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# Economists' Forum

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# ECONOMISTS' FORUM

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# Foreword

The *Economist's Forum* / *Közgazdász Fórum* has the privilege to publish some of the best papers presented at the *1st edition of the International Conference in Economics and Business Management – ICEBM 2013*, held on 23rd of November 2013 in Cluj-Napoca.

Academics and researchers from various fields (accounting, economics, finance, marketing and management) came together at the Babeş-Bolyai University Faculty of Economics and Business Administration to share their innovative ideas, strategies and research results regarding current economic problems, both at macro and micro levels.

The conference was organized by the Department of Economics and Business Administration in Hungarian Language, Faculty of Economics and Business Administration, Babeş-Bolyai University (also co-publisher of the Economist's Forum) in partnership with the Transylvanian Museum Society – Department for Law, Economics and Social Sciences and the Pro Oeconomica Association.

During the conference an important number of papers were presented: four in the plenary session and 61 in the four thematic sessions. Before admitting the presentation of the papers to the conference, the members of the scientific committee had carefully reviewed the abstracts sent in by the authors. During the conference, section moderators, discussants and participants had contributed with their comments, questions and suggestions to the improvement of the papers. Full papers went through a process of review and only those recommended by the reviewers have been accepted for publication.

I would like to express my gratitude to all those who contributed to the selection and review of the papers, as well as to the success of the conference:

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The present issue of Economist's Forum contains ten English-language papers out of the 65 presented at the ICEBM 2013. Further papers, written in both English and Hungarian, will be published in the forthcoming issues from 2014. In this way, the Economist's Forum would like to contribute to the dissemination of the outstanding scientific results achieved by the researchers participating at the conference.

**Kinga Kerekes**
*Editor-in-chief*

# The role of teachers and parents in the decision-making process of secondary-school students regarding their higher education choices

**EDIT BÁNYAI[1] – KATALIN DUDÁS[2]**

Today universities face major challenges in respect of application processes, and so it is an increasingly difficult problem for them to attract students to institutions due to the ongoing changes in Higher Education (HE) itself and in government policy. The purpose of this study is to analyse what we might term the 'coaching and counselling' activities of two significant groups of people who are only indirectly concerned: parents and teachers. Our results are based on in-depth interviews conducted with parents and teachers of pupils in their 11th and 12th forms, with two special focus groups among first-year students at the Faculty of Business and Economics of the University of Pécs, and on a questionnaire completed by 603 pupils from the same secondary school years. Our results suggest that parents have a moderate influence on students' decisions, although financial factors are becoming increasingly important for them, sometimes making it necessary to override the preferences or decisions of their children. The most important function of teachers in the HE decisionmaking process is to provide their pupils with all relevant information concerning HE. Clearly, if they are to attract students, universities need to understand the motives of parents and the role of teachers in the process.

**Keywords:** higher education marketing, enrolment, bachelor programme, marketing communication, empirical research, student (consumer) behaviour.

**JEL code:** M31.

## Introduction

This study does not deal with conceptual and definitive questions, since other authors (Kuráth 2004, 2007a; Sáfrány 2005, 2006) discuss the

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development, the target groups and marketing assets of 'Enrolment Marketing'.

Both the importance and timeliness of enrolment marketing are supported by several arguments. Drastic regulatory restructuring in the Hungarian HE market, increasing competition, the continuing decline in applicant numbers and significant changes in the labour market are all factors which make the marketing strategy of HE institutions increasingly important - and especially the planning of their enrolment strategy.

Broadly speaking, the target groups for enrolment marketing are: students in general, the actual applicants, teachers, parents, the job market and society. Unusually, with HE, the buyer and the consumer are rarely the same person. The students are the actual consumers (Harker et al. 2001, Conard and Conard 2001, Shash et al. 1999, Corbitt 1998, Browne et al. 1998, Joseph and Joseph 1997), whilst the parents, the job market and society can be regarded as the buyers. All have some degree of interest in the decision-making process and, clearly, in the vast majority of cases, the consumers (the students) make the final decision. However, the buyers exercise indirect influence and so, as finance providers, play an indirect role in the effects of HE. In this study, however, we focus on the role played by the actual consumers and by their teachers and parents in the decision-making process in Further Education (FE).

To take a more narrow focus, the target groups can be viewed from different angles (internal – external, education level of their membership and the level targeted, residence, age, type of secondary school, family background, etc). For the purposes of this study, our questionnaire was drawn up targeting the Bachelor programme, namely 17 to 19 years old secondary school pupils. These are on the border between Generations Y and Z; or, rather, they belong mainly to Generation Z. The age-range of this group means that its members are either on the threshold of their majority or have just reached it. In consequence, most need some support in respect of one of the most important decisions of their life. It follows that their parents and teachers, as the main influencers and

stakeholders, must also be taken into consideration during the planning of any enrolment marketing activity.

**Research objective and methodology**

The conducted exploratory research consists of the following main parts. Firstly we focused on secondary research with the aim to reveal the main changes and challenges due to the new education policy and the features of the target segment, the Z generation. Furthermore we investigated the characteristics of the HE from the perspective of service marketing. On the basis of the secondary research we conducted a primary research. The main aims were to explore the factors influencing secondary school pupils in their decisions regarding Further Education and to identify the main stages and actors of the process (their choice of location, type of institution, faculty etc.).

Our primary research uses four methods: ten in-depth interviews were undertaken with secondary school teachers (form-masters and career masters) and a further ten with the parents of students in the 11$^{th}$ and 12$^{th}$ forms. In addition, two focus groups (using psychodrama) were organised with 1$^{st}$ year Bachelor students at the Faculty of Business and Economics, University of Pécs. The objective of these interviews and psychodrama groups was to discover main decision habits, to gain insights into the decision-making process as well as into parents', teachers' and students' different initiatives. Based on the result of these qualitative methods, an online questionnaire was compiled in order to reveal secondary school students' opinions, information gathering habits and decision-making process in connection with HE. A questionnaire was administered to 603 secondary school pupils in the 11$^{th}$ and 12$^{th}$ forms. This was handled in part on a face-to-face basis and partly via the CAWI (Computer-Assisted Web Interviewing) method. The results for the 'indirectly concerned' segment will be shown in this study. Our goal is to investigate whether the role of the parents and teachers and their information gathering and supporting habits in connection with HE really reflect the above mentioned information asymmetry and high perceived risk.

**Theoretical basis**

***Specifics of Generations Y and Z***

According to 'youth research', it is clear that defining groups of young people is difficult, since the age limits of different groups can be established biological, sociological and legal criteria which do not necessarily coincide.

As a result, Generation Y is defined in a variety of ways by different authors. Some researchers limit this Generation to people born between 1980 and 1997 (Johnson and Hanson 2006), others to those born between 1980 and 2000 (Cheung et al. 2008), while a third group consider the period between 1982 and 1995 (Tari 2010). The last view is the most generally accepted, although, for the purpose of our study, the actual bracket used is not important.

The members of Generation Y typically do not accept traditional values; they have positive attitudes and are sometimes idealists. They are open to novelty, and the internet seems to have encouraged a kind of practical attitude among them. This is also typical of their attitude in the world of work, where they handle change flexibly.

Generation Y are active users of Facebook, the most popular online social community page in Hungary. Some 24% communicate online with their friends rather than offline (Ipsos 2012a). The internet's effects on their work, concentration and focus are first seen here. This generation are able to divide their attention and so they are able to simultaneously play with numerous TV channels whilst chatting with their friends, listening to music and using the internet. However, this divided attention does not mean that their connections are superficial. As this generation grew up with technological development, its members mostly regard the internet as a highly valid source of information, even if, unfortunately, it does not necessarily mean a reliable base of knowledge (Tari 2010, ITHAKA 2011).

In Hungary, according to Ipsos research, it is worthwhile using the social media to reach Generation Y since 74% have already 'clicked' on an advertisement placed on a social community's pages (Ipsos 2012b). Another trend, online word-of-mouth, builds on personal influence when, first of all, some opinion leader is persuaded to disseminate the

received information, with the result that the advertisement spreads like wildfire among the community's members.

Generation Z is made up of children born in the period between the mid-1990s to date. They have grown up in a completely digitalized world and are commonly believed to have acquired this name from the English word "zapper" (wikipedia.com) which, *inter alia*, means 'remote control'. They are also referred to as the 'Internet Generation' or 'digital natives' (Schmidt and Hawkins 2008). This generation has been used to everything being mobile and digitalised and their attention can focus on several things at the same time; they solve their problems flexibly and, we might say, in a mobile way. They spend much time in front of the computer; 65% of them use the internet daily or several times a day. There are, however, significant differences between urban and rural youth. Whilst 75% of young people from Budapest use the internet daily, the same can be said only about half of those in smaller settlements (Ipsos F&F 2011). The internet has become an inseparable part of life for the young; they entertain, gather information, make friends and relax here (MRSZ 2010, Kósa and László 2011). According to the research data provided by the National Media and Communication Authority on the technical and communication equipment owned by 13-17 year-olds and their families, 91% of these households have wired or mobile internet connection, about 98% of young people have their own mobile phone and 43% have internet access.

There is a relatively wide gap between Generations Y and Z since the latter has grown up in a more dynamic and constantly changing environment. To understand their behaviour it is very important to recognise their dominant characteristics as summarised by Törőcsik (2011. 214): "… the age of uncertainty was left behind for them." They are the first truly global generation. They are the smallest generation and this will have an effect on their position in the labour market in that the competition will be less strong for them than for today's entrants. However, they now consider daily life situations as stressful (Tari 2012, Törőcsik 2011) and this is in spite of the research results of Törőcsik (2011), who made the interesting observation that the members of the

young generations live better and more well-balanced lives than the average Hungarian. It is, therefore, not surprising that, among the lifestyle groups in the 16-24 years old bracket, the "experience consumers" are the most significant group (33%), followed by the "social centre" (30%), the "fast-modern" group (15%) and, lastly, the "emerging group" (13%) (Törőcsik 2011).

Generation Z members are more independent and more individual than those of Generation Y, thanks to their mobile gadgets and to their more active presence in the virtual communities. Their independence is associated with their near-total self-sufficiency, and this presumably is also the case with the Further Education (FE) decision-making process. There remains the question of the extent to which this generation is receptive to the messages from HE institutes or the media.

According to the research by Törőcsik (2011), the most important factors in the decisions of the group of "experience consumers" regarding HE institutions are: the atmosphere of the institution, study programmes, entertainment opportunities and a modern infrastructure. Other important factors are their friends' choices and the admission requirements. They prefer short-term goals, and evaluate HE as a service process in terms of its tangible features and immediate results. The "social centre" and "emerging" groups are more conscious and take price, convenience, availability and prospective salary into consideration as they make their HE-related decisions.

Career decisions have always been very significant and high-risk decisions, and the considerations generated by today's frequent social and economic changes obviously do not make this decision-making process any easier; neither do they help in forming a clear view of the future or long-term planning.

***Sources of information for the 'concerned' and the 'indirectly concerned'***

Realignment is slowly taking place in terms of the ways in which secondary school-leavers spend their free time, that is, by favouring the internet at the expense of TV. However, in respect of the credibility of information sources, personal contacts are the main ones as the

information provided by parents and teachers is trustworthy and supposedly acceptable by the young (Kósa and László 2011). According to the results of a separate research project (investigating the orientation channels of 10 400 new entrants and 16 500 experienced employees) those born after 1992 prefer to obtain information in an informal way from their own network of connections. More concretely, members of Generations Y and Z prefer university job fairs, mailing lists, company presentations and their teachers' opinion supporting their job decisions (AonHewitt 2012).

Generation Z are usually children of Generation X or older Generation Y, but there are also some younger baby boomers (55+) among the parents. Parental values are obviously reflected in the world of the young. Although in different ways, a significant number of parents must fight to retain their given living standard or even for subsistence. Often they are unaware of their own aim in life, or they may have to struggle to maintain their position in the labour market. (They might indeed be jobless). Although they seem self-confident, they do not necessarily set a good example for their child. Parents' technical know-how and use of the internet varies widely, but, generally, they do not share a common language with their children. This is important since the young can best be approached via the internet and social media. Young people need far more information than their parents did in their day and ways of information search and processing used by the young appear as a response to the challenges of our performance-oriented world. The majority of parents feel powerless, and professional teachers find it difficult to relate to this generation (Tari 2012).

The younger generations of our era are confronted with increasingly difficult career choices. The reality is that, whilst this age group becomes consumers early, their responsible and independent adult life is postponed. The difficulties associated with embarking on one's working life are supported by data such as those provided by the Central Statistical Office (KSH in Hungarian) according to which, in May-July 2012, the number of unemployed was 459 000, equal to a 10.5% unemployment rate. Of the total number of unemployed, 18% belong to the 15-24 age bracket, which features rather weakly in the

labour market. This group's unemployment rate of 28.1% is 3.1 percentage points higher than that of the previous year. The average length of unemployment was 17.8 months (KSH 2012).

One of the most interesting secondary sources for our research were the results of European Youth Research's (EIKKA) national youth survey showing the connections between Hungarian secondary schools and HE, as well as its problems (Jancsák and Polgár 2010). This investigation shows that students' strongest motivation for further studies is to avoid unemployment and to build a career (which is supposed to go hand in hand with a high level of social awareness). Parental qualifications are not an influencing factor according to the study, but the role of parents and friends as control factors in making choices for further studies seems to be strong.

The relationship between secondary and higher education has become extremely complicated because of the Bologna process. Students have to evaluate a good deal of information – a process in which neither parents nor teachers can seriously help. "Adults (teachers and parents alike) orientating-helping-supporting the young before further studies are characterised by a great lack of information about the world of Higher Education (the inner world of each institution, the content and outcome of programmes)" (Jancsák and Polgár 2010. 32). According to the teachers participating in the survey, parents and students have distorted pictures of HE programmes as a result of the inaccurate and incomplete information circulating in the communication channels.

***Approach to HE from the perspective of services marketing***

A special approach to HE marketing which follows the general principles of services marketing appeared first in the 1990s (Shnaks et al. 1993), clearly acknowledging that, within the services sector, HE is a service having numerous special characteristics (Liu 1998). It might, therefore, be useful to review those characteristics which may help us to understand the complexity of the decision-making process and the difference between specific Enrolment Marketing and general Services Marketing.

HE as a service is characterised by a two-sided risk relating to performance. The supplier institution and the user alike enter the process with a significant, perceived risk. The risk perceived by the user regarding performance is one of the most crucial factors influencing the decision. The outcome of the service is knowledge itself, but in the form of a graduate who has acquired adequate professional knowledge. This cannot be known at the time of decision-making since it is an experience-based product (Zeithaml 1981). At the same time, the process is an essential part of a service product which might last a long time – even a number of years. Parameters determining the perception of quality may well change during the process and may overwrite the requirements of output quality, even if only temporarily. Aspects which are important before and after entering HE differ. Short-term and long-term interests seem to mingle. There are short-term goals prior to entry, such as the hope of being accepted in 'a good place', and long-term goals, such as earning a marketable diploma. In some cases, short-term goals do not even exist for supporting parents and teachers.

Certainly everyone involved is aware of the fact that this is a long-term investment – or at least a decision – and the decision-maker has to set his own expectations regarding the future labour market. They obviously collect information about the current state of affairs, but perceive (or could perceive) the trends, the changes concerning the popularity of different professions. Accordingly, getting to know the complex product directly is not possible, and so decision-makers try to reduce the perceived risk by exploiting all the information sources available before their decision. They study welcoming messages in the media (at some stages actively looking for them), seek information from people they know and from current students, and visit universities on their open days. Current students, whose perception of quality is limited and who must be heavily influenced by a good deal of subjectivity, seem to be an important information source.

The information asymmetry between institutions of higher education and students comes partly from the above features (Bay and Daniel 2001). Earlier evaluation of the quality of HE is nearly impossible and it is obvious that the prospective student does not have

the same view of the future as the institutions. It is clear that the expectations of students and applicants are based on inadequate information.

The next influencing factor is that students do not pay, or pay only partially, for their education: they are state-funded or financed by their parents. Students pay for their own tuition fees in very few cases. Certainly, students do pay for their education in terms of time, energy and effort invested during the years spent in HE or in terms of the income lost by not working in a job of some sort, although HE is often a way of avoiding unemployment (Mészáros 2012).

These factors make the decision-making process and collecting objective information difficult both for students and for their supporters, i.e. their parents and teachers. The situation has now become even more complicated by the uncertainty generated by the changes implemented in HE in 2011, by the ongoing economic crisis and by the unpredictable steps of the government.

**Primary research results**

***Motivation for Further Education (FE)***

In the psychodrama focus groups of first year university students, two groups of motives are visible and both have a strong relationship with the respective family backgrounds. On the one hand, students came to university since this was a family tradition: their parents have degrees, and continuing the tradition is somehow expected of them ("I was born into these expectations"). On the other hand, the family background can produce a totally contrary reaction: students want to rise above their parents' level of education and they also feel their ability to realise this ambition ("I day-dreamed; there were no highly educated people in my family).

According to the in-depth interviews with parents, it is clear that all the parents interviewed, irrespective of their education level and financial situation, think a degree is important, useful and essential to finding a job and to prosperity. Several of them said that, today, a degree is worth the same as the so-called School Leaving Certificate (from a secondary school) of their own youth. Among our respondents there is a

family consensus in connection with the role and importance of Further Education.

***The HE decision-making process from the perspectives of parents and teachers***

According to the in-depth interviews with parents, it is totally clear for the majority of our respondents that FE was already in their mind during elementary school years (and even during kindergarten). Similarly, the teachers questioned highlighted two groups from among their school-leaver pupils:

• Pupils with a good family background (at least secondary school educated parents and a supportive home atmosphere), good abilities and good school achievements know very early (in the 9th year) that they will go into Higher Education.

• Students with a disadvantaged family background (poorly educated parents and modest financial circumstances), poor abilities and no more than medium school achievements scarcely make a decision and, if they make it, it is at the last minute.

According to the observations of parents and teachers, a pupil's academic path is generally decided in the second half of the 10th form, when students choose their optional courses. Their specific path or discipline is refined, that is to say, the particular faculty and university are chosen in the 12th form, often just before the application deadline. In these cases, the logical sequence of first choosing the institution and then deciding on the faculty simply cannot be seen and often these decisions are made in the same time.

The results of the questionnaire completed by pupils in their 11th and 12th forms support and refine the views of the teachers and parents questioned. From the results, three clusters emerge based on the answers to questions on the time dimension of the HE decision-making process:

• 33% can be classed among the group of "conscious students". They are those who had already decided on FE during their elementary school years and chose the area of their future specialisation in their 10th year (together with their optional courses), although their decisions concerning the specific faculty and institution were taken in their 10th

or 11th form, earlier than the parents had suggested.

• 58.5% of respondents are "average decision-makers", who make decisions about everything rather late: about FE in their 9th or 10th year, about the discipline in the 10th or 11th year, and about the institution and the faculty in their 11th or 12th year.

• 8.5% of the pupils interviewed can be described as the "impulsive group". The members of this group postpone their decision about FE even longer – in their 11th or 12th year, and about the specialisation, faculty and institution at the very last minute.

Aided by the questionnaire, we also have answers to the question of whether, after choosing the discipline, pupils make their decisions about faculty or institution earlier. Our results show that the "conscious students" and the "average decision makers" decide earlier about the faculty than about the institution. This process is reversed in the case of the "impulsive group".

