. The educational content has only secondary importance. Thus, the first dimension summarised the motivation, linked to the educational process, the second dimension highlights motivations associated with the student's lifestyle. It is worthy of mention that in this dimension the arguments related to the disciplines taught at the faculty had a significant negative value. This is valid for the statements related to post-study employment opportunities.

This constellation of dimensions reveals the contradictions with a considerable number of students: on the one hand they want to enjoy the student life, but a considerable number of them do not want to use these years to increase their knowledge. Of course this phenomenon has been always present in Hungarian higher education, but during recent years this behavioural pattern is increasingly prevalent.

The major causes behind this phenomenon can be attributed to three facts:

- the *weeding out* function of entrance exams has considerably diminished. Twenty years ago official statistics showed that 30 percent of applicants were accepted by colleges or universities, but nowadays it is over 80%;
- higher education institutes have a vested interest in retaining students because the most of the state subsidies are determined on a format based on the number of students. Given this financial reality, increasing academic pressure on students could harm the institutes' financial situation. Of course in the long run this strategy could diminish the prestige con-

ferred on diplomas' and those who have them, but one shouldn't forget that the majority of institutions face day-to-day financial problems and the possible consequences of lower academic standards will be felt only in the long run;

- the implementation of a credit system and rule changes governing study and exams offer virtually endless opportunities to prolong one's studies. The only limit is a family's financial constraints, which explains why the number of lacksadasical students is gradually increasing.

In the third dimension the highest loading involves motivations associated with suggestions or pressure coming from the social environment of the applicant. For example, in this dimension was the highest value for such arguments, as "continuing family traditions", or "recommendation of secondary education teachers", or the recommendation of family members and relatives. It is highly important that the motivations associated with the educational content have no significant loadings in this dimension. This phenomenon corresponds with the analysis of other tables, which emphasises the importance in choosing the faculty and the effect of factors, illustrating the student's own motivations. The consequences of this phenomenon are negative, and result in a heterogenous level of discipline and enthusiasm.

During recent years the attitude towards different types of activity has not changed significantly (Table 3). The most popular activities are negotiating, bargaining (3.57), strategic decision making (5.54), professional teaching (3.98) construction (3.49), laboratory work (3.44). The obvious heterogeneity of these activities supports the former analysis, showing the diverse values and attitudes of students. The above-mentioned activities entail highly different personality traits: bargaining and professional teaching require an extroverted personality, and construction, strategic decision making or working in a laboratory demand a relatively introverted personality. At the same time, this fact indicates practical differences. Numerous jobs require engineers willing and able to set up and maintain interpersonal relations, but there is a wide spectrum of jobs requiring young specialists who prefer remote work with materials or numbers. In our opinion, these different personality requirements should also be considered regarding curriculum development. That's why in new MSc programs there tend to be chemisty/biochemisty options and some oriented toward improving management skills.

It is noteworthy that the popularity of such activities such as "conducting business operations abroad" have greatly decreased. This can be explained by people's experience working for multinational firms or EU state services. Modern society necessitates a drastic increase in working with sophisticated information systems and calculations as well as planning. But these activities have not become sufficiently popular, which shows the importance of training students in the better integration of computer-aided information and decision support systems. This constitutes a capital-intensive activity, but over time this could be an important way of developing centres of education.

After applying categorical principle analysis, we were able to separate only two dimensions (Annex 3). This can be approximately attached to the first two knowledge categories in the Angelusz and Tardos model.

Table 3

Propensity to perform different types of activity in a future job, measured on a 1-5 interval-scale

Activities	1997	2007	Change (value of 2007-value of 1997)
control of work of another persons	2.71	2.97	0.26
discipline	1.67	1.71	0.04
analysis	2.91	2.98	0.07
transaction of affairs	3.18	3.25	0.07
transaction of affairs abroad	3.84	3.54	*-0.30
strategic decision-making	3.48	3.54	0.06
calculations, planning	2.74	2.74	0.00
working in laboratory	3.26	3.44	0.18
administration	1.73	1.94	*0.21
teaching	2.70	2.87	0.17
direct control of production processes	3.24	3.24	0.00
construction	3.39	3.49	0.10
professional learning	3.73	3.98	0.25
help desk operations	2.79	2.88	0.09
phoning	2.00	2.34	*0.34
running of machines	1.89	1.99	0.10
working with information systems	2.99	2.87	-0.12
negotiations, barging	3.61	3.57	-0.04
participation in professional meetings	2.92	3.10	0.18

Source: authors' own survey

In the first dimension the highest loadings entail activities associated with self-representation and verbal actions, meaning this is the knowledge dimension associated with the ability to establish relationships and self-representation. A good example of this is the high loadings for "negotiation, bargaining" and "participation in professional meetings", as well as "strategic decision making". These types of knowledge are rather removed from "classic" engineering activities, but we have to take into consideration that the majority of students find a position in food trade of catering. These economic fields focus mainly on marketing and logistics, highly required fields of knowledge. The second dimension corresponds with the cognitive-instrumental knowledge type. In this dimension the highest loadings have types of activity associated with planning, analysis, ans calculations. These are "classic" areas where engineers actively use this knowledge.