If we compare the results of the in-depth interviews with parents, with teachers and the questionnaires filled in by secondary school pupils, we can affirm the following:

• In the case of the in-depth interviews with parents, early decisions seemed to be typical. This matches the questionnaire's cluster of "conscious students" (33%). Hence, whilst in-depth interviews with parents show the conscious attitude as general, questionnaire research set this phenomenon right. The result of the difference may be found in that parents from conscious families were more willing to answer. According to the teachers' responses, the ratio of the "conscious students" is higher (even 70-80%) in the good and best performing secondary schools. In the lower quality schools their ratio is about 10-40 %.

• Based on the estimation of teachers, the proportion of the "average decision-makers" is 40-50 %.

• According to the teachers interviewed, pupils from a disadvantaged family background and/or with limited abilities (those who decide at the last moment), could be identified with the "impulsive group" cluster. The teachers estimated their ratio around 30-50%.

We would also like to draw attention to a further important issue.

Shaping the decision-making process is significantly influenced by the changes in the regulation of Hungarian HE in recent years. As one of the respondents (she is a career master) indicated, the time of decision for FE has changed significantly over the last few years. Whilst, previously, students "were much surer, and many were already sure at the beginning of the 12th year" where they would go; nowadays, she thinks that 50% is the current ratio of those students who decide only at the very last minute. "We feel this uncertainty also with parents. This was the first year when parents also visited me at my open hours and asked". Financial viability has become a very important point and so students and parents postpone the decision due to the changeable nature of the regulations. Hence, parental uncertainty and their desire to wait is another factor in postponing the decision. The results show that the changes in the regulations of HE and financial viability enhance the perceived risk of HE decision.

***The role of teachers in Further Education decisions***

In the opinion of parents, students interested in FE are very independent; they do not allow anyone to influence them. Parents may have the greatest influence, but the informants also mentioned the role of University Open Days, presentations in schools by form-masters and older friends (already studying in HE institutions). It seems that parents do not credit teachers with much real influence.

Our responding teachers also consider students independent, and so they target them (not parents) with communication about career and FE. In general they do not give particular advice, but they ask the right questions (students can think them over with their parents). Career masters evaluate the form-masters' role as more important than the parents', especially if they have a direct and good relationship with their pupils. Therefore, by their own admission, secondary school teachers do not influence pupils and do not take part in their decision in a direct way, but they explain the important factors and their opinion of the decision. Our responding teachers underlined that they have to emphasise rather the long-term factors, since the short-term entrance requirements and the students' preferences matter most.

Our questionnaire revealed that pupils consider the influencing factor of teachers as less than 'moderately important'. They graded it at 2.72 on a 5-point scale. In this respect, there is no significant difference between the three clusters and so teachers have an information provider role rather than direct influence. Obviously, the fullest range of information should be available and for the pupils it is obvious that their teachers are well informed about all of the aspects related to HE. It is very important what and how much information teachers provide, since this will naturally influence their students' decisions. It seemed to be an interesting opportunity to examine what communication activities secondary schools organise to help students with their career orientation. According to the in-depth interviews with teachers, there are 3 stages:

• In secondary schools thinking about FE begins in the 10th form, when students have to choose their optional course of study. This period is important since the chosen course technically determines the FE discipline for the majority of students. Therefore, in this period they are given detailed information about the situation in the different disciplines of Higher Education, especially concerning admission requirements and admission scores. This information makes it easier for pupils to narrow their possibilities and compare their abilities with the requirements.

• The next important stage is the 11th form, when schools are informed about the required admission scores and more specific questions emerge, such as the method of calculating scores.

• The 3rd stage of the information process is at the beginning of the 12th year, when faculties and institutions 'market' themselves. In January, when the admission web pages are opened, pupils are taught how to use them.

Secondary schools provide information about HE for pupils and parents in different ways:

• during the so-called 'form-master' classes
• by career masters (who have open hours)
• during the so-called 'parents' meetings'
• by organizing the so-called 'career days'

- by purchasing the annual admission information book
- through publicity posters and brochures provided by the HE institutions
- through enrolment presentations delivered by HE institutions
- by inviting alumni students
- through the social media, e.g. Facebook etc.

All in all, the role of secondary school teachers, especially form-masters and career masters, can be evaluated as significant. Although neither pupils nor parents associate teachers with influencing factors, their information-providing function is unquestionable since providing appropriate information is a key issue in an HE institution's enrolment marketing activity.

The in-depth interviews with teachers reveal that they plan to be well-informed in connection with FE and that they use several information sources for this purpose (see Table 1).

***The role of parents in HE decisions***

Every research method shows that parents have a moderately important role in a student's HE decision-making process. Parents themselves also have the same opinion: students are independent; they do not allow anyone to interfere in their FE decisions and, if they do, then the parents' words are the most accepted. Nevertheless, the parents interviewed stated that, literally, they had not interfered. Most of them declared that they had really not wanted to influence their children and would not like to press something on them: "We support anything he would like to do; only he must like it". In an ideal case, parents only strengthen them, ask questions, draw attention to pitfalls, listen, answer and help if necessary. In the opinion of the majority of the parents, with all these roles, they do have a significant effect on their children's decisions.

Serious discussion within the family about Further Education begins in the $10^{th}$ year. In general, only close family members take part in this: the student, the parents and older brothers and sisters. This buying centre will generally discuss a number of topics: the student's abilities, talent and fields of interest, which disciplines and faculties are

worth considering, what the family budget allows and how the regulation of HE is developing.

From the in-depth interviews with teachers, four groups of parents emerge:

• One segment of parents is not interested in FE; they do not collect information, do not participate in the meetings organized by the secondary schools or HE institutions. Generally, these parents do not possess any higher degree, and/or their child has no chance to be admitted to HE based on his ability and talent.

• Parents of 'very conscious' students, who possess a clear vision, also gather less information since they trust their children, leave the information gathering to them and accept their decisions. These parents, for instance, may not attend open days activities or parents' meetings in HE institutions.

• The majority of parents gather information primarily from the secondary school (about admission score calculations, about the difference between the levels of final examinations, and about the financial circumstances of Further Education); they do not interfere in their children's choice of institution and faculty, being mostly interested in financial questions.

• Parents (in general degree holders) who play a major role in their children's FE decision-making. There are two main motivations: on the one hand, they are the parents of 'uncertain' students with weaker school achievements, and they help more actively, by taking part in all the events; on the other hand, these parents want to orient their children towards a particular faculty or institution.

The results of the questionnaire shows that 64.5% of responding students made their FE decision with their parents, and that only 35% decided alone. According to their replies, parents were rated at 3.5, friends at 3.06 and teachers at 2.72 on the 5-point scale. These data show the importance of these groups in influencing decisions in this field. If the three main groups (parents, teachers, and friends) are taken into account, we can conclude that the students evaluated their parents' influence as the most important.

***Parents' and students' perspectives in FE decisions***

Parents, teachers and students were also asked about the parents' opinions of disciplines and institutions. According to the parents' common opinion, the financial situation of the family influences the decision on Further Education and only the extent of this effect varies. Four parents (out of ten) declared that financial factors were very crucial; that is, the family in no way could afford to pay tuition fees and/or choose an institution in a remote location. These limitations *a priori* exclude certain faculties (for instance Business and Economics). In the case of the other six responding parents, financial factors are important, but they are able and willing to make sacrifices for their children's future.

To determine the crucial factors influencing the HE decision, the parents were given a list of 22 items and asked to choose the 5 most important. The answers showed the factors below to be the most important (with frequency of mention in brackets):

- Prospective job opportunities (8)
- The reputation of the institution (6)
- Ability to study (i.e, which subject one is good at) (4)
- Entry difficulties (i.e. minimum points level) (4)
- Tuition fees (4)
- Job opportunities in the institution's location, in addition to studies (4).

Our responding teachers were asked to compare the factors listed by the pupils with those of the parents. In their opinion there are points of conflict between the generations, such as:

- Parents typically try to persuade students to choose the local HE institution, although students would prefer to move and be independent.
- For parents, the market value of the diploma and the potential career opportunities seem more important than to the students.
- Students, unlike parents, accord more importance to student life and the entertainment opportunities in an institution.

In the questionnaire, the secondary school pupils were also asked about the factors that are important to their parents in connection with

their FE decision and the responses about their parents views can be interesting:

• It seems that parents evaluate prospective job opportunities as the most important factor, which favours faculties of Business and Economics.

• The parents' point of view differs significantly from the students' belief in two respects. Six of the ten parents interviewed evaluate the "good reputation of the HE institution" as very important although students rarely thought of it (11$^{th}$ place). The other four parents think that "job opportunities in the institution's town in addition to studies" is an important aspect to consider, but this factor ranks only 15$^{th}$ on the students' list.

***The information sources of students, parents and teachers***

Students, parents and teachers use different channels and methods for collecting information about HE based on their generational differences. The results of our survey show that teachers are required to be well-informed and that parents also make efforts to gather essential information in their desire to help their children make the great decision. Table 1 shows the main information sources of students, parents and secondary school teachers.

The parents and teachers interviewed were also asked about reliable information sources. Above all, they consider independent people most reliable. For parents these are their own child, their child's older friends (who attend an HE institution), teachers, the form master, relatives and friends, while for teachers, the present and former students of a HE institution.

**Conclusions**

The HE decision-making process is multipersonal and multi-dimensional. A decision about an intangible and scarcely assessable service and that involves a long-term commitment has to be made in an unstable environment based on restricted information. Higher Education is characterised as a two-sided risky process. There is an information asymmetry between the institutions of HE and students, and so getting to know the complex product directly is not possible.

Table 1. Information sources of students, parents and teachers

| Type of the information source | Students | Parents | Teachers |
|---|---|---|---|
| Personal | Friends<br>Older friends (who attend HE institution)<br>Secondary school:<br>• Form-masters<br>• Career masters | Students<br>Secondary school:<br>• Parents' meetings<br>• Form-masters<br>• Career masters<br>Friends, relatives, colleagues | Alumni students<br>HE institutions' contacts |
| Commercial | HE institutions':<br>• internet websites<br>• presentations in the sec. school<br>• Open Days<br>• leaflet | HE institutions':<br>• internet websites<br>• Open Days | HE institutions':<br>• internet websites<br>• presentations in the sec. school<br>• leaflet |
| Public | Felvi.hu<br>Annual admission information book | Felvi.hu<br>Annual admission information book<br>Media news | Felvi.hu<br>Annual admission information book<br>Media news |
| Empirical | – | Own HE experience | Own HE experience |

*Source: own research*

Hence decision-makers must endeavour to reduce the perceived risk by exploiting all available information sources before the decision is made. Meanwhile, the relationship between secondary and higher education has become extremely complicated because of the Bologna process.

Students, parents and teachers use different channels and methods for collecting information about Higher Education based on their generational differences in evaluating the various elements of this complex service.

Our research highlights some changes in HE that have definitely influenced the decision-making process. On the one hand, the time horizon for the final decision has changed, the tendency being for the final decision to be postponed due to students' uncertainty. The parents' own uncertainty and consequent dilatory behaviour reinforce postponing decisions. On the other hand, the influencing factors have been realigned in that financing has become an extremely important issue. It is obvious that personal information sources are the most important and so the role of parents as financiers and of teachers as primary information sources represents a significant aspect in the Higher Education decision-making process.

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# The new role of consumer meanings and legitimacy in building marketing value

**TAMÁS CSORDÁS**[1]

Starting from the current official definition of marketing, in our conceptual paper we present an overview of the literature of consumer value in marketing in connection with the topical process of co-created value which includes firms as much as their consumers and third-party digital audiences, thus widening the pool of stakeholders present in the value creating process. Based on the service-dominant logic of marketing and the value buildup model, we argue that, ultimately, it is consumers' meaning creation processes that drive what can be referred to as the process of consumer advocacy, thus becoming one focal point of postmodern marketing theory and leading to a real relationship based on interactive communications where earned media are as important elements of marketing communications as paid advertising. Following this we introduce the concept, process and role of brand legitimacy and its expressions within various social groups (brand communities, subcultures and neo-tribes) as well as its impact on marketing science.

**Keywords:** marketing value, consumer meanings, consumer participation, brand legitimacy, earned media, value buildup, consumer tribes, postmodern marketing.

**JEL codes:** M31, M37.

## Introduction

There is growing evidence that marketing science as well as practice is undergoing a paradigm shift. For nearly 20 years, between 1985 and 2004, the American Marketing Association's (AMA) official definition of marketing had remained unchanged, despite the three-year review cycles while, since then, it has already been significantly altered twice (Gundlach and Wilkie 2009), leading more and more to an externally-focused interpretation of marketing logic through the

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growing emphasis on stakeholders, relationships or communications (see e.g. Vargo and Lusch 2004; Merz et al. 2009). At the same time, the notion of postmodern marketing enters into mainstream scientific discourse (Brown 1993, 2006; Dholakia 2009). Hence, according to the official definition of the AMA, marketing "is the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large" (AMA 2007).

The notion of value entered the definition of marketing in 2004, while the current definition adopted in (and kept since) 2007 introduces, even beyond the organizations and its stakeholders, society at large as a beneficiary of the marketing activity. Another novelty is that value creation is no longer considered a direct task of an organization's marketing activity. Instead, value creation is carried out indirectly through promises and offerings by the organization as a whole and achieved through interactions between the organization and its other stakeholders. Overall, this brings about a conceptual extension of marketing that takes into account the complex environment in which companies exist in the new millennium, characterized by a growing number of the aforementioned stakeholders as well as of their market connections, an exponential growth of available marketing data (referred to as "big data") and a growing variety of communication channels (Forsyth 2004).

The growing influence of company-stakeholder interactions, as well as the sharp increase of the number of stakeholders, foreshadows an appreciation of the organizational role of communications. Moreover, "brands do not exist in a void. Regardless whether or not a company participates online, consumers are constantly talking online about companies and services" (Johnston 2011. 84). The communication space can thus be defined as an „aggressively interactive" (Rust et al. 2010. 96), "many-to-many" environment where each participant can take the role of the information source and thus where the organization is but one of many information sources, concerning even their own product or brand messages. This is why, in a

postmodern, consumer-centric marketing view, the consumer is an integral part of the value creation system (Prahalad and Ramaswamy 2002) and marketing communications cannot merely imply solely transmitting a marketing message, but rather should be considered a partnership where meanings are created outside of the organization, in a communication space shared by the organization and its stakeholders. Marketing communications, by using user- and consumer-generated content in this perspective become a tool for differentiation through a merely marketing-based value proposition going beyond the core product benefits.

However, in the postmodern space, the notions of production and consumption intertwine: consumers themselves participate in the marketing activity, marketing becomes a value carrier as much as production itself, and production becomes a consumer of consumers' expected value (Firat and Venkatesh 1995). In this context, production is no longer a linear and delimited process nor can consumers be considered end-users at the end of the value chain (Mitev and Horváth 2008). Similarly, the concepts of product and service are blurred. On a market of consumer goods filled with products with practically matching attributes (Shugan 2004), a manufacturer ought to prevail through the de-commoditization (Sassatelli 2007) of its products and thereby constitute added value to consumers (and, in addition, apply a price premium) (Mahajan and Wind 2002). According to this perception, consumer relations and highly personalized communications to narrow and well-defined target groups appear as a core element of a company's marketing activity (Rust et al. 2010). Following this logic, the product itself can still remain generic although marketing communications are to establish and maintain unique, personal value perceptions and meanings related to the extended product.

**Consumer value in marketing**

The concept of value in the business literature can be traced back to three main approaches (Khalifa 2004): (1) shareholder value (e.g. Black et al. 1998), (2) stakeholder value (e.g. Peyrefitte 2012) and (3) consumer

value. Understanding the consumer side of value creation can help to contribute to elaborating services- and value-focused business strategies (Woodruff 1997), to increasing perceived consumer value and thereby to consumer loyalty. The driving force behind a company's business performance lies in the quality of its consumer relations (Grönroos 2000) or consumer loyalty (Reichheld et al. 2000). Thus, marketing research often focuses on the third category, that of consumer value.

Defining consumer value in marketing is difficult, for it is a complex, multidimensional and, to a large extent, subjective concept (Payne and Holt 2001) used by researchers in various contexts and research fields. These sources, however, offer a number of key features that can help in delimiting it. A first common characteristic is the dynamic and temporal nature of consumer value (Jaworski and Kohli 1993). Sources on consumer value also largely agree on the fact that value stems from consumers' perception and experience (Helm and Jones 2010; Merz et al. 2009) and is not the mere result of a company's intended effort. Thus, "the value of a product is not what the producer puts in, but what the consumer gets out" (Doyle 1989. 78). Consumers' perception of value is therefore equally influenced by the consumption and market environment (e.g. number of substitutes, marketing communications).

Khalifa (2004) identifies three groups of value models in the literature: (1) value components models, (2) benefits/costs ratio models and (3) means-ends models. He argues that value as a marketing concept can be identified through the combined consideration of these three views. In the following, we present a brief overview of the three models.

*Value components models* distinguish between various building blocks and functions of consumer value. Kaufman (1998) defines three value components: (1) exchange value or "worth", (2) utility value or "need", and (3) esteem value or "want". Based on previous reviews on the concept of value (e.g. Khalifa 2004; Rowley 2008), one can state that the literature often confuses the narrower with the broader concepts of consumer value.

Based on Kaufman's (1998) categories, exchange value ("worth"), a microeconomic concept, can be considered the narrowest interpretation

of the concept. Similarly, Green and Jenkins (2011. 119) define „value" (interestingly, in opposition to „worth") as no other than measurable and quantifiable exchange value, based on "agreed upon standards and measurements". In other words, exchange value can be considered a measurement of the preference of a consumer toward one or another product or service of similar attributes in a supply and demand context, and can give indications as to the social and other contexts of the intended use of the given product or service by the user (Kaufman 1998). In contrast, a consumer "need" is intended to describe physical characteristics of a product or service (Kaufman 1998) and thereby a consumer performance triggered by that product or service. Lastly, the esteem value of a product or service is the sum of those attributes that lead consumers to buy them for the mere desire of ownership (Kaufman 1998) and which it is impossible to put a price on (Hyde 1983 in Green and Jenkins 2011. 119). Esteem value is therefore largely personal and thus variable. In this way, unveiling and understanding consumer meanings becomes particularly important in assessing esteem value as this category can be described as the colloquial concept of "added value". In this perspective, the added value of a product or service is an "emotional investment" (Green and Jenkins 2011. 119) in the consumption of culturally embedded products.

Building upon the disconfirmation model (Oliver and Bearden 1985), Kano's model of customer perception (Kano et al. 1984 in Khalifa 2004. 648) distinguishes various functional components within the concept of value. The model examines two dimensions: the presence of characteristics and the level of customer satisfaction. Along these two dimensions, three major product attributes can be distinguished (Khalifa 2004): (1) dissatisfiers, (2) satisfiers and (3) delighters. Dissatisfiers are elementary, implicitly expected requirements that every product within a category should satisfy to even be marketable: their existence does not lead to any additional satisfaction, but their absence leads to customer dissatisfaction. Satisfiers are comparable to performance indicators. They are expected and expressed consumer needs. These are one-dimensional product attributes, most often

associated with the product's or service's performance. Delighters are unexpected, often innovative features which, when met, trigger surprise and additional satisfaction from the consumer.

One can observe from the description of delighters that value components models merely represent a static state and therefore are less applicable to the entire product and consumer life cycles: they do not take into consideration the temporality and dynamics of the latter (e.g. during the life cycle of a product a delighter can first become a satisfier then even a dissatisfier on the market).

One equally has to take into consideration the subjectivity and emotional characteristic of value. As Schneider and Bowen (1999) argue, most consumers range from moderately satisfied to moderately dissatisfied. This implies that consumer loyalty is a rather ambivalent construct (Khalifa 2004) and various momentary value magnifiers (e.g. sales promotion tools) or destroyers (e.g. poor customer service) can easily dissuade consumers from their original purchase intentions (Keiningham et al. 2011). At the same time, the presence of delighters and, in some cases, the absence of dissatisfiers can predict even more intense consumer reactions. While moderate (dis)satisfaction is mainly due to product performance (i.e. satisfiers), in these extreme cases above average emotional charges like delight or "awesomeness" (Haque 2009), or outrage (Schneider and Bowen 1999) will prevail. These in turn would then explain consumer behaviours like brand evangelism (Scarpi 2010) or anti-branding (Krishnamurthy and Kucuk 2009).

*Benefits/costs ratio or utilitarian models* trace back perceived customer value to the difference between customers' perceived benefits and customers' perceived costs (Day 1990; Horovitz 2000), where the value of a product or service is what a consumer is willing to pay for (Porter 1998). However, it can be noted that with their purchase decision of a product or service customers not only make a pecuniary effort but also a sacrifice (i.e. opportunity cost) by diverting resources from other possible uses and investing time and effort into purchasing and consuming the given good or service (Kotler and Keller 2012). Huber et al. (2001) identify the following cost factors: time costs, search

costs, learning costs, emotional costs, cognitive and physical effort, as well as financial, social and psychological risks. The higher the exchange value or the associated costs of a product or service, the lower its perceived benefit will be for the customer (Khalifa 2004). The company can improve, extend or expand the perceived benefit (Horovitz 2000) by improving the performance of certain product attributes (e.g. by pointing out a product's unique selling propositions during marketing communications), extending the product to an integral solution (Vargo and Lusch 2004; Helm and Jones 2010) (e.g. by offering software as a service [SaaS] instead of software alone) and by expanding the act of consumption to an experience. In this sense, products consist of a core value and additional, added value elements (Grönroos 2000). The latter, however, can also be negative: the incorrect handling by the company of its support activities (e.g. poor distribution system) can negatively impact on the perceived value by the customer.

*Means-ends models* are based on the premise that products and services are purchased with the ultimate intention to satisfy a given need or goal. These models are prevalent in consumer behavior literature. Value surveys developed by social psychologists (e.g. Rokeach 1973) explore consumers' cultural, social and personal beliefs and convictions. These psychological and symbolic values can be related to consumer culture through the acts of consumption, purchase or communication. Moreover, symbolic values represent a category of values that includes all consumer perceptions beyond the mere functional attributes of a product.

End values or terminal values include personal and social values, while means values or instrumental values can be divided into moral and competence values. Moral values have an interpersonal focus and define expected behavioral patterns for the individual while competence values are intrapersonal and pertain to individuals' self-actualization (Rokeach, 1973).

Gallié (2009) identifies two main components of value: utility value and existential value. The first assesses the extent to which customers' functional expectations are met. Existential or symbolic values can be

further divided from social, hedonic and ethical value components (Gallié 2009) to personal (affective/emotional) and external – social, i.e. linking value (Cova and Cova 2002) components. Symbolic values contribute to consumers' self-expression and social success and thereby determine the consumer experience derived from the consumption of a given product or service.

In a social psychological approach, consumers might manifest a direct or indirect relation to their acts of consumption needs other than a product's or service's functional attributes. Conversely, one can consider consumption as a socially embedded phenomenon, where consumption itself contributes to the expression of consumers' value systems. In a means-end logic, consumption brings about desirable or undesirable outcomes that manifest themselves either directly, at the moment of consumption, or indirectly, over time, through other consumers' behaviors. In this respect, the notion of value extends beyond the scope of the company and that of the perceived and actual product attributes. In this regard, individuals are first and foremost human beings with psychological and social needs and only then consumers (Fournier and Lee 2009). This explains why it is emotional factors stemming from experiences related to the act of consumption and not the product attributes that will lead to the aforementioned extreme states of delight and outrage.

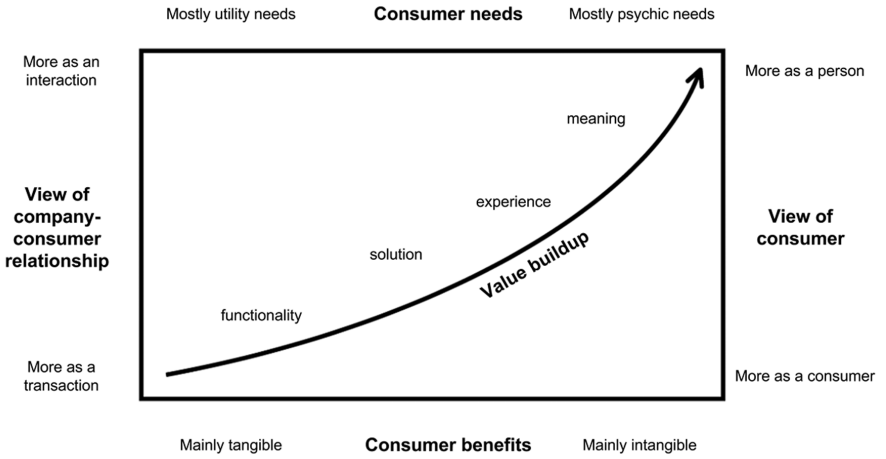
Woodruff (1997. 142) defines customer value as "a customer's perceived preference for and evaluation of those product attributes, attribute performances, and consequences arising from use that facilitate (or block) achieving the customer's goals and purposes in use situations". According to this definition, value stems from a subjective consumer perception, consequence of the consumption of a product or service. It is positive when the product or service goes beyond its simple functional properties and is instrumental in solving the original problem or need it was consumed for in the first place, and negative if it fails to achieve this function. Value is a dynamic process: each use of or encounter with the product shapes its evaluation thereof by the consumer. By including a context (i.e. goals and purposes) to the act of

consumption, the definition explains why perceived value is relative and why certain product attributes are more important to a given circle of consumers than to others. In short, one can state that perceived value is subjective, relative, context-driven and interactive.

In contrast to the purely economic viewpoint, where consumers are considered to pursue a value- and utility-maximizing behaviour, whereas companies seek to increase the gap between the production costs and the actual exchange value (value exchange model), the notion of value-in-use is increasingly present in the literature on consumer value (Payne and Holt 2001; Porter 1998). According to it, consumer value stems from the use rather than the exchange of a product. The more complex a service is, the more attributes consumers need to evaluate – and the less price weighs as a decision criterion, even less in the case of technologically saturated products with rapid obsolescence, or of expensive, high-involvement products with high social risks of purchase. According to Mahajan and Wind (2002), consumers' pre-purchase information need is surprisingly low, mainly due to the abundance of available information and their limited capacity of information processing (Johnson 2012), which leaves emotions and product promises as a major decision factor. Unless the phenomenon of cognitive dissonance arises (i.e. the product does meet consumer expectations), objective product attributes thus become of secondary importance.

Developing the concept of value-in-use, Khalifa (2004) highlights the importance of psychic value. In his integrative model, he distinguishes four main categories that determine consumers' perception of value: (1) consumer needs, (2) consumer benefits, (3) the nature of the relationship between the supplier and the consumer, and (4) the perceived treatment or view of the consumer by the supplier (Figure 1). The model places a product's functionality (and thus utility value) on the lowest level of total consumer value.

Beyond the perceived value of product attributes, the perceived added value appears as a direct antecedent of brand love in Batra et al.'s (2012) model: in case a consumer is satisfied with a consumed product,




*Source: Khalifa (2004. 657)*

Figure 1. Customer value buildup model

their commitment towards that product is strengthened to potentially trigger a "loyalty loop" (Court et al. 2009). A loyalty loop, however, does not necessarily imply brand loyalty, but rather a shortened decision-making process, a greater propensity to consume the given brand from among many others (i.e. top-of-mind) and a facilitated information processing and potential sharing of its marketing messages, thus leading to user-generated, positive word-of-mouth (Edelman 2010) and earned media to the brand (Corcoran 2009). Brand love thus contributes to business performance by triggering consumer outcomes like brand loyalty, positive word-of-mouth, resistance towards negative word-of-mouth, the willingness to pay a quality premium (Batra et al. 2012) or a shortened information search cycle. However, these dimensions of brand loyalty only apply until the consumer perceives the brand as significantly superior to the others on the market (Khalifa 2004), once again highlighting the subjective and dynamic nature of the concept.

Consumers evaluate their relationship to the company along their own personal value system. Van Dijck and Nieborg (2009) note that the

majority of consumers do not aim to actively participate in this relationship, do not require higher order interactions from brands they like and keenly settle for an "I don't call them, and they don't call me" type of relationship (Barnes 1997. 771), which they can equally judge as a suitable (smooth, useful, etc.) kind of company-consumer relationship. Based on the above, a company should distinguish between relational clients, who deem important and require an active relationship with the company, and transactional clients, who do not put emphasis on the affective dimensions of their relationship with the brand. The value buildup model thus contributes to a better understanding of the different perception of value between low- and high-involvement products. While consumers with a high involvement are prone to process larger amounts of cognitive information (Greenwald and Leavitt 1984), low involvement consumers can be characterized by a total lack of interest (Fagerstrøm and Ghinea 2010). While a low involvement consumer can be characterized as a transactional client, potential users of high-involvement products have more (implicit or explicit) expectations, going beyond their functional needs.

Another significance of the value buildup model is that it forms a direct hierarchical link between functionality, solution, experience and meanings within the process of consumer value generation. Thus, functionality can be related to generic product attributes (Levitt 1983) and to meeting consumers' rational needs, solution comes back to what can be referred to as a consumer-centric view of business (Vargo and Lusch 2004), experience is the extension of perceived benefits beyond the mere product or service itself, while meanings imply meeting consumers' most abstract social or psychic needs.

According to Khalifa (2004. 658), meaning "magnifies the worth of the experience", referring to the fact that meanings are those elements of the act of consumption that affect long-term memory and through which from a one-time experience consumption becomes an ideological and philosophical act that supports an individual's views, values (in a social-psychological sense) and self-realization. There is empirical

evidence that, in the case of relational clients and real company-consumer relationships, marketing communications through experiences do effectively contribute to building brand equity (Fransen and van Rompay 2011). In this context, therefore, business performance largely relies upon consumers' perception of value rather than actual product attributes and performance. In other words, market competition is increasingly based on subjective consumer experiences (Helm and Jones 2010). It is equally the presence of the emotional factor that allows the company to convert its value propositions into relevant consumer meanings, through its marketing communications activities, in a broad sense.

**Manifestations of consumer value in marketing communications: Meanings and social embeddedness**

Marketing communications represent a growing scene of the company-customer interactions. One of its main tasks is to convey to consumers positive meanings about the brand. From an economic point of view, the growing importance of meanings within the concept of added value is a natural consequence of a welfare society (Potts et al. 2008). From a sociological perspective, consumption itself is a socially and culturally embedded activity, and consumer creativity (e.g. the creative use of tools) is a constituting element thereof (Becker 1982; Bourdieu 1993). User-generated content, such as user brand mentions and narratives of consumption, is also part of consumer creativity. This is ubiquitous in the new media and constitutes the defining element of virtual communities and, incidentally, the ultimate channel for the expression of shared consumer meanings.

As in the case of consumer value, the notion of meanings is multidimensional, allowing a variety of interpretations in the various fields of research (Finne and Grönroos 2009). Meanings as a marketing concept manifest themselves through consumers interpreting their acts of consumption, a process during which symbols, experiences and meanings are created. In this context, interpreters (consumers) gain a far more important role than the sender of a marketing message (the

brand) can plan ahead. Research shows that consumers can interpret brand messages in a far wider scope and in far more different ways than the brand owner has originally intended (Schouten and McAlexander 1995; Kozinets 2001; Muñiz and O'Guinn 2001).

As mentioned above, consumer value can be interpreted as a dynamic process (value buildup). The sum of a consumer's past experience with the brand constitutes one temporal dimension of consumer value and makes up the current meaning thereof for them. Past experiences can be of a commercial origin (e.g. experiences at the point of purchase, during product use, advertising messages, etc.) and can equally originate from any other source with loose ties to the brand: personal conversations (word-of-mouth), browsing, etc. However, brand meaning does have another temporal dimension, namely that of experiences not yet lived, of which the most important are brand expectations. As brand messages can most often be associated with a promise of future consumer satisfaction (Berry 2000; Grönroos 2009), marketing can only succeed in constituting value through meanings if it can avoid any "communication gaps" (Parasuraman et al. 1985), i.e. if the implied or explicit promises are not at odds with actual product attributes and individual product experiences (Mahajan and Wind 2002). The future dimension of brand meanings also includes external elements that are not directly related to the brand itself (e.g. the effect of the economic crisis on consumption patterns and brand choice).

The temporal dimension is particularly important in marketing communications, as consumers' past experiences are of a cumulative nature (Helm and Jones 2010). It follows that a company's response cannot be but incremental in nature, i.e. it ought to have a long term, strategic focus.

One can also distinguish between internal and external dimensions of brand meanings. External dimensions comprise all the effects of the (cultural, economic, etc.) environment on consumers. The external environment also includes competitors' marketing communications messages. Internal dimensions reflect consumers' individual situations regarding their social, emotional, motivational, etc. states.

It is important to note that it is the consumer who, along with the context and time dimensions, makes up their own understanding and meaning of a brand's communications that they subsequently do or do not embrace. Green and Jenkins (2011. 114, 117) emphasize that, in a consumer-to-consumer information flow, the context itself can modify the objective content and (intended) meaning of a message. In this case, the recipient interprets not only the message itself but also the (implicit or explicit) meaning attached to it by its source (referred to as "grassroot intermediary" by the authors).

One also has to note the potential negative impact of the phenomenon on marketing communications. Marketing messages, as products of popular consumer culture, are prone to be hijacked and turned against the company by an empowered audience (Green and Jenkins 2011; Krishnamurthy and Kucuk 2009).

Based on its personal and relative nature, value-based emotional positioning also involves necessarily restricted targeting, but at least well-defined target groups might have a notably differing interpretation of a same message (Mahajan and Wind 2002; Kates 2004), while messages similar in content but configured in different ways are framed differently by target groups (Yi and Baumgartner 2009). Virtual communities build around specific needs and activities and the subsequent internal consistencies thus offer the possibility of a natural segmentation along consumer needs, habits and even lifestyles (van Dijck 2006).

Brand communities are self-organized groups of consumers of a commercial brand. Muñiz and O'Guinn (2001) note that a strong brand community can contribute to socially embedding a brand by affirming consumer loyalty, commitment, and even the phenomenon of brand evangelism. However, relatively few brands (those referred to as lovebrands or lovemarks) are fit for generating active and widespread brand communities. Moreover, it can be stated that a large majority of consumers are not self-conscious members of brand communities (Kates 2004) and that their relationships to brands are embedded within their daily lives and routines. People nonetheless are still members of

various communities referred to as neo-tribes, where common lifestyle and shared experiences are the basis for closer or looser social connections (Cova and Cova 2002).

Marketing's value creation within groups organized around shared experiences, lifestyle and rites can best be characterized and evaluated through its level of legitimacy (Kates 2004; Muñiz and O'Guinn 2001). In this respect, marketing activity is necessarily built around community participation, as the product, service or brand it serves is positioned as a tool, a channel for members to succeed within their respective communities (e.g. through community experiences offered by the product [Schouten and McAlexander, 1995]), thus accepting that a given community of consumers gain some level of control on shaping the brand's social and cultural meanings (i.e. consumer empowerment). In this approach, brand equity is the result of a company-consumer co-creation, where in return of a certain degree of openness from the organization's side, customers become voluntary advocates of its products or services (Urban 2004).

Marketing activity can thus join a community's everyday life through contributing to its self-determination with the ultimate goal to reach a level where the community accepts a product or brand as a legitimate information carrier of the community's own values,resulting, in the long term, in what can be referred to as "institutional isomorphism" (Handelman and Arnold 1999). Such communities, even though not related directly to brands, represent a special and well-delimited circle of consumers who can thus contribute to developing a brand's products by using them in a way adapted to their own needs, even by modifying or recycling them (user-led innovation).

The process of legitimation is a bottom-up, consumer-generated process that manifests itself at the top of the before-mentioned value-buildup model, through personal meanings merging into a collective sphere. A brand's legitimacy is complete on a community level when it admittedly fits the community's greater relationship and value chains (Cova and Cova 2002), effectively contributes to building and perpetuating its ethos (Kates 2004) and its messages are accepted by the

community as socially accurate (Handelman and Arnold 1999). According to several authors (e.g. Andsager et al. 2006; Paek et al. 2011), in these cases perceived similarity plays a greater role in the reception of a marketing message than perceived expertise. As legitimacy is a socially embedded process, in the case of a relatively large community, a brand owner may have little control over the dynamics of brand meanings and consequently of brand equity, which might, in extreme cases, lead to a forced repositioning or adaptation to the actual market situation.

**Conclusion**

Despite the extraordinary growth in quantity and in importance of user-generated content, companies still remain hesitant to venture into this unproven environment. Their concerns stem from a fear of intruding into a "consumer" environment, a lack of understanding of virtual community members and their behaviour, as well as a lack of control over the context in which their messages are exhibited (Krishnamurthy and Dou 2008). Regardless whether or not they participate, brands are inherently present in the discussions of consumers in virtual communities. In a postmodern space, de-commoditized brands are bound to communicate through affective components and to offer user experiences that go beyond mere functionality. By understanding how consumers live their encounters with the brand through monitoring expressed meanings, companies can not only direct more relevant messages to their target groups but also identify positive experiences and shared consumer meanings in connection with the brand, which can offer them new grounds for targeting and positioning activities through organically integrating the brand into the community by relying on the social values and beliefs thereof, offering community members an additional channel of self-expression.

In this context of interactive communications and co-created meanings, marketing communications face a new challenge, i.e. that of becoming an activity providing media content and management, through which new stakeholders and target groups come into the

picture. Not only must a company perform in its core business through creating value in order to delight its marketing target groups, but it also needs to take into consideration a new pool of stakeholders, namely its audiences or media target groups. Stakeholders, in addition to consuming the company's products and messages, ought to be motivated to participate in the co-creation of a brand's equity.

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# A test of the Theory of Planned Behaviour – the cross section of the students' entrepreneurial attitude in Hungary[1]

**SZILVESZTER FARKAS[2] – ANDREA S. GUBIK[3]**

A country's economic performance highly depends on successful entrepreneurship. Conducting research into entrepreneurial behaviour and the processes of becoming an entrepreneur as well as developing tools of how to enhance this activity are of essential importance. The tasks of the researchers dealing with this issue would seem to be very simple if only the abundant available literature and the applied theories on behaviour were taken into account. However, there are many issues regarding the conceptual and methodological approach, which have not been dealt with so far. The present study tests Ajzen Theory of Planned Behaviour within the framework of the GUESSS research project and its database. The study attempts to provide a very detailed description of entrepreneurial intentions by using Multinomial Logistic Regression (SPSS).