In comparing the two knowledge type dimensions, it is obvious that in practice they associate with different personality traits. One type of activity may be appealing for one student, but doesn't appeal to another, making it crucial for students to be able to specialise. Based on these principles the faculty has developed numerous MSc courses, ranging from unit operations engineering to food industrial management. This gives students the chance to choose the best program for them given that, after a three and a half year BSc course, they only got an overview of food engineering, and are then able to immerse themselves in practical activities.

Analysis of the Hungarian labour market 10-15 years after graduation produces a realistic picture (Table 4). During the last ten years logistics and marketing have definitely gained in importance. Although the appeal of some jobs such as operative management has not grown, there is still an increasing demand for specialists in this sphere. The old romantic image of the independent, small-scale food enterprise is fading, and this fact is mirrored in the results. But efforts at increasing the entrepreneurial spirit seem to be bearing fruit. Jobs in research and higher education have gained in popularity, but university or research activities are not as popular, which stems from the long-term crisis of food science research institutions and the relatively low wages (especially in the capital, where the average wage level is far higher than in other regions).

Table 4

Expected workplaces/positions after 10-15 years of graduation

Future position	1997	2007	Change (value of 2007-value of 1997)
Member of high-level management at a food processing company	3.98	3.22	-0.76
Member of decision – preparation team	3.79	3.65	-0.14
Analyst	2.62	3.10	0.48
Member of procuration	3.01	3.85	0.84
Member of marketing-team	3.54	4.50	0.96
Member of quality – control division	2.98	3.87	0.89
Product or process development	3.59	3.87	0.28
Member of department/company for professional education	2.71	3.84	1.13
Owner of a family – owned enterprise	3.54	3.11	-0.43
Entrepreneur	2.93	3.75	0.82
Production manager	2.96	3.11	0.15
Member of public administration	1.99	3.12	1.13
Researcher, university teacher	3.05	3.21	0.16
Other activity, demanding higher education	2.82	3.51	0.69
Other activity, not necessarily demanding higher qualification	2.34	2.81	0.47

Source: authors' own survey

The popularity of expected future positions has changed considerably. In 1997 the most popular position was top management in a food processing company. During the last decade it became obvious that this involved in-depth economic knowledge so students with such ambitions likely opted for economic faculties at Hungarian universities or colleges. Another possible explanation is the fact, that these positions seem volatile and short-term. At the same time, there was increasing popularity of "back office" activities.

McClelland (1971) believed that human needs fall under three distinct categories: the need for achievement, the need for affiliation, and the need for power. Like Maslow (1968) McClelland believed that needs were the source behind all motivation, but, unlike Maslow, he argued that one level of need prevailed over all others, and claimed that there should be a bias toward this

need because individuals motivated by achievement are most likely to be professionally successful. Moreover, achievement driven societies are more economically advanced than those societies which are not. Our research does not support categorization of students according to McClelland's classification because power is difficult to define: a production manager seemingly has a lot of power over the workers, but is still highly dependent on his/her bosses, but this model could serve as a starting point for further research.

Analysis of principal components yielded three dimensions. These can be approximately identified as managerial, "classical engineer", and independent entrepreneurial functions (Annex 4).

A priori, we expected that it would be possible to determine a model among the values, motivations for choosing the Food science faculty, attitudes towards different activities and the expected future positions. After some unsuccessful trials we had to recognise that it was impossible to determine one "elegant" system of equations among the different dimensions. The system of equations has not yielded any reliable result, and correspondence with the model was not up to standard. Minus the motivation for choosing a faculty, we were able to determine a more reliable model, significant to 95%. This model has established a system of relationships between the basic values, types of knowledge, and future job expectations (Annex 5). This fact is not a question of theoretical research and only: indicates the importance of differential pedagogical work and career orientation of future engineers. This is especially important for student motivation. All over the world motivation is a growing and general phenomenon in higher education, mainly because of increasing student numbers. For example, Bale and Donna (2000) contend that in the developed world students typically go through university with a pragmatic view toward their education, viewing their courses primarily as means to an end, meaning a well-paid job. "To this extent, they may deem the actual content of a given course to be only of limited interest or relevance to the things they care about. As a result, they are often resistant to becoming fully engaged in the readings, class activities and assignments. Yet they feel entitled to a good grade." We contend that it is only possible to increase student involvement and motivation by offering variety in higher education. The scientific, systematic analysis of students' needs and expectations is one of the most important ways to achieve this goal.