**Keywords**: entrepreneurship, attitude, entrepreneurial intention, Theory of Planned Behaviour.

**JEL codes:** C31, C38, I25.

## Introduction

The international research project GUESSS (Global University Entrepreneurial Spirit Students' Survey)[4] investigates entrepreneurial intentions and activities of students. The first aim of this survey is to provide a deep insight into the process of starting up a business. In addition, this survey helps explore the processes and factors that may be crucial in the development of the students' positive attitude in undertaking business activities. Moreover, it provides an international platform for comparison of career intentions of students who study at

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[4] http://guesssurvey.org.

different universities and countries. The results of the survey enable the researchers to identify the type of courses and services of a particular institution, which really contributes to the students' intentions to set up a business of their own, and to determine how efficient these courses and services are in creating a business friendly atmosphere that promotes these intentions. Finally, the survey also examines the students' main individual motives that lead to a more positive attitude towards enterprise as a career option.

The project is coordinated by the Swiss Research Institute of Small Business and Entrepreneurship at the University of St. Gallen (KMU-HSG). The Institute processes the collected data. The participants in the research receive access to the database, which they can use for scientific analysis.

### ISCE/GUESSS data and the composition of the Hungarian sample from 2011

The survey is conducted every second year. The first survey was conducted in 2003 with the participation of two countries. Table 1 shows the grewing international character of the survey and the increasing number of the participating students. The last questionnaire was published in 2011, when 26 countries joined the project.

Table 1. Countries and students participating in the research

| Year | No. of participating countries | No. of students filling out the questionnaire | Title of the research |
|---|---|---|---|
| 2003 | 2 | - | START |
| 2004 | 2 | 5 000 | International Survey on Collegiate Entrepreneurship (ISCE) |
| 2006 | 14 | 37 000 | International Survey on Collegiate Entrepreneurship (ISCE) |
| 2008 | 19 | 63 000 | Global Entrepreneurial Spirit Students' Survey (GUESSS) |
| 2011 | 26 | 93 000 | Global Entrepreneurial Spirit Students' Survey (GUESSS) |

*Source: http://www.guesssurvey.org/*

The circle of countries and universities participating in the research has been constantly expanding, mainly due to the relevance of

the issue. As a result of the repeated data input and the regular feedback, the research has been developing steadily. The questionnaire itself has partially deviated from the original, since time and country-specific questions have been added, while the main question categories remained unchanged. Thus, the questionnaire provides an opportunity to follow certain changes through time, and to understand the underlying factors. Moreover, because of the growing numbers of participating universities and countries, there is more room for geographical comparisons.

In 2011, in the fifth survey, 93 265 students from 502 higher education institutions participated. In Hungary, 5677 students filled the electronic questionnaire (average response rate was 8%). In the 2010/2011 academic year there were 361 347 students enrolled in Hungary, but only institutions with over 1000 students were selected for the survey. Thus, the GUESSS survey from 2011 reached 289 336 students, roughly 80% of the total number of students from Hungary. Table 2 shows the distribution of Hungarian respondents by institutions.

The GUESSS survey basically deals with four groups of questions, namely the willingness to start a venture traceable in the students' career plans, the influence of university/college environment, the entrepreneurial intention of students and the role of family businesses influencing this attitude. Each of the four question groups is made up of 16 question blocks with closed-end questions, both alternative and selective ones. The questionnaire offers an option to choose the answer „other" five times.

**The concept of the research and its operationalizing possibilities**

As promoting entrepreneurship is a core objective of many countries, measuring its actual level and developing models to understand its substances are crucial. Several methodologies can be found in the literature. The Eurobarometer Survey on Entrepreneurship has been studying the development of entrepreneurship in EU Member States for over a decade in order to explain setting up businesses and

Table 2. Distribution of Hungarian students participating in GUESSS 2011

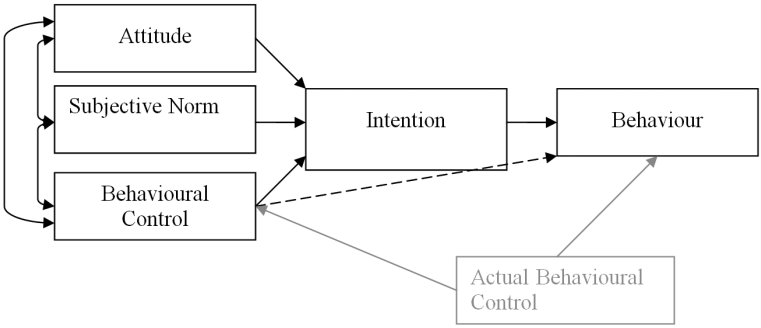
| Name of Institution | No. of students enrolled in 2010/2011 | Distribution of enrolled students | No. of sent inquiries (link) | No. of filled questionnaires | Response rate (No. of filled questionnaires/No. of sent inquiries) |
|---|---|---|---|---|---|
| BME - Budapest University of Technology and Economics | 23 655 | 6.55% | 0 | 5 | |
| BCE - Corvinus University of Budapest | 17 134 | 4.74% | 4 800 | 201 | 4.19% |
| SZE - Széchenyi István University | 16 978 | 4.70% | 8 900 | 681 | 7.65% |
| DE - University of Debrecen | 23 655 | 6.55% | n.a. | 538 | |
| ME - University of Miskolc | 13 546 | 3.75% | 14 055 | 620 | 4.41% |
| PTE - University of Pécs | 27 963 | 7.74% | 8 400 | 757 | 9.01% |
| SZTE - University of Szeged | 27 227 | 7.53% | n.a. | 254 | |
| PE - University of Pannonia | 9 632 | 2.67% | 0 | 1 | |
| KE - Kaposvár University | 2 985 | 0.83% | n.a. | 38 | |
| NYME - University of West Hungary | 13 590 | 3.76% | 7 600 | 291 | 3.83% |
| ELTE - Eötvös Lóránd University | 30 455 | 8.43% | n.a. | 175 | |
| SZIE - Szent István University | 16 978 | 4.70% | n.a. | 166 | |
| BGF - Budapest Business School | 17 595 | 4.87% | 13 622 | 620 | 4.55% |
| BMF - Óbuda University | 11 870 | 3.28% | 0 | 5 | |
| DF - College of Dunaújváros | 4 085 | 1.13% | 2 460 | 158 | 6.42% |
| KRF - Károly Róbert College | 9 966 | 2.76% | 8 000 | 97 | 1.21% |
| ÁVF - Budapest College of Management | 2 820 | 0.78% | n.a. | 147 | |
| GDF - Dennis Gábor College | 2 333 | 0.65% | n.a. | 182 | 4.81% |
| EJF - Eötvös József College | 1 425 | 0.39% | 1 350 | 65 | |
| BKF -University of Applied Sciences Budapest | 5 539 | 1.53% | 0 | 1 | |
| KJF - Kodolányi János University of Applied Sciences | 6 229 | 1.72% | n.a. | 423 | |
| MÜTF - College for Modern Business Studies | 1 922 | 0.53% | 1 200 | 145 | 12.08% |
| SE - Semmelweis University | 11 898 | 3.29% | 330 | 65 | 19.70% |
| Others | 61 867 | 17.12% | n.a. | 42 | |
| Total | 361 347 | 100.00% | 70 717 | 5 677 | 8.03%* |

* average *Source: GUESSS 2011 database*

Explanation: Sent inquiry (link) – the number of students that received the internet link for filling out the GUESSS questionnaire; 0 means that the institution has not made the questionnaire available for its students either through internal system or in any other form.

business growing (EC 2012). The GEDI index of GEM (Global Entrepreneurship and Development Index) regards entrepreneurship as a multidimensional concept where individual and environmental factors are both important and the institutional setup determines the effectiveness of individual (Szerb et al. 2012). The Entrepreneurial Event model of Shapero and Sokol (1982) and the Theory of Planned Behaviour of Ajzen (1991) also try to describe the above mentioned multidimensional nature.

The GUESSS's research concept relies on Ajzen's Theory of Planned Behaviour (1991). According to this theory, attitude, subjective norms and the degree of behavioural control together influence the individual's willingness to become an entrepreneur that can eventually manifest in actions. Figure 1 illustrates Ajzen's Theory of Planned Behaviour (TPB).




*Source: Ajzen, 2006*

Figure 1. Factors Shaping Entrepreneurial Intentions

One of the main ideas of Ajzen's Theory is the difference between intentions and behaviours. The occurance of a serious entrepreneurial intention does not necessarily mean that the entrepreneurial activity will be pursued and an enterprise will be set up. Intentions depend on the attitudes towards behaviour, subjective norms and the perceived behavioural control. Actual pursued activities cannot be expected without serious intentions. Objective factors such as available financial

resources and opened-up opportunities (money, time, etc.) that are required for carrying out intentions also influence business activities. This factor is termed as actual control in the revised Ajzen's Theory model (Ajzen 2006).

According to this model, there is a direct positive relationship between the entrepreneurial attitude and the willingness to start up a business. The more favourable a person's attitude toward entrepreneurship, the stronger the intention to run an enterprise. A supporting social environment is also nourishing for entrepreneurship intentions. Thus, the more positively the individual's environment is reacting to his entrepreneurial intention, the more likely he will show willingness to start up his own business.

The third factor – perceived control over events – also directly influences the individual's intention to start up an enterprise, and can have a significant effect on the behaviour as well. The impact of the perceived behavioural control on intentions and actions is twofold. Firstly, the more an individual feels that he is in control of his surroundings, the more likely he is in favour of starting up his own venture. Secondly, self-efficacy also has a positive effect on entrepreneurial spirit. The more the person feels that he has acquired the appropriate skills and knowledge to start up an enterprise, the more likely he thinks his own business can be launched.

The factors influencing willingness are interlinked as well. The twofold nature of the perceived behavioural control consisting of susceptibility to control and self-efficacy are also positively related. The latter can be interpreted as an individual who feels he has the required skills and experience and thinks that he is in control of the events.

On the basis of this survey, the factors of Ajzen's model, as well as the most important factors influencing them can be analysed. When operationalizing these concepts, this study heavily relied on the related literature. The questionnaire in this study also contains questions applied by conventional research methods. However, as in the case of most research studies aiming at measuring qualitative factors, it is inevitable to deal with the issue of validity, whether the variables

original planned to be measured are really measured. Then, methods for measuring the factors of the model described in the related literature are investigated. Finally, the practical implementation of the method used in this study is explained.

***Entrepreneurial Intention***

Krueger (1993) tried to clarify the concept entrepreneurial intention by applying simple closed questions (yes/no), such as „Do you think you will ever start a business?" Autio et al. (2001) made attempts to measure the probability of time span, notably the respondents' intentions to start a business at the time of filling in the questionnaire or five years after filling the questionnaire in. Ajzen (2002b) underlines that all items aimed to measure an intention has to measure exactly the same things, that is, the questions have to present a strong internal correlation (to realize internal consistency). He himself measured the intention on a 7-grade differential scale, but Likert-scale is also an accepted method for measuring entrepreneurial intentions.

GUESSS questionnaire measures intentions in several ways. One of them is similar to Autio's solution, but the question regarding entrepreneurial intentions is more strongly related to the respondents' studies when formulated in the following way: „Which career path do you intend to pursue right after completion of your studies, and which career path 5 years after completion of studies?" (respondents complete a table). Another similar question is „Please indicate if and how seriously you have been thinking about founding an own company."

***Attitudes***

According to Ajzen, any standard attitude scale is suitable for measuring attitudes (2002). In his methodological article he gives several examples of semantic differential scales, and he mentions the use of Likert and Thurstone scales as well. There is a possibility to measure attitudes both in a direct and indirect way. Direct measurement refers to the judgement of a person's actions as a whole. Indirect measurement tries to determine how much an individual believes in the happening of a certain event, and how important he

believes the event will happen. The aim of the questions is to determine why the respondents think in this or that way. Since the factors lying behind a certain attitude are ambivalent in many cases, Ajzen (2002) highlights that internal consistency does not necessarily prevail in these cases.

According to the common practice of testing (e.g. Autio et al. 2001, Krueger et al. 2000), this study conceptualised attitude as the acceptance of entrepreneurship as a career goal. However, contrary to common practices, this study measured the effects of four variables instead of one. For the measurement of attitudes, respondents evaluated the following four statements on a 7-grade Likert scale:

- Being an entrepreneur implies more advantages than disadvantages to me.
- A career as entrepreneur is attractive for me.
- If I had the opportunity and resources, I would become an entrepreneur.
- Being an entrepreneur would entail great satisfactions for me.

***Subjective Norms***

For the measurement of subjective norms, literature describes several approaches. Kolvereid (1996) applied 3 items, and used them to find out what the groups (immediate family, friends, other people with important influence), which are of determining importance to the respondent, think a potential entrepreneurial activity. Krueger et.al. (2000) also used this approach, but they weighted the responses according to how much the respondent relied on the opinion of a particular group. Autio et al. (2001) investigated an additional aspect, namely, how much the respondents felt their university environment inspiring.

The GUESSS questionnaire gives the possibility for testing all the three approaches. In case of question 10 (If you would pursue a career as an entrepreneur, how would people in your environment react to/judge that decision?) the respondents had to judge if the reaction of their environment would be negative or positive, and to what extent. The respondents had to evaluate the opinion of parents/family

members, friends/fellow students, and other people they consider to be important. Question 11 (Please indicate how much you care about the opinion of the following persons.) shows how important for the respondent the opinion of a given group is. The supporting university atmosphere becomes clear from question 2.6 in the questionnaire. In all of the above-mentioned three questions students had to give their answers on a 7-grade Likert scale.

***Perceived Behavioural Control***

Most surveys measure perceived behavioural control by using a varying number of questions answered on a Likert scale. Autio et al. (2001) formulated 4 statements (I am confident that I would succeed if I started my own firm; It would be easy for me to start my own firm; To start my own firm would probably be the best way for me to take advantage of my education, I have the skills and capabilities required to succeed as an entrepreneur) that students had to evaluate on a 5-grade scale. According to Ajzen (2002), the perceived behavioural control has to measure both the person's susceptibility for external control, and his self-efficacy, and the internal consistency of these items has to be taken into account.

This study measured the perceived behavioural control by using two variables in line with Ajzen's (2002) suggestions. Question 12 in the questionnaire is suitable for measuring controllability, and question 13 is applicable for measuring self-efficacy. In both cases, the respondents had to evaluate the statements and the significance of each factor on a 7-grade Likert scale.

Question 12 (Please indicate your level of agreement with the following statements) contains nine statements that can be helpful in assessing how much the respondents feel they can control and manage the events around them, and how much they feel influenced by others in making their own decisions, etc. Factor analysis was used to describe the nine variables of controllability in terms of a smaller collection of variables. Principal component method was applied to create 3 factors (KMO=0.745, 65.834%):

*Offensiveness*

• When I make plans, I am almost certain to make them work.

• I can pretty much determine what will happen in my life.

• I am usually able to protect my personal interests.

*Defensiveness*

• I feel like what happens in my life is mostly determined by powerful people.

• My life is chiefly controlled by powerful others.

• In order to make my plans work, I make sure that they fit in with the desires of people who have power over me.

*Passiveness*

• When I get what I want, it is usually because I am lucky.

• I have often found that what is going to happen will happen.

• It is not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune.

Question 13 measured self-efficacy with the help of the following question: Please indicate your degree of certainty in performing the following roles / tasks. In this question respondents had to evaluate 12 factors, out of which 11 measured the students' sensitivity to risk, innovative behaviour, and how consistent they were when making their decisions. The variables were grouped into 3 factors (KMO=0.745, 65.834%):

*Risk Tolerance*

• Reduce risk and uncertainty

• Take calculated risks

• Perform financial analysis

• Make decisions under uncertainty and risk

*Innovativeness*

• Start my own firm

• Lead my own firm to success

• Develop new products and services

• Generate new ideas

*Consistency*

• Take responsibility for my ideas and decisions

- Establish and achieve goals and objectives
- Manage my time by setting goals

**TPB test with Multinomial Logistic Regression**

In most cases, the theory's descriptive power is assessed by the analysis of correlation coefficients, and by using multi-variable regression models. Autio et al. (2001) for instance tested this model with the participation of 3445 Finnish, Swedish and American students. Gird and Bagraim (2008) investigated the model on 247 South-African, Carr and Sequeira and 308 American students.

Krueger had tested entrepreneurial intention models in his studies. In 1993 he used the data of 126, in 2000 of 97 students, and applied a very similar method in both cases. However, in 1993 he measured entrepreneurial intention with a dichotomous variable, while in 2000 he used continuous variables. As a first step, he analysed the strength of correlation between each pair of factors by using linear correlation coefficients, and in the case of dichotomous variables, biserial correlations. After this, he calculated the whole impact of the analysed independent variables on entrepreneurial intention using a path analysis. He did the same thing in 1993 despite the fact that he used dichotomous variables for the measurement of intention.

Zellweger et al. (2011), Szerb and Márkus (2007) and Gubik (2013) applied multinomial logistic regression. The advantage of this method is that it can be reliably used in case of low level measurement variables with non-normal distributions.

There are several examples of SEM (Structural Equation Modelling) models, which aim at the most accurate description of causal relationships between variables. This type of analysis can be found in the Kolveleid (1996), Plant and Ren (2010) studies.

Throughout the GUESSS survey analysis, we tested Ajzen's Theory of Planned Behaviour by multinomial logistic regression and structural equation modelling. This study presents the results of the regression model, using a low-level measurement variable for the expression of the degree of entrepreneurial intentions. Despite of its low interpretability,

this model can be reliably applied for identifying the most important variables for determining entrepreneurial intentions and also provides an order of importance according to their influence.

It is obvious that the regression model is in line with the original theoretical assumption (Theory of Planned Behaviour). However, the dependent variable is a variation of three categories included in one „Please indicate if and how seriously you have been thinking about founding an own company" (1: Do not plan to start a business, 2: Plan to start a business, 3: Have a business). The original variable offers 9 solutions. For the measurement of independent variables of the model (attitude, perceived behavioural control and self-efficiency) 28 variables were available. To compact the variables, a factor analysis was performed. Table 3 illustrates the most important data of the transformed variables that were finally built into the model.

Table 3. Outcomes of variable reduction

| Parameter | Number of variables | Number of factors | Explaining power of variable (%) |
|---|---|---|---|
| Attitude | 4 | 1 | 84.42 |
| Subjective norms | 3 | 1 | 82.91 |
| Controllability (Perceived behavioural control) | 9 | 3 | 65.83 |
| Self-efficacy (Perceived behavioural control | 12 | 3 | 69.09 |

*Source: Calculations based on GUESSS 2011 database*

The next step in analysing entrepreneurial intention was the inspection of explanatory factors. Due to the peculiarities of the database mentioned above, multinomial logistic regression proved to be the best solution. The conditional odds ratio analysis is not always unambiguous, because it does not always allow accurate comparison of different effects (Bartus 2003). According to Bartus, when more complicated models are used, it occurs that a wrong direction is determined. For this reason, this study considered only the explanatory power of the model, and justified the significant impact of each individual independent variable. The outcome of the regression analysis is shown in Table 4.

The significance of the created model is justified by the Chi-square test, and its explanatory power is measured by Nagelkerke's R2 value.

The study applied the Wald statistics to check the significance of each individual independent variable, and the conditional odds ratios show the partial effect of each variable.

Table 4. The effect of endogenous variables of entrepreneurial intentions

| Have you ever thought about starting up your own business | Variable | B | Std. Error | Wald | Sig. | Exp(B) |
|---|---|---|---|---|---|---|
| Planning own enterprise | Constant | -.265 | .036 | 53.379 | .000 | |
| | Controllability, Defensiveness | -.177 | .037 | 23.351 | .000 | .838 |
| | Controllability, Passiveness | -.369 | .038 | 93.185 | .000 | .691 |
| | Self-efficacy, Risk Tolerance | .009 | .039 | .054 | .816 | 1.009 |
| | Self-efficacy, Innovativeness | .938 | .050 | 356.364 | .000 | 2.556 |
| | Attitude | 1.205 | .052 | 536.131 | .000 | 3.338 |
| Already an entrepreneur | Constant | -3.840 | .166 | 537.769 | .000 | |
| | Controllability, Defensiveness | -.369 | .099 | 13.937 | .000 | .691 |
| | Controllability, Passiveness | -.702 | .090 | 60.947 | .000 | .495 |
| | Self-efficacy, Risk Tolerance | .290 | .107 | 7.288 | .007 | 1.336 |
| | Self-efficacy, Innovativeness | 1.791 | .160 | 125.857 | .000 | 5.994 |
| | Attitude | 1.042 | .147 | 50.449 | .000 | 2.835 |

Nagelkerke's $R^2 = 0.47$

*Source: Calculations based on GUESSS 2011 database*

The findings of this study show that the most important and significant factors of entrepreneurial intentions are attitudes and self-efficacy. The relationship has a positive direction in both cases, notably, the more positive the students' attitude and the more they believe they possess the necessary skills, the more likely they will show interest in starting up a business. The two variables applied for the measurement of controllability in the study are in a negative relationship with entrepreneurial intentions. This means that the more a person feels that he is capable of controlling his future, the more likely he will become an entrepreneur. The conducted analyses justified the assumptions that attitudes and perceived behavioural

controls play a significant role in the development of entrepreneurial intentions. However, the role the subjective norms play in this process could not be confirmed.

**Conclusions**

Fostering entrepreneurship has become a priority for economic policy makers. It is of essential importance to identify the factors that shape the students' entrepreneurial intentions. It has also become crucial to analyse the areas that considerably contribute to developing these intentions.

Ajzen's Theory of Planned Behaviour provides a detailed description of entrepreneurial intentions, which is relevant in the Hungarian context as well. The findings of this study clearly illustrate that the more positive attitude the students express in terms of starting a business of their own, and the more they believe that they possess the skills and competencies necessary for implementing this, the more stimulating intentions they have to do so. The controllability of the events is of determining importance as well. The more students feel that they are capable of influencing their future, the more likely they become entrepreneurs.

Education, training and a supportive atmosphere can considerably contribute to shifting these factors in a positive direction. Students' openness towards entrepreneurship will increase if they receive appropriate knowledge and higher education institutions offer more practice-oriented programmes.

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# Diffusion of renewable energy innovations – innovation-acceptance behaviour of the Hungarian society[1]

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Nowadays, innovation and its diffusion represent a crucial phenomenon of economic practice and economic theories. The increase of the proportion of renewable energy consumption is an essential task of the governments worldwide; however, it has been quickly acknowledged that, in the diffusion of such innovations, social acceptance could mean a serious obstacle. The paper investigates the innovation-acceptance behaviour of the Hungarian society. It focuses on the following aspects: the moment when consumers adopt alternative energy resources, the motivations they base their decisions on and, moreover, the communicational processes and segments that characterize the acceptance procedure, especially regarding the role of information. According to research results it can be concluded that Hungarian society adopts innovations similarly to the presented theoretical background, appreciate the financial advantages of an ecologically sustainable energy source and can be influenced by a prior trial. The third result of the paper is the identification of three clusters that can provide a good basis for a communication strategy.

**Keywords:** renewable energy, innovation acceptance, diffusion of innovation, alternative energy consumption, social acceptance, consumer behaviour.

**JEL code:** M30.

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[1] The paper presents partial results of the research SROP-4.2.2.A-11/1/KONV-2012-0058, Modeling the effects of the energy-production, utilization and waste management technologies to the competitiveness of the cities and regions.

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**Introduction**

People of the 21st century meet such worldwide problems as air pollution, scarcity of water supply and effects of fossil energy sources on our everyday lives. In line with these, one can also mention renewable energy sources, their usage being able not only to help out budget but to protect the Earth for future generations as well. Increasing the share of renewable energy is high on the policy agenda of the governments worldwide. However, it was quickly acknowledged that there is one factor that can potentially be a powerful barrier to the diffusion of such innovations: their social acceptance. The paper presents one slice of a bigger research carried out in the frames of SROP-4.2.2.A-11/1/ KONV-2012-0058, Modeling the effects of the energy-production, utilization and waste management technologies to the competitiveness of the cities and regions. The aim of the research is to study the social acceptance of the ecologically sustainable technologies in Hungary, primarily the residential energy consumption. For reaching this aim, designed on literature base, a personal interviewing was carried out. The present study reveals the innovation acceptance behaviour of the Hungarians as a part of the overall research. It focuses on the diffusion of ecologically sustainable energy technology innovations in society, namely the moment when the consumers adopt the new energy sources, the motivations they base their decision on and the communication processes that characterize the social acceptance of such an innovation, especially regarding the role of information.

**Literature review**

Nowadays, innovation is a crucial phenomenon of economic practice and economic theories, on the turn of the 20th and 21st century. Its concept was introduced in the theory of economics by the Austrian economist Schumpeter (1980) in the 1930's as "the process born in a creative idea" and he was followed by a series of definitions. According to Vágási (2001) by synthesizing the different definitions innovation means new knowledge, ideas, methods, procedures, organizations, new

strategies, markets, new products or services and their establishment at any field supposed to be associated with some economic and societal development. When an innovation aims to win a market it is not only necessary to investigate the company side (as it is neither done in this study) but the company's innovativeness and its ability to accept as well. Several researchers and thus several fields of research deal with innovation diffusion and almost all of them are based on the theory of the "father" of innovation diffusion, Everett M. Rogers researching the topic since the early 1960's. Researchers of the diffusion defined by Rogers (2003) study the process by which the innovation is communicated through certain channels over time among the members of a social system. According to Rogers four main elements in the diffusion of innovations are: innovation, communication channels, time and the given social system. The typical process of the new product diffusion can be displayed as an S-curve that shows the cumulated percentage of the adopters of the innovation within the population concerned against time. Based on this it can be concluded that the percent of the new product adopters is low at the beginning, it gradually grows until the possible maximum where its steepness shows the proportion of acceptance and its maximum shows the market potential. Thus, while at the beginning of the diffusion relatively few people became users, the number of people joining started rising after a while and later it diminished again. Accordingly, people can be divided in groups based on the time of innovation adoption. According to Rogers' research on American consumers from 1962, five consumer types can be differentiated: innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%) and laggards (16%). This theory of Rogers is studied in our research as well.

Ecologically sustainable energy sources being different than the traditional, years-long familiar ones are also innovations. Increasing the proportion of renewable energy consumption is an essential task of the governments worldwide; however, it has been quickly acknowledged that in the diffusion of such innovations their social acceptance could mean a serious obstacle. According to Wüstenhagen et al. (2007)

Carlman was the first scholar defining the problem of social acceptance in her study on the acceptance of wind power in 1984 in which she suggested that there were several constraints for social acceptance. There are several features of renewable energy innovations that bring new aspects to the topic of social acceptance. Their implication in houses is specifically an investment decision of the individual, in which the energy conversion is carried out near to the customer ("backyard") and means short-term expenditure but long-term return at the same time. Wüstenhagen et al. (2007) intending to contribute to the clarity of the term's understanding distinguished three dimensions of social acceptance, namely socio-political acceptance, community acceptance and market acceptance that could be studied even independently in some cases. Based on the three dimensions detailed above, Sovacool and Ratan (2012) defined the conditional framework, the factors influencing acceptance. At the level of socio-political acceptance there is a need of strong institutional capacity, political commitment and favourable legal and regulatory frameworks. In case of market acceptance competitive costs, adequate information mechanisms and access to financing are needed. Furthermore, community acceptance depends on the presence of prolific use, participatory project siting and recognition of externalities. Besides, the acceptance of an innovation can also be influenced by some psychological factors. Wejnert (2002) specified characteristics of the innovation, innovators and environment, while Huijts et al. (2012) developed their model specifically regarding alternative energy consumption by defining three types of motives for the individual. Depending on whether the acceptance of energy innovation is motivated by gain, normative or hedonic goals, individuals (1) can evaluate costs, risks and benefits, (2) can perform an evaluation based on moral aspects thus weighing whether the new technology has more positive or negative effects on the environment and society, and (3) can make a decision based on their positive or negative feelings such as satisfaction, happiness, fear or anger. In addition to these knowledge and experience, trust and fairness have an essential role. The study of

McMichael and Shipworth (2013) is focusing on the diffusion of energy-efficiency innovations in households in the UK. Authors built upon Rogers' network theory and also investigate the significance of social capital. Supposing that the desired information is in connection with energy-saving innovations, the individual would ask someone, for instance, and would receive technological knowledge, experience or an argument as an answer. This practically means mobilizing the social capital, thus the authors are striving to understand the information-seeking within the communication channels regarding energy-saving opportunities through the theory of social capital. The research shown in the paper is based on the presumption that the above mechanisms are true for the Hungarian innovation acceptance behaviour as well, and the listed factors affect the willingness to apply an alternative energy source also in case of the investigated sample.

**Methodology**

Paper-based face-to-face interviews were carried out with a sample of 2000 people that is representative for gender, age, settlement type and highest level of education criteria, considering the Hungarian population as the base population. The questionnaire used in the face-to-face interviews is not processed entirely in the present study; we investigate only the elements regarding the basic consumer behaviour reactions on innovations and changes: acceptance of innovations and alternative energy sources in the society and behavioural elements regarding the information source. The analysis was done by using SPSS and Microsoft Excel software.

The sample consists of 52.2% of women and 47.8% of men. The majority of the respondents possesses secondary school degree (41.4%); besides, there is a higher proportion of respondents with vocational school qualification (27.5%) than those with college (14.2%) or university (4.5%) degree and primary school qualification (9.6%). 57.4% of the respondents live in a house. Regarding the age groups, 24.8% of the respondents belong to the group of 18-29, 18.6% to 30-39, 21.7% to 40-49, 16.9% to 50-59 and 18.1% to the group over 60 years.

41.6% of the respondents are married, 33.9% live with a partner and child while 21.9% only with a partner.

**Results and discussion**

As the overall aim of our research is to help the enhancement of using sustainable energy sources by studying current attitude of the Hungarian society regarding innovation acceptance, more fields of this topic are presented in this chapter. Based on Rogers' (2003) theory one investigates the groups included in the sample in terms of time of adoption of an energy resource, motivations of innovation acceptance and segments that can be identified in connection with the credibility and source of the information, and at the same time regarding communication target groups which can be identified for enhancement of renewable energy consumption.

***Time dimension of innovation adoption***

As mentioned in the previous chapter, people can be divided into five categories based on their attitude towards using an innovation. As Rogers defined (2003) these are the groups of innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%) and laggards (16%), acting along different behavioural features. Initiated by this theory, we intended to see whether there are any groups in the sample based on the time dimension of using an innovation. Using Rogers' adopter groups and their behavioural features we set five statements for each category and tried to identify these groups in the sample of our study:

- innovators: "I am really open to new things, I begin to use them as one of the firsts";
- early adopters: "I buy them when they are still new, I like getting familiar with innovations myself and then give advice about them to others";
- early majority: "I am open to new things but after others already use them";
- late majority: "I am curious about new things but I wait until their price gets lower";

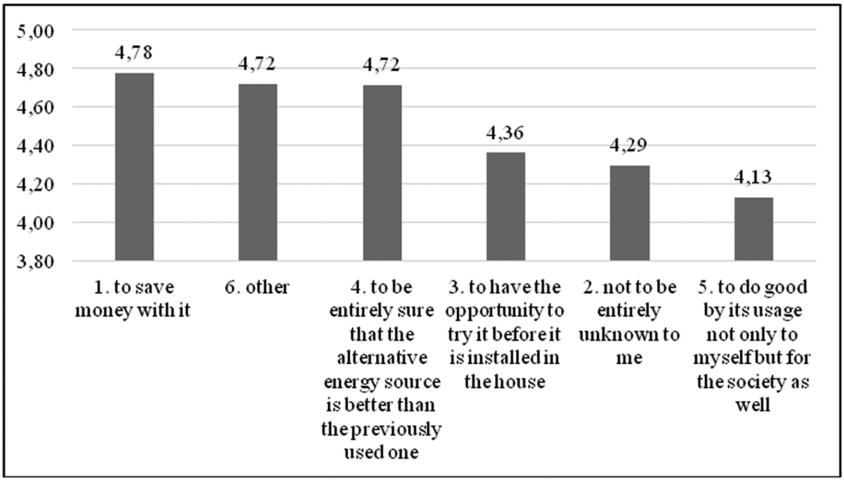
• laggards: "I do not buy innovations, I do not want to be the tester".

The respondents were asked to choose the statement most suitable for them in connection with a new product or method emerging on the market. The results were also evaluated in comparison with Rogers' results used as a reference point. According to the results, 6% of the respondents belong to the innovator category being two times larger than the basic category in Rogers' theory (2.5%). It can be concluded that the participants at the survey are more open to innovations and like to use new things more than it could be presumed based on the secondary data. The category of early adopters is theoretically 13.5%, but its size is a lot smaller in our sample as only 8% stated they buy innovations when they are still brand-new as they like getting familiar with them themselves and give advices to others. Two segments being practically the initiators of the innovations are altogether smaller than they should be according to the theory; however, compared to Rogers there is a higher proportion of those – according to their statement – who really introduce innovations to the society. The group named early adopters is larger in our research with 4% than the one presented by Rogers while late majority represents itself in almost the same proportion. However, the category called laggards is smaller with 3.5% as instead of 16% it is only 12.5%. All in all, according to the results, Rogers' adopter categories can be identified in our study on the innovation adoption of the Hungarian society as well. However, a slight shift can be realized towards the ones more open to innovations. Identifying when people start to use an innovation can be an essential base for studying further behavioural elements with the overall aim of enhancing usage of sustainable energy sources.

***Motivations of innovation adoption***

The respondents were asked to evaluate on a five-point Likert scale the importance of the listed aspects (1 – not important at all, 5 – very important) in case of deciding to use an alternative energy source or not: to save money with it; not to be entirely unknown to me; to have the

opportunity to try it before it is installed in the house; to be entirely sure that the alternative energy source is better than the previously used one; to do good by its usage not only to myself but for the society as well.




*Source: own editing*

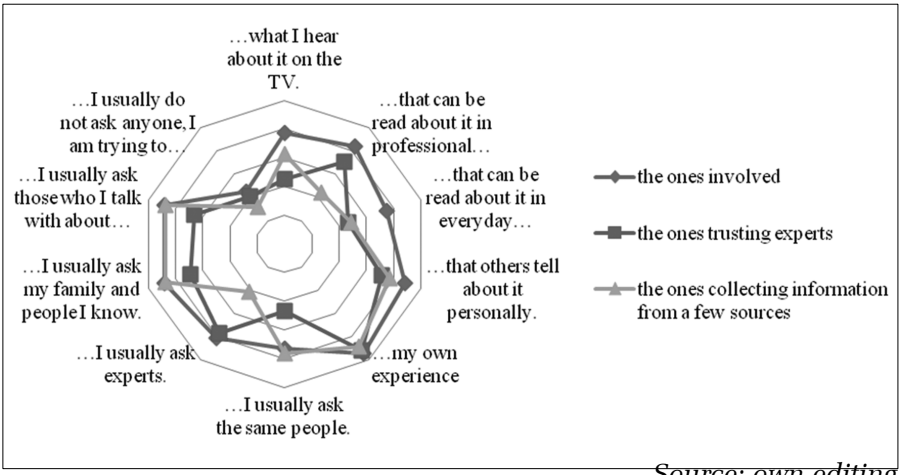
Figure 1: How important are the listed aspects to you when you decide about applying an alternative energy resource? (N=2000)

According to the respondents the most important aspect regarding the decision about applying an alternative energy source is to save money with it and it is similarly important to them to be sure that the new energy source is better than the one previously used. Still important to them is to have the opportunity to try the given technology before installing it in their house and also not to be completely unknown for them. The least important factor for the respondents is to do good not only for themselves but for the society as well by using an alternative energy source. Thus, it can be concluded that all listed aspects are important to them when making such a decision as all the average ratings are above four on the five-point scale (Figure 1). The aspect of doing something good not only for ourselves but for the whole society as well was rated at least with 3 on the five-points scale by 94% of the respondents although this is very

important only for 48% of them. In connection with this it is worth investigating the aspects and their importance included in the "others" category. 53 persons, only 2.5% of the sample, mentioned other factors to be considered in case of starting to use a new, alternative energy source. Regarding their importance, they are all important, thus they received the following rates on the scale: 4.68 is the average rating of environmental protection, 4.67 of the price and 4.5 of the "valuable and useful" category. Nearly 40% of the ones mentioning some other factor emphasized environmental protection as an important or very important aspect in decision making. It can be concluded that, taking into consideration the society, it is highly rated but at the same time it is the least important factor from the listed ones. One must add that the most frequently mentioned factors in the "other" category are associated with this. 26% of the respondents mentioning something "other" consider that the price is a crucial influencing factor as well, and some of them mentioned some important aspects such as the quick return, not to go hand in hand with destruction, to work for sure, to be long-lasting, easily used, useful, to be able to find a specialist for it, to be able to benefit entirely from its advantages, and to be implemented easily. These factors identified in our research are considered to be essential in the studies shown in the previous chapter as well (Sovacol and Ratan 2012; Wüstenhagen et al. 2007; Huijts et al. 2012). Accordingly, in case of a decision about the usage of an alternative energy source the primary aspect is whether one can save money and whether it is better than the previous one. Although the triability of the new energy source and not being completely unfamiliar with it are important factors but not unambiguously "very important" ones, opinions are divided when it comes to the importance of the factor about doing good for not only ourselves but for the society as well. It seems that by the introduction of an ecologically sustainable energy source, Hungarian residents appreciate its financial advantages (saving money) and it can also be influential if, based on a trial, the individual can make sure of it being better than the previously used one.

***Groups formed by source and credibility of information***

Being well-informed and the information base itself occur in the literature as quiet essential factors in enhancing the introduction or usage of an alternative energy source. The possibility of forming clusters in the sample, according to the source of information and the credibility of the received information, serving as a base for targeting in case of a communication strategy was investigated in the research. According to the results the respondents can be divided in three groups by K-means cluster analysis: "the ones involved" (44%), "the ones trusting experts" (33%) and "the ones collecting information from a few sources" (23%) (Figure 2). In what follows, the characteristics of the chapters are presented. There is a significant difference ($p<0,05$) between the clusters in case of every feature.




*Source: own editing*

Figure 2. Groups formed by source and credibility of information

***The ones involved***

The group of the ones involved is almost the most balanced segment. They consider any information possibly important thus they would like to know about everything; they mostly believe the information from their own experiences or the one they get from

someone personally about an alternative energy source. Things read in professional journals are convincing for them as well and they also pay attention to the information gathered from the TV or everyday papers.

They collect information from their family or people they know about an energy innovation as they do in case of other topics as well and they usually ask the same people with this aim. This segment is interested in the professional opinion of experts but they primarily collect information from people living close to them. Accordingly, they can be characterized by a high involvement when they want to get to know a new technology as these people try to find as much trustworthy information as they can; they thoroughly deal with the problem as they are not only interested in outside but in also direct information.