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Annex 1

Motivations for choosing the Faculty in 1997 and 2007 survey, measured on a 1-5 scale, arranged in descending order of averages of the1997 survey (significant differences are indicated by *)

Motivations	1997	2007	Difference between 2007-1997
My profession seemed to be interesting, I wanted to work here	3.92	3.54	-0.38
I can perform serious work, useful for the society after obtaining the diploma	3.87	3.84	-0.03
I wanted to broaden my mind	3.84	3.94	0.10
I have taken great interest in disciplines, thought at this faculty	3.78	3.34	-0.44
I wanted to obtain some degree/diploma*	3.73	4.01	0.28
Material welfare after graduation	3.56	3.42	-0.14
Possibility to meet with new people	3.48	3.58	0.10
High image and prestige of education at this faculty	3.34	3.24	-0.10
By my qualification I will be able to help to another people, to have the possibility to accomplish an useful work	3.30	3.41	0.11
High chance to get into this faculty	3.25	3.33	0.08
High social prestige and acknowledgement of qualification, obtainable at this faculty*	3.18	2.67	-0.51
I wanted to remain a student, I don't want to work yet*	3.10	3.75	0.65
During the studies I will have time enough for my hobby or another activity	2.90	2.97	0.07
Former personal and/or professional experiences e.g. summer work in food industry, professional secondary school*	2.77	2.31	-0.46
Advices of family members and relatives	2.72	2.64	-0.08
Favourable image of student-life*	2.67	2.15	-0.52
I know some successful persons from my future profession*	2.66	2.11	-0.55
I have been expected by my family to get a degree*	2.53	3.75	1.22
Possibility to live further from parents: to experience the independence	2.53	2.68	0.15
Continuation of family traditions*	2.43	1.45	-0.98
Possibility to build-up new pair connections*	2.19	2.65	0.46
yearning for adventures*	2.18	3.15	0.97
The majority of my friends is student in higher education: I didn't wanted to stay out of this*	2.11	2.98	0.87
Possibility to taste the city-life*	1.98	2.54	0.56
Recommendation of secondary education teachers	1.94	1.87	-0.07
Nearness of the University*	1.77	2.95	1.18

Source: authors' own calculations, based on the survey

Annex 2

Principal component analysis of factors behind choosing the Food Science faculty, based on research in 2007 (only the significant loadings are indicated)

Factors of choice of Food Science faculty	Dimensions		
	1	2	3
Continuation of family traditions			0.606
Material welfare after graduation	0.406		
During the studies I will have time enough for my hobby or another activity	0.440		0.327
Advices of family members and relatives			0.527
High image and prestige of education at this faculty	0.639		
Former personal and/or professional experiences e.g. summer work in food industry, professional secondary school, etc.	0.451		
I wanted to obtain some degree/diploma		0.440	
Favourable image of students life	0.661		
I have been expected by my family to get a diploma		0.564	0.317
Nearness of the university		0.451	
Recommendation of secondary education teachers			0.455
Yearning for adventures	0.391		
I have taken great interest in disciplines, thought at this faculty	0.396	-0.445	-0.359
I wanted to broaden my mind	0.360	-0.364	
Possibility to meet with new people	0.700		
I know some successful person from my future profession	0.650		
Possibility to build up new pair connections	0.528		
I wanted to remain a student. I don't want to work yet		0.681	
High social image and acknowledgement of qualification, obtainable at this faculty	0.617		
My future profession seemed to be interesting, I wanted to work here	0.437	-0.559	
Possibility to live further from my parent: to experience the independence	0.458		
By my qualification I will be able to help another people, to have the possibility of accomplish an useful and efficient work	0.512		
High chance to get into this faculty			-0.426
The majority of my friends is student in higher education: I didn't wanted to stay out of this		0.670	
I can perform serious work, useful to the society after obtaining the diploma	0.509	-0.333	
Possibility to taste the city-life		0.468	0.564

Source: authors' own calculations, based on the survey

Annex 3

Component loadings of propensity to perform different activity types, based on research in 2007 (only the significant loadings are indicated)