This is the most populous cluster as 880 respondents (44%) belong to the group of the involved ones out of the 2000-member sample. Although this is not the group where the largest number of women is present but there are more involved women (55%) than men (45%) – this can come from the specialty of the topic or even from the stereotypic traits characterizing the genders. Their majority belongs to the age group of 40-49 (24.7%) or to the young age group of 18-29 (23.1%); all in all more than 43% of them feels to be part of the middle-aged generation, while 42% marked the young generation for this answer. 45% possesses college or university diploma although the highest percentage of primary school qualification is also here (24.7%). They mostly consider the financial situation of their household to be moderate, 46% can buy the basic things but do not have money for others while 42% can afford some extra expenditures next to the basic ones but cannot save any money (N=1917). Compared to other groups they are the closest ones to the environment.

Equally to the ones trusting experts, 63% of the involved ones are open to modernization of their homes to reduce energy costs; 23% (two percentage points more than the ones trusting experts) have already carried out some kind of modernization, 40% have planned but have not done anything and 37% have not thought about this. The latter two categories were also asked to express their reasons. The majority of the group (56%) is restrained from modernization with the aim of reducing

energy costs because any change would lead to high expenditure, therefore they can be called to be price sensitive. 13% marked the option of not interested in the topic at all as an answer and quite a few of them answered not to have enough information or professional help in implementation. It seems that they are aware of the fact (more than 90%) that return on this investment would appear in long-term.

***The ones trusting experts***

The ones trusting experts are primarily convinced by their own experiences and by the information gathered from professional journals about an alternative energy source. Tools of mass media are slightly effective in their case as they do not appreciate information coming from the TV or everyday papers. When they collect information about a new technology, they rarely do this on their own and neither is typical that they would ask the same people every time. They are much more interested in expert opinions and perhaps the ones living in their close environment, family or people they know.

This is the second most populous cluster, 660 persons (33%) belong to it, out of the 2000-membered sample. This is the only segment where the proportion of men (55%) is averting the number of women (45%) that is supposed to be in connection with the fact that men are usually more familiar with the world of technology than most of the women. 27% of them are young (18-29 years old), 22% belong to the age group of 40-49, 18% to 50-59 while nearly 47% feel to be middle-aged and 43% to be young. More than 70% (71.4%) possess secondary or vocational school qualification. They evaluate their household finances to be a bit better than the category of the involved ones, 47% can buy the basic things and can also afford some extra expenditures but cannot save money, while 41% cannot spend money on things above the basic level. In this group there are more members who cannot even buy the basic things (7%) than in the previous group. After the involved ones, this group feels to be closest to the environment. 7.1% of all the answers (N=1991) belong to the group of trusting experts from those who rated this question with ten on the ten-point scale. Out of 1990 answers only 4.5% of the ones trusting experts felt to be environmental friendly and protecting the environment, which result is less than the involved ones by 3 percentage

points although still higher than the one of the third group.

63% of the ones trusting experts are open to the modernization of their home to reduce energy costs, similarly to the involved ones, but 2 percentage points less claimed to have already carried out something. 37% chose the answer "have not thought about this". The ones who have been already thinking about it but have not carried out anything or the ones who have not been thinking about this topic, also gave their reasons. The costs were the most frequently marked reason for not carrying out any modernization although this is by three percentage points less (54%) than the ones' involved. It can be observed that more members from this group do not live in their own apartment and more mentioned (10%) not to possess enough information about the opportunities. Similarly to the involved ones 13% marked that they are not interested at all in the topic. Thus, this group can also be price-sensitive besides the fact that that they can be influenced by a satisfying amount and quality information coming from experts or found in professional journals.

***The ones collecting information from a few sources***

The segment of the ones collecting information from a few sources is the smallest one as it consists of 460 persons (23%). They mostly do not make an effort to get information about innovations, about a new technology or about an alternative energy source. The most convincing information is coming from their own experiences or personal contacts but they consider things on TV moderately trustworthy as well. They are not persuaded by the information in professional journals or everyday papers thus they are not susceptible to print media. When collecting information they ask someone, however, not experts but those who they contact anyway, their family members and people they know (similarly to the involved ones but more than the ones trusting experts). They contact more the same people than the ones trusting experts as this latter category considers the professional opinion important thus supposedly they ask experts about the given problem.

This is the most feminine group (58%) and this group includes the lowest proportion of men (42%). This could come from a presumption that women are less interested in new technologies thus they make less

effort to gain information, however, this can be denied as in the group of involved people trying to find as much information as possible 55% are women. This is the group with the highest proportion of people above 60 years (23.7%) and at the same time 25% of the cluster ranges between 18 and 29 years. 40.6% feel to be young and 37.4% consider they belong to the middle-age generation. There are far less people with a diploma (12%) and while in the group trusting experts there is a proportion of 71% possessing at least secondary degree, in this category only 50% have secondary degree.

While the previous two clusters – although marking a moderate level regarding the financial situation of the household – chose the stronger, better financial level categories, this group of the ones collecting information from few sources rated themselves to possess a higher financial status by 14 percentage points less. 50% can buy the basic things but nothing else and 36% can afford some additional expenditures as well but cannot save money. They feel to be far away from the environment and they are the last to think to be environmental friendly or environmentalist.

Here is the highest percentage of those who are not interested in energy-cost-reducing modernization (57%) and the lowest proportion of those who have been thinking about modernization but have not done anything (30%) or have already done something (14%). The respondents of the first and second category gave a reason for that as well. The respondents from this cluster also mentioned more than the involved ones that they do not have enough information (7%); 12% do not live in their own apartment thus do not want to spend money on modernization and here is the largest group of those who are not interested in the topic at all (23%). Accordingly, they are the least inquiring group which can be in connection with their financial status or even with their qualification. Perhaps this is the segment that could be reached most difficultly, they are by all means price-sensitive as the cost of a modernization means an obstacle for them; moreover, they are the most disinterested group of all the three.

***Summary of the clusters***

According to the above details, three groups can be formed in the sample (being representative for the Hungarian society) regarding the information about alternative energy source. Table 1 summarizes the features of these clusters. The research tried to find whether there are some identifiable groups in the sample that can be used as target groups in case of a communication strategy.

Table 1. Summary of cluster features

| | **The ones involved** | **The ones trusting experts** | **The ones collecting information from a few sources** |
|---|---|---|---|
| Information about an alternative energy resource | *"everything can be important"* | *"searching professional sources"* | *"no big efforts done"* |
| Gender | 55% women | 55% men | 58% women |
| Age | 40-49 (24,7%)<br>18-29 (23,1%) | 18-29 (27%)<br>40-49 (22%)<br>50-59(18%) | above 60 (23,7%)<br>18-29 (25%) |
| Qualification | diploma (45%)<br>primary school (24,7%) | secondary or vocational (71,4%) | at least secondary school (50%) |
| Financial situation | 46% basic expenditures<br>42% some extra expenditures | 41% basic expenditures<br>47% some extra expenditures | 50% basic expenditures<br>36% some extra expenditures |
| Attitude towards the environment | more environmentalist | moderately environmentalist | farest from being environmentalist |
| Modernization of their homes to reduce energy cost | open and has done the most | open but more only planning | less open and the most not interested |
| Reason of not open to modernization of their homes to reduce energy cost | cost | cost | cost and no interest |

*Source: own editing*

According to the results three segments can be identified from which the group of the involved ones and the ones trusting experts seem to be the most susceptible for adoption of alternative energy sources and can become available by the proper communicational tools.

**Conclusion**

Results shown in the study are a slice of a bigger research that aims to investigate social acceptance of ecologically sustainable

technologies, focusing on the residential energy consumption. The relevance of the research is unquestionable as, mostly, our environment falls victim to the nowadays running, consumption-centric world and it would be useful to know the basis that can be influenced for reaching the aim of enhancing renewable energy consumption.

The study investigates more fields. On the one hand, based on Rogers study (2003) we intended to identify adopter groups divided on the basis of time dimension – namely the innovators, early adopters, early majority, late majority and laggards – in the sample of our research. According to the results our sample shows similar proportions as the theoretical background although a slight shift can be observed towards the ones open to innovations. In connection with this, factors that weight in a decision about installing an alternative energy source are also shown where according to the respondents' opinion we are more open to apply a new, renewable energy source when we can save money and we are also influenced by the level of how sure we are that the new source is better than the previous one. On the other hand, the possibility of forming clusters within the sample according to the source of information and the credibility of the received information, serving as a base for targeting in case of a communication strategy was investigated. According to the results the respondents can be divided in three groups: "the ones involved" (44%), "the ones trusting experts" (33%) and "the ones collecting information from a few sources" (23%) out of which the ones involved and trusting experts could become available through the proper communication ways characterizing them. With a consciously designed communication strategy, based on the results of the research, these types of people could be convinced to use renewable energy sources thus we could get one step closer to save our environment for the following generations.

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# Welcome to the machine How web-based technologies affect team collaboration?

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No matter how large an organization might be, it cannot achieve fast or significant development on its own. Collaboration has become a fundamental element: collaboration with customers, with suppliers and internal and external stakeholders. This phenomenon fades the boundaries of companies away, giving soil to a higher level of cooperation, as the advent of the Internet has made information readily available in a press of a button. With the absence of information disparity organizations thrive to continue to innovate in order to sustain its corporate competencies. Traditionally, innovation has always been made within a small-dedicated group within an organization. More recently, some of major corporations have discovered that innovation is the responsibility of the entire organization and the best ideas are most likely to come from the collaboration of people of diverse background, culture, experience, and age. Unlikely to the traditional face-to-face collaborations, modern meetings can take a virtual form that participants are completely separated from physical location and time zones. Social ties are not anymore established only at the canteen's coffee table but through computer assisted communication systems. Recent studies on global collaboration are concentrated mostly under the domain of Group Decision Support System (GDSS) on communication efficiencies, problem solving, and decision-making.

In this paper the results of an experiment on how inter-departmental communication can proceed to render higher decision quality, productivity and satisfaction is demonstrated. 175 team members of 45 student teams have worked in technologically and demographically diverse groups. The factor variables were the task/technology fit, productivity, decision quality, satisfaction and key competencies. It has been proven that modern web-2

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based social technologies called wikis may facilitate such collaborations and massive knowledge share.

**Keywords:** diverse teams, decision-making, GDSS, task/technology fit, wiki collaboration technologies.

**JEL codes:** M12, I29, O39, C92.

## Introduction

Created by Ward Cunningham in 1995, wikis are web-based hypertext applications intended for collaborative writing. In addition to writing and viewing their own pages in real time, people who use a wiki can see pages others have published and hyper-textually link to them without having to wait for an editor to assemble the various components developed individually on multiple PCs. Second, during the writing process, content can be displayed immediately to other team members, who can immediately add their own contributions and see others' revisions without having to wait for an editor to assemble the various elements from people working on other PCs (Lin et al. 2012).

Wikis can facilitate knowledge management by formatting collaboration. As McAfee argued, "The technologists of Enterprise 2.0 (e.g., wikis) are trying hard not to impose on users any preconceived notions about how work should proceed or how output should be categorized or structured. Instead, they're building tools that let these aspects of knowledge work emerge" (McAfee 2006). Tacit knowledge is unstructured, subjective, abstract, and without a fixed format. Wikis have evolved as a tool capable of matching these various characteristics (Lin et al. 2012).

## Literature review

### *Recent trends in Web2 and Wiki technologies*

Web 2.0 technologies enable remarkable interactivity and create many new collaboration models such as Wikipedia or InnoCentive. What encourages us is not only its popularity but its idiosyncrasy; simple and parallel editing, version control, and real-time updates (Trkman and Trkman 2009). Bean and Hott (2005) pointed out "bottleneck effect" where updates are delayed through centrally managed entry. Instead of

being served as a control centre, wiki serves as a platform and central repository. This makes asynchronous cooperation and cross-time zone operations possible, and conflicts can be solved in an asynchronous and location independent setting.

First, in a typical corporate hierarchy, opinions from higher ranked officers may be valued more. Wiki provides an equal opportunity that allows all opinions to be heard. It also permits efficiency. As Bean and Hott (2005) commented, rather than the back-and-forth exchanges of e-mail attachments or discussion boards, wiki allows direct exchanges of opinions centrally and stored permanently.

Second, unlike blogs or micro-blogs available today, wiki allows bi-directional communication, which makes it a dynamic process that closely resembles the real life communication exchange. Mattison (2003) pointed out that compared to blogs where articles are written mainly by individuals, wiki is a groupware where authors have a chance to see others' writings and offer their own thought. Most wiki provide forums where authors can discuss and resolve conflicting opinions before they are posted.

Lastly, the entire methodology is built on trust, which means all entries are assumed to be genuine and correct and filters are established only when necessary. The assumed trust and the way wiki encourages continuous enhancement of facts, in turns harness the power of diverse individuals to create collaborative works globally (Shu and Cheng 2012).

In the past 20 years, many organizations have begun to understand the importance of companywide knowledge management as a key to competitiveness and productivity (Stratford and Davenport 2008). A wiki is a readily available and convenient tool for knowledge management and collaboration. Many organizations such as Motorola use wiki as an internal knowledge management system (Chu and Kennedy 2011; Shu and Yu-Hao 2012). IBM has also used wiki to manage and obtain product knowledge and insights through its component broker (Hasan and Ptaff 2006). Organizations need to focus on their own organization learning to sustain growth in order to compete favourably in the global market (Argyris 1997). Wikis have been successful in helping companies

converge scattered information into a streamlined and easily accessible knowledge base (Hasan and Ptaff 2006). Wikis enable people to work collaboratively in the creation and storage of knowledge (Wagner and Bolloju 2005), the accumulation of knowledge, which allows innovators to absorb and use of knowledge to generate innovation (Cohen and Levinthal 1990), and the organizational body of thoughts which can be collected. These are important for studying the organizational learning and knowledge creation (Lam 2004).

***The different perspectives of understanding diversity in work-groups***

The increasing dilemma in organizations is the growing presence and need to manage diversity in work-groups: namely how can the unavoidable symptom of different faces of diversity turned to a potential benefit? Traditional management techniques had used the assumption of a much more homogenous work-force. And for quite a long period of time the techniques seemed to work well-enough. However with the internationalization of markets, the radically changing motivation and attitude of the work-force, and the equity legislation in many countries, those techniques do not seem to be valid anymore for today's organizations.

As Maznevski (1994) argues, any group of people can be described by its diversity. Two basic types of diversity sources can be identified:

*Role diversity*, which includes occupation, organizational position, specialized knowledge and skills, and family role. Diversity along this dimension seems easy to understand even in the everyday practice of a company. Moreover, in business settings role type of diversity is often consciously created in decision-making teams. These explicit roles and the behaviours, attitudes and norms associated with them are publicly recognized.

In spite the public relevance of role diversity, *inherent diversity* is less obvious and visible. This dimension includes age, gender, nationality, cultural values, personality and information processing and decision-making style. By being less explicit, the impact and consequences of inherent diversity are also more challenging to

understand. Interestingly gender seemed to become a role-related source of diversity recently. Research has demonstrated that women and men bring different perspectives, better ideas to a group thus generating different solution possibilities and better performance (Dyson et al. 1976; Hoffman and Maier 1961; Ruhe 1978). Culturally diverse groups also generate more ideas of higher quality in brainstorming processes (Adler 1990; McLeod and Lobe 1992). Mobilizing the energy and synergy of people from various cultures working as a team can lead to more creative approaches to the problems and challenges faced by corporate teams (Marquadt and Horvath 2001). The summary of task-related effectiveness of diverse teams is demonstrated on Table 1.

Another perspective of diversity takes the individuals cultural background as the main source of classification. Adler (1990) focuses on the cultural background of the individuals in the construction of teams. In *homogeneous groups* all members share the same cultural background. Therefore members of homogeneous groups generally perceive, interpret, and evaluate the world in a very similar way. Homogeneous nature of the team can be perceived by professional and national culture and other inherent diversity characteristics. When all but one member of a certain group share the same diversity characteristics then *token groups* are taking over. Managing token groups can be a real challenge even if the leader of the team is the one culturally/professionally etc. different member, which is often the case in business reality. This situation requires a high level of leadership and cultural and managerial intelligence, where authority and power are in contrast with the majority of the members. In *bicultural groups*, two or more members represent each of two distinct diversity characteristics. This bicultural situation happens very often in the case of mergers and acquisitions (M&A), when experts and managers from two companies try to integrate the cultures of the two merging organizations or in product development teams with engineers and marketing people on board. Such bicultural interactions raise the most cultural conflicts. Following the diversity framework of Adler (1990), in multicultural groups, three or more culturally or otherwise diverse backgrounds are represented. The latter is the type, which is mostly referred to as diverse group in this study.

***The effectiveness of diverse teams***

Hundreds of studies have already focused on the effectiveness of groups' problem-solving (Bettenhausen 1991; Hill 1982; Shaw 1983). However most studies did not have much focus on diverse teams. The ones which have examined the impact of diversity on group problem-solving have produced inconsistent results (Watson et al. 1993). As far as decision-making is concerned, empirical studies have contrasting results. While diversity in membership (inherent and role-related as well) is desirable for decision-making tasks for the increasing number of solutions or alternatives offered, in the meantime diversity also appears as a serious obstacle to smooth interaction processes, often resulting in decreased performance (Adler 1990; Maznevski 1994).

Ling (1990) argues two advantages of diverse composition in decision-making teams, such as specific and general. Most of the time the task of the group requires more knowledge and skills than any individual member would possess. Therefore, out of necessity the individual contributions will complement each other. In this case the specific advantages of role-related diversity are used. General advantages are less easy to tackle, simply because diversity itself supports the process and increases the potential productivity of the group.

Table 1. The Effective Managing of Diversity in Work Groups

| | EFFECTIVE | INEFFECTIVE |
|---|---|---|
| **TASK** | Innovative | Routine |
| **STAGE** | Divergence (earlier) | Convergence (later) |
| **CONDITIONS** | Differences recognized<br>Members selected for task-related abilities<br>Mutual respect<br>Equal power<br>Superordinate goal<br>External feedback | Differences ignored<br>Members selected on basis of ethnicity<br>Ethnocentrism<br>Cultural dominance<br>Individual goals<br>No feedback (complete autonomy) |

*Source: Adler 1990*

These teams can also help to minimize the risk of uniformity and pressures of 'group-think' that can easily occur in long-standing homogenous teams (Schneider and Barsoux 2003).

In conclusion, studies have demonstrated that diverse groups have the potential to perform well, they can generate more and better alternatives and criteria than homogenous groups. However when it comes to solutions and implementation their performance falls behind the homogenous groups (Kumar et al. 1991; Ruhe and Allen 1977). Overall, most research seem to suggest as little diversity as possible for decision-making teams. Where diversity proved to enhance effectiveness, the common element seemed to be the conscious integration of that diversity (Maznevski 1994). Once diversity is integrated, diverse teams can achieve their potential (Hurst et al. 1989). On the process stage effectiveness and considerations of diverse teams, see Table 2.

Table 2. Diversity and the Group's Stage of Development

| Stage | Process | Diversity makes the process | Process based on… |
|---|---|---|---|
| Entry: Initial group formation | Trust building (developing cohesion) | More difficult | Using similarities and understanding differences |
| Work: Problem description and analysis | Ideation (creating ideas) | Easier | Using differences |
| Action: Decision making and implementation | Consensus building (agreeing and acting) | More difficult | Recognizing and creating similarities |

*Source: Adler 1990*

**Performance parameters of teamwork/collaboration**

In this research and during the planning of the experiment the methodology and experiment procedure developed by Shu and Yu-Hao (2012) and Shu and Yu-Hao (2011) at National Central University, Taiwan were followed. In this study the Hungarian results of our comparative Hungarian-Taiwanese research experiment are demonstrated. The terminology and task classification of Shu and Lee (2003) has been used in the paper. Thus teamwork was featured with the following performance parameters and factors as a priori variables in further analysis.

***Task/technology fit***

Although wikis demonstrate different technology characteristics,

which may be proven to be superior in terms of productivity, decision quality, and satisfaction in collaboration, they may not be superior in all types of tasks. Goodhue (1998) has demonstrated that different technologies may fit into different task categories.

According to (McGrath 1984), collaborative tasks can be divided into two classifications: intellective tasks and preference tasks; the former is the task to solve a problem that has an anticipated outcome. The latter is a task that an outcome is uncertain. The final agreement must rely on team members' values and beliefs. Zigurs and Buckland (1998) believe team members will, under different task classifications and collaborative technologies, collaborate differently and cause difference in task fit. The nature of the preference task makes us to infer that it is more likely to incite discussion within the group, different opinion exchange, and alternative interpretation on the task, which makes the need for sound collaborative platform more prominent.

In Goodhue (1998) task/technology fit (TTF) model, the usefulness of tools in performing a task is highly correlated with how well the task collocates with the tools functionality. The main thrust of TTF theory is that any science and technology must collocate in unison with the needs of mission before any measurable performance is possible. For example, collaboration between team members under a collaborative support system can solve problems more efficiently because it is not subjected to time and geographical constraints (Dennis et al. 1999; Jessup and Valacich 1993; Klein and Dologite 2000).

We believe TTF is appropriate for our study. First, wiki and traditional collaboration differs in synchronization. It is our goal to find out which technology mode fits better on tasks requiring extensive asynchronous collaboration.

Second, TTF differs from the utilization models such as UTAUT (Venkatesh et al. 2003) in that it is a direct measurement of performance. As Goodhue stated, "Utilization of a poor system (i.e., one with low TTF) will not improve performance, and poor systems may be utilized "extensively due to social factors, habit, ignorance, availability, etc., even when utilization is voluntary." When the technology use is not voluntary, then it is treated as a contaminant in a utilization model, which makes

the model less credible as measure performance (Goodhue and Thompson 1995).

According to Goodhue (1998) as Shu and Yu-Hao (2012) refers Technology/Task Fit (TTF) is related to the usefulness of tools used in performing a task which is highly correlated with how well the task collocates with the tools' functionally. The main trust of TTF model is that any science and technology must collocate in unison with the needs of mission before any measurable performance is possible. Goodhue is the first scholar to conceive the Task/Technology Fit Theory (TTF), which stated that the degree of task/technology fit determines how helpful an information technology is to a user while performing tasks. Goodhue pointed out that an information technology is said to have a good fit whenever it is able to reduce operating costs, provide easier user experience, and better performance outcome (Goodhue 1988). In other words, a user must believe that the information system is useful and able to provide considerable benefits to his/her assigned task (Greenstein 1998). Collaboration between team members under a collaborative support system that can solve problems without time and geographical constrain would be more efficient and favourable (Dennis et al. 1999; Katz and Shapiro 1994; Klein and Dologite 2000).

***Productivity***

In mathematical terms, productivity can be calculated as the ratio between inputs and outputs (Belanger et al. 2001). Yet not all aspects of input and output are measurable (Brynjolfsson and Yang 1996). Outputs such as quality of life, fun, and convenience are nearly impossible to quantify or measure directly.

Consequently, the respondents' beliefs about the effectiveness of using wikis or not using wikis in the performance of tasks and their perceived productivity should be measured. Thus, previous researches that have shown strong links between self-judgments and the quality of performance were strongly relied upon (Kauffman and Weill 1989; Kelley 1994). Productivity will be measured in two ways. The first is a questionnaire based on Shu and Chuang (2012). The second is an objective measurement, which will count the number of generated ideas.

***Decision Quality***

Much of the studies on group decision quality came from the study of Group Support Systems (GSS). Benbasat and Lim (1993) quantitatively integrated the results of several experimental studies on GSS usage and found that it has a positive effect on decision quality. Their founding was further supported by Nunamaker et al. (1996) that in laboratory studies that group using GSS produce higher quality ideas than those using standard meeting techniques.

Quality is often used to measure the final results in collaborative research. It refers to team members' own feelings towards the team output during the decision-making process (Chen 2003). It can also be equate to members' own evaluation of the final decision outcomes (Chizmar and Zak 1983). Decision quality will be measured by a questionnaire based on Shu and Yu-Hao's study (2012).

***Satisfaction***

Satisfaction may be defined as an application's ability to meet the expectation of the users. It is by far a subjective term that varies with one's perceptions and attitudes toward its eventual benefits and outcomes. Past studies have indicated that satisfaction is closely moderated by the aspect of an application's ease of use or the precision of the user-machine interface (Adam Mahmood et al. 1999). Satisfaction often used to measure the effectiveness of a collaborative process or result (Church and Gandal 1992, 1993).

Past researches also suggested that care must be taken when formulating satisfaction metrics, because measurement of satisfaction and quality are similar, but in practice, high degree of satisfaction may or may not necessarily equates to high quality (Jonscher 1983). Satisfaction will be measured by a questionnaire based on Shu and Yu-Hao's study (2012).

***Key capabilities***

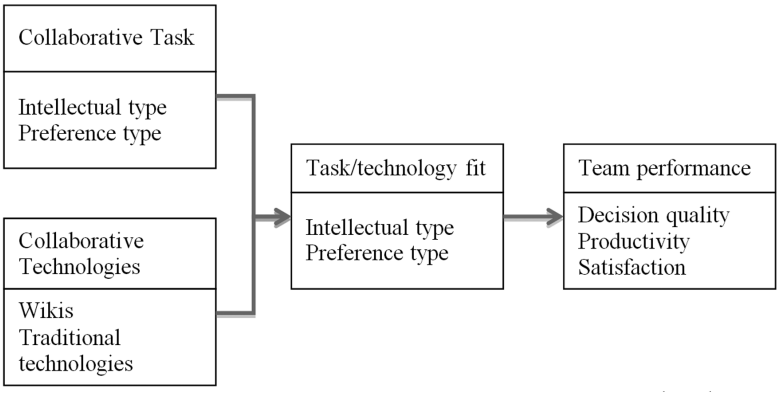
In this sense some typical capabilities and competencies of team members were measured regarding to teamwork and collaboration with other team members as suggested in literature (Lin et al. 2012; Shu and Cheng 2012; Shu and Lee 2003; Shu and Yu-Hao 2012). The ability of

knowledge sharing and absorption potential, learning and knowledge transfer, shared knowledge creation, access to knowledge during teamwork, the integration of knowledge from different sources, filtering knowledge and many efficiency issues, such as learning efficiency, problem-solving efficiency, learning from mistakes were measured, so as the evolution of teamwork and collaboration and the ability of knowledge utilization.

**Research methodology and experiment design**

***Research model and hypothesis***

In this paper and during the whole research process (including planning and implementing) the methodology presented in Lin et al. (2012); Shu and Lee (2003); Shu and Yu-Hao (2012) were followed. This methodology is based on the separation of collaborative tasks to intellectual type and preference type tasks on the one hand, and the separation of collaborative technologies to traditional (face-to-face meetings) and wiki (web2)-based technologies on the other. In this sense the research need to measure the fit of the two dimensions of tasks and technologies and the team performance.




*Source: Shu and Lee 2003*

Figure 1. Research model

Goodhue and Thompson (1995) in their task/technology fit (TTF) model argued that the usefulness of tools in performing a task is highly correlated with how well the task collocates with the tools' functionality. The main thrust of TTF theory is that any science and technology must collocate with the needs of the mission before measurable performance is possible. In other words, potential users must be thoroughly convinced that a technology is capable of assisting them in completing their mission before it is adopted (Greenstein 1998). For example, collaboration between team members under a collaborative support system that can solve problems with no time and geographical constraints would be the most efficient (Banker and Kemerer 1989; Katz and Shapiro 1994).

Zigurs and Buckland (1998) have shown that groups adopting a group support system are more motivated to express their ideas than groups that do not. This is probably because the group members can avoid the possibility of face-to-face confrontation, which might lead to coercion and embarrassment. Additionally, systems that support parallel editing and allow multiple participants to instantly share and express their opinions, ideas, and information could be far more efficient than conventional systems in which editing and expression are sequential (Berndt 1992).

Based on these arguments, we proposed the following hypotheses:

***Hypothesis 1****: In the context of inter-group collaboration, wiki offers a better task/technology fit than conventional processor.*

***Hypothesis 1a:*** *In the context of inter-group intellective tasking, wiki offers a better task/technology fit than conventional processor.*

***Hypothesis 1b****: In the context of inter-group preference tasking, wiki offers a better task/technology fit than conventional processor.*

Christensen and Jorgenson (1969) argued that the amount of information a member of a team can contribute is an important indicator of the quality of the group collaboration. Christensen and Greene (1976) further defined productivity as the quantity of output data that a collaborative team can produce. Grover et al. ( 1998) used perceived productivity as the dependent variable in their study of IT diffusion, primarily because previous studies of IT and productivity yielded

ambiguous results, largely due to measurement issues. In our model, neither the inputs nor the outputs in either the intellective or the preference task are measurable. Thus, we defined productivity, in the context of inter-group collaboration, as the perceived adequacy of the acquired and assimilated information for completion of the task at hand. Based on the above argument, we argued the following hypotheses:

***Hypothesis 2****: The better the task/technology fit, the better a team's productivity.*

***Hypothesis 2a****: The better the task/technology fit, the better a team's productivity in intellective tasks.*

***Hypothesis 2b****: The better the task/technology fit, the better a team's productivity in preference tasks.*

Decision quality is often used as a metric to measure the results of collaborative studies. Fan et al. (2004) argued that decision-making quality is a good measure of group communication performance. Salas et al. (1992) agreed with Fan et al. that output quality is an important indicator of performance. Quality is defined as team members' feelings about the team's output during the decision-making process (Chen 2003), has also been used to measure the final results of collaborative research. Quality can also refer to members' evaluation of the outcomes of the final group decision (Chizmar and Zak 1983)**.**

***Hypothesis 3****: The better the task/technology fit, the better the quality of the team's decision.*

***Hypothesis 3a****: The better the task/technology fit, the better the quality of the team's decision in intellective tasks.*

***Hypothesis 3b****: The better the task/technology fit, the better the quality of the team's decision in preference tasks.*

Satisfaction, defined as the manifestation of good feelings that the team members experience during the course of collaboration, is often used in studies of collaboration to measure the success of a process or outcome (Church and Gandal 1992, 1993). It is often associated with group members' positive evaluation of their collaborative efforts. According to the above literature, the following hypotheses can be defined:

***Hypothesis 4****: The better the task/technology fit, the greater the group satisfaction.*

***Hypothesis 4a****: The better the task/technology fit, the greater the group satisfaction in intellective tasks.*

***Hypothesis 4b****: The better the task/technology fit, the greater the group satisfaction in preference tasks.*

The research experiment also focuses on the performance improvement due to wiki usage during the procedure. It is our intention to prove, that experimental groups have greater improvement in all collaboration performance factors than control groups – and this is also influenced by their previous attitudes to teamwork and wikis.

***Hypothesis 5a****: If a team member's attitude to teamwork is positive, they will reach higher improvement in all performance parameters due to wiki usage during the experiment and vice versa than those, who did not use wikis.*

***Hypothesis 5b****: If a team member's attitude to wiki usage is positive, they will reach higher improvement in all performance parameters due to wiki usage during the experiment and vice versa than those, who did not use wikis.*

***Experimental design and procedure***

The research was implemented at Budapest Business School, Faculty of Finance and Accountancy among part-time master students of finance and accounting specialization. A demographic survey was carried out among participants before the experiment procedure to detect their attitudes and habits of teamwork and wiki usage. The usage frequency of wiki platforms (social sites, cloud computing devices, on-line collaboration tools) by each participant was measured in their work and dichotomous variables were defined to classify them whether they are wiki users or not. Teamwork habits were also measured: how often and how many times participants work in teams, and dichotomous variables were defined to classify them whether they are team workers or not.

Having these results made it possible to form teams of four, with special regard to their demographic features – as detailed in the sample allocation and distribution part of this paper. Having all the teams formed

the first pre-experiment survey were implemented, testing the attitudes of collaboration in several dimensions.

At this stage of the research all clusters of teams were divided randomly into two: experimental teams and control teams. For the 22 experimental teams a 60 minutes training on "Modern web2 based applications for on-line teamwork and mass collaboration" were hold and some specific freeware applications (Skype, Dropbox, Google Drive, etc.) were demonstrated. The intention was to make them committed to solve their team tasks on-line without face-to-face communication. To ensure this, the experiment description required them to make screenshots while using wikis. Control groups had no information about the research; those teams just got one of the experiment case studies to solve.

There were three kinds of experiments projects (Apple, Facebook and Google case studies) with 4-4 tasks: two intellectual and two preference type tasks in each projects (Intellectual task for closed ended problems, that have a certain solution, and preference tasks for open ended problems, that do not have only one single solution). In our experiment intellectual task refers to the net present value of the company, what are the determinants of this value and what capitalization trends do they have. While preference type tasks expect creative solutions: market conditions and bargaining power of the company, strengths and weaknesses of the companies and what are the advantages and disadvantages of the current brand strategies. The projects were distributed to groups randomly and had 4 weeks to complete the projects and present the results in a 30.000-35.000-character assignment document.

After this experiment session the same questionnaire (the one used before the experiment) were distributed again, however all the questions were focused on the specific tasks in projects this time. Thus the experiment resulted in two surveys: a pre-test for general attitudes and a post-experiment for project experiences.


*Source: own research*

Figure 2. Process of research

***Sample allocation and distribution***

The sample consists of 175 participants. The gender mix distribution represents other programmes of the school as well: 68% female and 32% male.

The bases of the research experiment are teams that were generated by two dimensions. In a previous sampling some demographic characteristics of all participants were defined based on their teamwork experiences and wiki usage experiences, habits and generated two factors: attitude of teamwork and familiarity with wiki applications. According to these two dimensions 175 participants were divided into 45 groups with 4 members (in average) and at least two members were unknown to each other and any other member of the team. In Table 3 the distribution and the number of teams in each category (and all participants) are shown: we had 8 groups (with 31 members as total) who do not work in groups and do not use wikis; 10 groups (with 39 members as total) who usually work in team but do not use wikis; 4 groups (with 16 members as total) the opposite of this previous; and 14 groups (with 56 members as total) who are familiar with wikis and teamwork as well. We also had 9 miscellaneous groups (with 33 members as total). This covers 45 groups and 175 individuals as total.

Table 3. Construction of the participant teams

| | | Team workers | | | Total |
|---|---|---|---|---|---|
| | | no | yes | misc. | |
| Wiki user | no | 8 (31) | 10 (39) | 3 (12) | 21 (82) |
| | yes | 4 (16) | 14 (56) | 3 (10) | 21 (82) |
| | misc. | 0 (0) | 0 (0) | 3 (11) | 3 (11) |
| Total | | 12 (47) | 24 (95) | 9 (33) | 45 (175) |

*Source: own research*

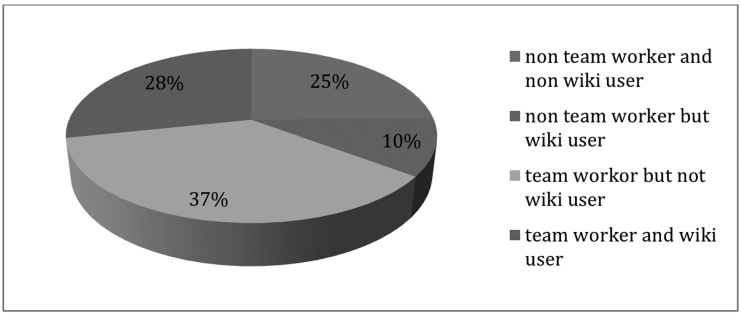
To ensure that the sample size was large enough to minimize Type I error and Type II error, an analysis were performed to determine the optimal sample size for each cell of the design, using the formula described by List et al. (2010):

$$n = 2\left(t_{\alpha/2} + t_{\beta}\right)^2 - \left(\frac{\sigma}{\delta}\right)^2,$$

where $n$ is sample size, $t_{\alpha}$ is t-value (type I error), $t_{\beta}$ is t-value (type II error), $\sigma$ is population standard deviation, and $\delta$ is the minimum detectable mean outcome difference between the experimental and control conditions.

Setting power at 0.80 and 0.90 and the criterion alpha level at 0.05, the ideal minimum treatment cell sizes were determined between 16 and 21 respectively. As the number of participants in each cell of our study was minimum 16, it could be concluded that our sample was large enough to detect the desired effects.

The measured characteristics of the sample (team members) are defined by wiki usage experiments and teamwork experiments.




*Source: own research*

Figure 3. Demography of sample based on wiki usage and team working

**Data analysis methodology, model reliability and validity**

Having the result of pre- and post-experiment surveys, an exploratory factor analysis (EFA) were performed with principal components extraction and VARIMAX rotation with Kaiser normalization on both dataset (pre and post) on each 37 measured variables to identify latent factors of a priori variables.

Table 4. Rotated component matrices of EFA

| PRE | Component | | | | | POST | Component | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | KEY | FIT | DQ | SAT | PRO | | KEY | SAT | FIT | PRO | DQ |
| k_8_pre | .826 | -.025 | .080 | .100 | .143 | k_8_post | .837 | .270 | .109 | .147 | .000 |
| k_17_pre | .808 | -.038 | -.012 | .056 | .065 | k_7_post | .799 | .253 | .060 | -.106 | .121 |
| k_16_pre | .807 | -.087 | .133 | -.011 | .147 | k_2_post | .764 | .165 | .135 | .292 | -.017 |
| k_14_pre | .806 | .078 | .020 | -.005 | .099 | k_11_post | .762 | .018 | .165 | .400 | -.044 |
| k_7_pre | .801 | .106 | .100 | .056 | .052 | k_6_post | .719 | .284 | .120 | -.076 | .209 |
| k_4_pre | .788 | -.084 | .053 | .194 | .051 | k_14_post | .701 | .024 | .302 | .295 | -.016 |
| k_2_pre | .781 | .043 | .117 | .138 | .041 | k_10_post | .688 | .308 | .006 | .168 | .201 |
| k_15_pre | .769 | -.033 | .151 | .113 | .055 | k_9_post | .681 | .403 | .159 | .203 | .087 |
| k_3_pre | .763 | .027 | .018 | .201 | .001 | s_2_post | .234 | .867 | .213 | .146 | .015 |
| k_9_pre | .763 | .157 | .009 | -.001 | .097 | s_5_post | .248 | .857 | .261 | .044 | -.015 |
| k_6_pre | .760 | .062 | .096 | .101 | .081 | s_3_post | .291 | .831 | .216 | .168 | -.011 |
| k_11_pre | .742 | .130 | -.074 | .052 | .031 | s_1_post | .391 | .691 | .329 | .225 | .123 |
| k_10_pre | .719 | .271 | -.017 | .023 | .142 | f_5_post | .227 | .236 | .867 | .038 | .101 |
| k_5_pre | .690 | .106 | .126 | .171 | .191 | f_3_post | .156 | .358 | .796 | -.004 | .168 |
| k_12_pre | .536 | .170 | -.033 | .117 | .371 | f_2_post | .106 | .209 | .796 | .080 | .220 |
| f_2_pre | .100 | .872 | .011 | .057 | -.110 | p_3_post | .297 | .096 | -.122 | .802 | .000 |
| f_3_pre | -.012 | .733 | .279 | .108 | .061 | p_4_post | .163 | .298 | .233 | .764 | .044 |
| f_5_pre | .119 | .724 | .245 | .245 | .018 | d_4_post | .048 | .070 | .129 | -.008 | .876 |
| d_2_pre | .134 | .217 | .922 | -.001 | -.003 | d_2_post | .145 | -.047 | .222 | .038 | .826 |
| d_1_pre | .118 | .239 | .895 | .095 | .059 | | | | | | |
| s_2_pre | .188 | .183 | .028 | .869 | .140 | | | | | | |
| s_4_pre | .209 | .180 | .066 | .837 | -.019 | | | | | | |
| p_4_pre | .136 | -.077 | .036 | .225 | .874 | | | | | | |
| p_5_pre | .218 | .001 | .028 | -.114 | .839 | | | | | | |

*Source: own research*

As the 5-5 latent variables were expressed [task/technology fit (FIT), productivity (PRO), decision quality (DQ), satisfaction (SAT) and key competences (KEY)] out of the 37-37 measured variables a confirmatory factor analysis (CFA) was performed to test the fit of the clausal models (pre and post) as Jöreskog (1969) suggests.