Activities	Dimensions	
	1	2
control of work of another persons	0.575	
discipline	0.563	
analysis	0.312	0.487
transaction of affairs	0.479	-0.515
transaction of affairs abroad	0.343	-0.512
strategic decision-making	0.655	
calculations, planning		0.622
working in laboratory		0.704
administration	0.405	0.383
teaching	0.452	0.375
direct control of production processes	0.307	0.516
construction		0.522
professional learning		
help desk operations	0.517	
Phoning	0.512	
running of machines		0.489
working with information systems		
negotiations, bargaining	0.602	
participation in professional meetings	0.637	

Source: authors' own calculations, based on the survey

Annex 4

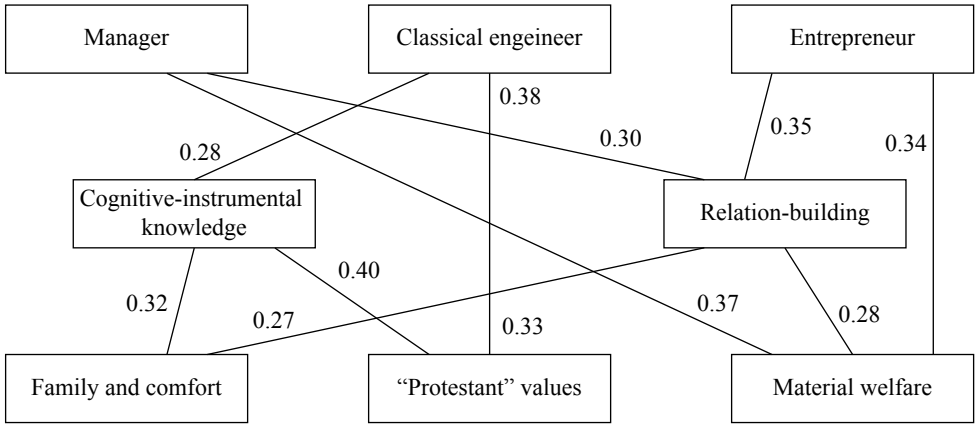
Component loadings of different future positions, based on research in 2007 (only the significant loadings are indicated)

Positions	Dimensions		
	1	2	3
Member of high-level management at a food processing company	0.694		
Member of decision-support team	0.767		
Economic analyst, controller		0.701	
Member of procuration division	0.693		
Member of marketing-team	0.729		
Member of quality-control division		0.685	
Product or process development		0.757	
Member of department/company for professional education	0.337	0.459	
Owner of a family-owned enterprise			0.854
Entrepreneur			0.670
Production manager	0.372	0.576	
Member of professional	0.359		-0.438
Researcher, university teacher	-0.320	0.655	
Other activity, demanding higher education			0.325
Other activity, not necessarily demanding higher qualification			0.311

Source: authors' own calculations, based on the survey

Annex 5

Results of structural equation modelling, based on research in 2007



Source: authors’ own calculations, based on the survey

References

1. **Angelusz**, R. and **Tardos**, R. (1990): Alapadatok a tudás-stílusok társadalmi megoszlásáról a nyolcvanas évek Magyarországán (Basic Data on Social Distribution of Knowledge-styles in Hungary in Eighties). In: Andorka, R.; Kolosi, T.; and Vukovich, Gy. (eds.). Társadalmi riport. Budapest: Tárki, 332-356.
2. **Arbuckle**, J. L. and **Wothke**, W. (2005): Amos 4.0 User's Guide. Chicago: Smallwaters Inc.
3. **Bale**, J. M. and **Donna**, D. (2000): Teaching Generation X: Do Andragogical Learning Principles Apply to Undergraduate Financial Education? Financial Practice and education. 12(2): 216-227.
4. **Berent**, T. I. (1998): Decades of Crisis: Central and Eastern Europe Before World War II. US Calif: Univ. of California Press
5. **Bishop**, S. (1999): The Effect of Test Item Familiarization on Achievement Test Scores. Applied measurement in education. 12(4): 327-341.
6. **Cave**, L. A. and **Lange**, S. J. (2006): Student Motivation: Finding the Carrots. APSA Teaching and Learning conference in Washington DC
7. **Esmer**, Y. and **Pettersson**, Y. (2007): Measuring and Mapping Cultures: 25 Years of Comparative Values Surveys. Leiden and Boston: Brill,
8. **Füstös**, L. and **Szakolczai**, Á. (1994): Value Changes in Hungary, 1978-1993: Continuities and Discontinuities in the East-Central European Transitions. Vienna: EUI. Working Paper SPS
9. **Giddens**, A. (1997): Sociology, London: Polity Press
10. **Hankiss**, E.; **Manchin**, R.; **Füstös**, L. and **Szakolczai**, Á. (1984): Modernization of Value System: Indicators of Change in Cross-Cultural Comparisons. In: Melischeck, G.; Rosengren, K. E. and Stappers J. [eds]: Cultural Indicators: An International Symposium. Wien: Verlag der Österreichischen Akademie der Wissenschaften
11. **Hanley**, E. and **McKeever**, M. (1997): The Persistence of Educational Inequalities in State-Socialist Hungary: Trajectory-Maintenance versus Counterselection. Sociology of Education. 70(1): 1-18.
12. **Hungarian Central Statistical Office** (2007): Statistical Yearbook of Hungary 2006. Budapest
13. **Johnstons**, C. (1995): The Rokeach Value Survey: Underlying Structure and Multidimensional Scaling. Journal of Psychology. 129(2): 547-581.
14. **Kárpáti**, A. (1995): Assessment of Art Education in Hungary: Historical Problems in Contemporary Perspective. International Journal of Art & Design Education. 14(3): 277–288.
15. **Ladányi**, A. (1993): A magyar felsőoktatás története a 20. században (History of Hungarian higher education in 20th century). Budapest: Akadémiai kiadó
16. **Lehota**, J.; **Komáromi**, N. and **Szabó**, Z. (2004): Marketing stratégiai típusok és csopor-tok szerepe, valamint a magyarországi borászatok (Role of marketing strategy-types and group, and the role of Hungarian vineries). Gazdálkodás. 39(3): 25-35.
17. **Bak**, J. M.; **Békés**, Cs.; **Kozák**, Gy.; **Litván**, Gy. and **Rainer**, M. J. (1996): The Hungarian Revolution of 1956; Reform, Revolt and Repression 1953-1963. London, New York: Longman

18. **Maslow**, A. H. (1959): New Knowledge in Human Values. New York: Harper

19. **Maslow**, F., **Mausenr**, B. and **Snyderman**, B. (1959): The motivation to work. New Jersey: Tansaction Publishers

20. **McClelland**, D. (1966): The urge to achieve. In: Kolb, D. A.; Olsand, J. S. and Rubing I. M. (eds.): The Organisational Behaviour Reader. Englewood Cliffs, NJ: Prentice Hall

21. **Palló**, G. (1984): Scientific Migration from Hungary. ICON, 5(4): 210-220.

22. **Palló**, G. (2000): The Hungarian Phenomenon in Israeli Science, Bulletin for the History of Chemistry. 25(1): 35-42.

23. **Palovecz**, J. (1985): Reform Programme for Higher Education in the Hungarian People's Republic. Higher Education in Europe. 10(2): 85-93.

24. **Palovecz**, J.(1987): Current Problems of Higher Education Following Passage of the New Hungarian Education Law. Higher Education in Europe. 12(3): 28-33.

25. **Parsons**, T. (1968): The Structure of Social Action. New York: The Free Press

26. **Péteri**, Gy. (1993): 'Scientists versus Scholars': The Prelude to Communist Takeover in Hungarian Science, 1945-1947, Minerva. 31(3): 291-325.

27. **Péteri**, Gy. (2005): The Communist Idea of the University: An Essay Inspired by the Hungarian Experience", In: Connelly, J. and Grüttner, M. (eds.): Universities under Dictatorship. University Park, PA: Pennsylvania State University Press

28. **Polónyi**, I. and **Tímár**, J. (2001): Tudásgyár vagy papírgyár? (Knowledge-Factory or Paper-Factory?) Budapest: Új Mandátum Kiadó

29. **Rainer**, J. M. and **Péteri**, Gy. (2005): Muddling Through in the Long 1960s. Ideas and Everyday Life in High Politics and the Lower Classes of Communist Hungary. Trondheim Studies on East European Cultures & Societes No.16. Trondheim: 1956 Institute – Program on East European Cultures and Societes

30. **Rokeach**, M. (1973): The Nature of Human Values. New York: The Free Press

31. **Simkus**, A. and **Andorka**, R. (1982): Inequalities in Educational Attainment in Hungary 1923-1973, American Sociological Review. 47(6): 740-751

32. **Stamm**, B. and **Hudnall**, C. (1996). Measurement of Stress, Trauma, and Adaptation. New York: Sidran Press

33. **Van der Kooij**, A. J. and **Meulman**, J. J. (2001). Algorithm Document. CATPCA. Chicago: SPSS Inc

34. **Weber**, M. (1995): The Protestant Ethic and the Spirit of Capitalism. London: Allen and Unwin; reprint of the original book, published in 1904-05