In order to get the best fit of the model, numerous iterations were performed and the results of the last are demonstrated here, which was the most significant and showed the best fit.

All required tests were performed as well which are necessary for the interpretation of the results, with special regard to reliability analysis [Cronbach's $\alpha$ for internal consistency of the scales, Kaiser-Meyer-Olkin test (KMO), Bartlett's spherical test, and we measured the total variance expressed (TVE) by the factors], convergent validity [range of factor loadings, composite reliability (CR) and average variance expressed (AVE) by the factors], discriminant validity [correlation of the scales,

maximum shared variance (MSV), average shared variance (ASV) and square root of AVE], and fit tests [absolute fit (AF), incremental fit (IF), parsimonious fit (PF)].

***Reliability Analysis***

The best-fit models with their five latent factors have 24 and 19 variables out of the measured 37. After this reduction the inner consistency of the scales is still high as Cronbach's α measures: 0.691 is the lowest value which remains above desired values referred by Cronbach (1951).

The factorability were also tested and found both KMO measures above 0.8, meaning that the data set is "meritorious" for factor analysis (Kaiser 1974). Also Bartlett's spherical tests are significant (Snedecor and Cochran 1989) in all constructs and TVE is desirable high. In this sense no reliability issues are present: all constructs are suitable.

Table 5. Reliability Analysis

| Construct | PRE-EXPERIMENT | | | | |
|---|---|---|---|---|---|
| | # of var. (measured) | Cronbach's α | KMO | Bartlett sig. | TVE |
| Technology/task fit | 3 (5) | 0.764 | 0.864 | 0.000 | 68.932 |
| Productivity | 2 (5) | 0.751 | | | |
| Decision quality | 2 (5) | 0.907 | | | |
| Satisfaction | 2 (5) | 0.806 | | | |
| Key competences | 15 (17) | 0.951 | | | |
| **Construct** | **POST-EXPERIMENT** | | | | |
| | # of var. (measured) | Cronbach's α | KMO | Bartlett sig. | TVE |
| Technology/task fit | 3 (5) | 0.885 | 0.897 | 0.000 | 76.694 |
| Productivity | 2 (5) | 0.691 | | | |
| Decision quality | 2 (5) | 0.714 | | | |
| Satisfaction | 4 (5) | 0.938 | | | |
| Key competences | 8 (17) | 0.928 | | | |

*Source: own research*

***Validity***

It is absolutely necessary to establish convergent and discriminant validity when doing a CFA as Carmines and Zeller (1979) suggest. If factors do not demonstrate adequate validity and reliability,

moving on to test a causal model will be useless – no interpretation will be correct.

There are a few measures that are useful for establishing validity: Composite Reliability (CR), Average Variance Extracted (AVE). The thresholds for these values are as follows: CR > 0.7; CR > AVE; AVE > 0.5 (Hair et al. 2010).

Having a closer look at the measures of convergent validity more preciously, Fornell and Larcker's (1981) recommendations were followed: convergent validity is achieved, when the following three conditions are met: (a) all the standardized factor loadings exceed 0.5; (b) the composite reliability is higher than 0.6; and (c) the average variance expressed exceeds 0.5.

Convergent reliability was achieved by both conditionality for all construct in both cases (pre and post).

Table 6. Measures of Convergent Validity

| | PRE-EXPERIMENT | | | POST-EXPERIMENT | | |
|---|---|---|---|---|---|---|
| | Composite reliability | AVE | Range of item loadings | Composite reliability | AVE | Range of item loadings |
| SAT | 0.809 | 0.681 | 0.869 – 0.837 | 0.934 | 0.780 | 0.867 – 0.691 |
| FIT | 0.766 | 0.523 | 0.872 – 0.724 | 0.889 | 0.729 | 0.867 – 0.796 |
| PRO | 0.772 | 0.634 | 0.874 – 0.839 | 0.700 | 0.542 | 0.802 – 0.764 |
| DQ | 0.908 | 0.832 | 0.922 – 0.895 | 0.749 | 0.608 | 0.876 – 0.826 |
| KEY | 0.950 | 0.561 | 0.826 – 0.536 | 0.920 | 0.591 | 0.837 – 0.681 |

*Source: own research*

Fornell and Larcker (1981) also set the rules of achieving discriminant validity. It happens when (a) the square root of the AVE of a construct is greater than the correlation between that construct and another construct; (b) when MSV < AVE and (c) ASV < AVE. Table below shows that discriminant validity was achieved by all these criterion for all constructs, so no validity issues were presented.

It is necessary to determine whether the model-in-use provides the best of the available choices (Fornell and Larcker, 1981). The three kinds

Table 7. Measures of Discriminant Validity

PRE-EXPERIMENT

| | AVE | MSV | ASV | SAT | FIT | PRO | DQ | KEY |
|---|---|---|---|---|---|---|---|---|
| SAT | 0.681 | 0.203 | 0.118 | (0.825) | | | | |
| FIT | 0.523 | 0.263 | 0.128 | 0.451 | (0.723) | | | |
| PRO | 0.634 | 0.108 | 0.050 | 0.289 | -0.003 | (0.796) | | |
| DQ | 0.832 | 0.263 | 0.094 | 0.211 | 0.513 | 0.084 | (0.912) | |
| KEY | 0.561 | 0.140 | 0.088 | 0.374 | 0.213 | 0.329 | 0.245 | (0.749) |

POST-EXPERIMENT

| | AVE | MSV | ASV | SAT | FIT | PRO | DQ | KEY |
|---|---|---|---|---|---|---|---|---|
| SAT | 0.780 | 0.441 | 0.291 | (0.883) | | | | |
| FIT | 0.729 | 0.387 | 0.219 | 0.622 | (0.854) | | | |
| PRO | 0.542 | 0.349 | 0.200 | 0.563 | 0.351 | (0.736) | | |
| DQ | 0.608 | 0.162 | 0.062 | 0.141 | 0.402 | 0.099 | (0.780) | |
| KEY | 0.591 | 0.441 | 0.263 | 0.664 | 0.452 | 0.591 | 0.241 | (0.769) |

(Square roots of AVE)

*Source: own research*

of model fit (absolute fit, incremental fit and parsimonious fit) for our data is presented in table below using the threshold reference recommendations of Schreiber et al. (2006), Wheaton et al. (1977), Tabachnick and Fidell (2007) and Mulaik et al. (1989).

In this context the results of all tests in both dataset meet the acceptable levels of model fitting criteria as shown in Table 8.

According to these tests, validity and reliability analyses shown above both pre-experiment model and post-experiment model is the best of the available constructs, interpretable and applicable for further research to draw conclusions.

**Hypothesis test**

***Post-experiment analysis***

The next step was to test the hypotheses. First the Shapiro-Wilk statistic were used to test normality and Levene's statistic to test homogeneity of variances of the sample. The sample was found to follow normal distribution and the variances are homogeneous for

Table 8. Measures of Model Fit

| Statistic | Value | | Threshold | Result | |
|---|---|---|---|---|---|
| | PRE | POST | | PRE | POST |
| *Absolute fit* | | | | | |
| $\chi^2$/df | 1.653 | 1.790 | ≤ 3 | good | good |
| GFI | 0.849 | 0.865 | > 0.8 | good | good |
| RMR | 0.028 | 0.044 | < 0.08 | good | good |
| RMSEA | 0.062 | 0.068 | < 0.1 | good | good |
| *Incremental fit* | | | | | |
| TLI | 0.934 | 0.94 | > 0.9 | good | good |
| IFI | 0.946 | 0.952 | > 0.9 | good | good |
| CFI | 0.945 | 0.952 | > 0.9 | good | good |
| *Parsimonious fit* | | | | | |
| PGFI | 0.654 | 0.633 | > 0.5 | good | good |
| PCFI | 0.791 | 0.744 | > 0.5 | good | good |
| PNFI | 0.730 | 0.730 | > 0.5 | good | good |

*Source: own research*

post-experiment data. Thus, equal-variance version of t-tests was employed to test the hypotheses.

Performing the tests the decision can be made whether the performance of the experiment sample or the control sample was better. In Table 9 the results are summarized. In all constructs and all tasks experiment groups performed better.

This difference was significant in all cases, except in some issues regarding to intellectual tasks (productivity, decision quality and satisfaction).

***Analysing the differences between pre- and post-experiment data***

When analysing the results of post-experiment result the difference of post-experience and pre-experience datasets were generated to

Table 9. Post-experiment comparison between experimental and control groups regarding to task type

| Construct | Task | Group | Mean | SD | t-value | p-value |
|---|---|---|---|---|---|---|
| Task / Technology Fit | Overall | Experimental/Post-test | 4.231 | 0.41 | 6.621 | 0.000*** |
| | | Control/Post-test | 3.269 | 0.823 | | |
| | Intellective | Experimental/Post-test | 4.013 | 0.275 | 3.675 | 0.001** |
| | | Control/Post-test | 3.313 | 0.807 | | |
| | Preference | Experimental/Post-test | 4.45 | 0.41 | 7.112 | 0.000*** |
| | | Control/Post-test | 2.875 | 0.901 | | |
| Productivity | Overall | Experimental/Post-test | 4.425 | 0.447 | 3.314 | 0.001** |
| | | Control/Post-test | 3.9 | 0.897 | | |
| | Intellective | Experimental/Post-test | 4.3 | 0.47 | 0.551 | 0.585 |
| | | Control/Post-test | 4.2 | 0.661 | | |
| | Preference | Experimental/Post-test | 4.55 | 0.394 | 3.911 | 0.000*** |
| | | Control/Post-test | 3.6 | 1.012 | | |
| Decision quality | Overall | Experimental/Post-test | 3.706 | 0.607 | 2.415 | 0.018* |
| | | Control/Post-test | 3.363 | 0.665 | | |
| | Intellective | Experimental/Post-test | 3.513 | 0.676 | 0.562 | 0.578 |
| | | Control/Post-test | 3.4 | 0.587 | | |
| | Preference | Experimental/Post-test | 3.9 | 0.469 | 2.912 | 0.006** |
| | | Control/Post-test | 3.325 | 0.748 | | |
| Satisfaction | Overall | Experimental/Post-test | 4.333 | 0.585 | 4.229 | 0.000*** |
| | | Control/Post-test | 3.583 | 0.957 | | |
| | Intellective | Experimental/Post-test | 4.283 | 0.575 | 1.392 | 0.172 |
| | | Control/Post-test | 4.017 | 0.635 | | |
| | Preference | Experimental/Post-test | 4.383 | 0.605 | 4.585 | 0.000*** |
| | | Control/Post-test | 3.15 | 1.04 | | |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

*Source: own research*

measure the improvement (or decline) of each construct in each group. The constructs were cut with demographic variables: the habit of usage of wiki applications, the teamwork attitude and their current specialization.

Productivity and decision quality have significantly declined during the experiment for those, who were not familiar with teamwork meaning

Table 10. Inter-experiment comparison between experimental and control groups regarding to wiki usage

| Construct | Demo | Group | Mean | SD | t-value | p-value |
|---|---|---|---|---|---|---|
| Task / technology fit | Wiki user | Experimental/diff | 0.074 | 1.612 | -0.156 | 0.438 |
| | | Control /diff | 0.124 | 0.987 | | |
| | Non wiki user | Experimental/diff | -0.062 | 1.292 | 0.006 | 0.498 |
| | | Control/diff | -0.063 | 0.979 | | |
| Productivity | Wiki user | Experimental/diff | -0.127 | 1.540 | 0.063 | 0.475 |
| | | Control /diff | -0.151 | 1.548 | | |
| | Non wiki user | Experimental/diff | 0.086 | 0.917 | -0.028 | 0.489 |
| | | Control/diff | 0.092 | 1.278 | | |
| Decision quality | Wiki user | Experimental/diff | 0.074 | 1.122 | 0.445 | 0.329 |
| | | Control /diff | -0.059 | 1.301 | | |
| | Non wiki user | Experimental/diff | -0.186 | 1.181 | -1.399 | 0.082 |
| | | Control/diff | 0.169 | 1.396 | | |
| Satisfaction | Wiki user | Experimental/diff | 0.086 | 1.301 | -0.343 | 0.366 |
| | | Control /diff | 0.195 | 1.300 | | |
| | Non wiki user | Experimental/diff | 0.153 | 1.240 | 1.787 | 0.038* |
| | | Control/diff | -0.329 | 1.496 | | |
| Key capabilities | Wiki user | Experimental/diff | 0.153 | 0.741 | 0.623 | 0.268 |
| | | Control /diff | 0.024 | 0.923 | | |
| | Non wiki user | Experimental/diff | 0.051 | 0.716 | 1.123 | 0.132 |
| | | Control/diff | -0.170 | 1.225 | | |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

*Source: own research*

that those seemed to have problems with wiki applications in context of effective decision-making and productivity.

The opposite effect can be measured in these groups in key capabilities as experiment groups had significant improvement in this construct, meaning that wiki groups had better knowledge share, absorption, filtering and learning capabilities during the experiment.

Table 11. Inter-experiment comparison between experimental and control groups regarding to teamwork habits

| Construct | Demo | Group | Mean | SD | t-value | p-value |
|---|---|---|---|---|---|---|
| Task / technology fit | Team worker | Experimental/diff | -0.061 | 1.454 | -0.776 | 0.220 |
| | | Control /diff | 0.116 | 0.922 | | |
| | No team worker | Experimental/diff | 0.138 | 1.362 | 0.817 | 0.209 |
| | | Control/diff | -0.129 | 1.045 | | |
| Productivity | Team worker | Experimental/diff | 0.112 | 1.317 | 1.090 | 0.139 |
| | | Control /diff | -0.169 | 1.343 | | |
| | No team worker | Experimental/diff | -0.302 | 0.795 | -1.817 | 0.037* |
| | | Control/diff | 0.213 | 1.416 | | |
| Decision quality | Team worker | Experimental/diff | 0.034 | 1.099 | 0.401 | 0.345 |
| | | Control /diff | -0.062 | 1.330 | | |
| | No team worker | Experimental/diff | -0.381 | 1.277 | -1.865 | 0.033* |
| | | Control/diff | 0.266 | 1.389 | | |
| Satisfaction | Team worker | Experimental/diff | 0.058 | 1.214 | 0.959 | 0.170 |
| | | Control /diff | -0.208 | 1.574 | | |
| | No team worker | Experimental/diff | 0.305 | 1.380 | 0.984 | 0.165 |
| | | Control/diff | -0.040 | 1.272 | | |
| Key capabilities | Team worker | Experimental/diff | 0.081 | 0.732 | -0.151 | 0.440 |
| | | Control /diff | 0.104 | 0.836 | | |
| | No team worker | Experimental/diff | 0.123 | 0.718 | 1.760 | 0.041* |
| | | Control/diff | -0.348 | 1.366 | | |

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

*Source: own research*

**Results and discussion**

Having the results of all statistical tests the hypotheses should be answered. Hypothesis group 1 was confirmed, so one can conclude, that in the context of inter-group collaboration wiki applications offer a better task/technology fit for preference type tasks and intellectual type and in overall cases as well.

Hypothesis group 2 was partly confirmed as H2a were rejected: there

were no significant evidence found that team productivity is higher in wiki user groups in solving intellective tasks. However the connection in solving preference type tasks and in overall cases could be significantly confirmed.

The same was the case in context of team's decision making: H3a hypothesis were rejected, however the fact that wiki user groups reached better decision quality through the experiment in preference type tasks and in overall cases could be significantly confirmed.

Similar conclusions could be drawn in hypothesis group 4, as H4a is rejected: the better the task/technology fit the greater the group satisfaction in preference type tasks and in overall cases – but not significantly better in intellectual type tasks.

Therefore in case of H2a, H3a and H4a it can be argued that in accordance to the reviewed literature (Adler 1990; McLeod and Lobe 1992; Marquadt and Horvath 2001) diversity only provides better performance when it is integrated into the process. Thus wikis provide a good framework of collaboration for more divergent tasks (i.e. preference tasks in this study), whereas in case of more routine and procedure based tasks (i.e. intellective tasks) performance has not increased significantly.

Hypothesis group 5 have many cases after the split of all the performance indicator variables by wiki dichotomous and teamwork dichotomous demographic variables. Due to this splitting very few significant differences were found in post/pre experiment differences by experimental and control groups. However it can be argued that non-wiki users who did not use wiki applications before the experiment and now were forced to use them had significantly greater satisfaction with the teamwork than those in control groups.

The opposite was found regarding to decision quality and teamwork: those who did not work in team before have significant decline in decision quality during the experiment due to the wiki usage than those who were in control groups (and was not asked to use wikis during the experiment). However these groups of non-team workers have significantly higher improvement in key capabilities of teamwork than those in control group. This means, that non-team workers can improve

Table 12. Hypothesis test results

| Hypothesis | Method | Test result | Conclusion |
|---|---|---|---|
| H1 | t-test of post-exp data split by task type | *** | Confirmed |
| H1a | t-test of post-exp data split by task type | ** | Confirmed |
| H1b | t-test of post-exp data split by task type | *** | Confirmed |
| H2 | t-test of post-exp data split by task type | ** | Confirmed |
| H2a | t-test of post-exp data split by task type | Rejected | |
| H2b | t-test of post-exp data split by task type | *** | Confirmed |
| H3 | t-test of post-exp data split by task type | * | Confirmed |
| H3a | t-test of post-exp data split by task type | Rejected | |
| H3b | t-test of post-exp data split by task type | ** | Confirmed |
| H4 | t-test of post-exp data split by task type | *** | Confirmed |
| H4a | t-test of post-exp data split by task type | Rejected | |
| H4b | t-test of post-exp data split by task type | *** | Confirmed |
| H5a | t-test of the difference of post-exp and pre-exp data split by wiki usage | * | Partly confirmed |
| H5b | t-test of the difference of post-exp and pre-exp data split by teamwork | * | Partly confirmed |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

*Source: own research*

their key capabilities due to usage of wiki applications during the experiment.

However no other significant differences were found in variances in these two contexts; tables 10 and 11 show some major (but not significant) differences in performance indicator means of both experimental and control groups.

**Managerial implications**

Having the results of our experiments it can be argued, that wiki applications can significantly improve task and technology fit in teamwork, for any kinds of tasks. Wikis also foster higher productivity, better decision quality and higher satisfaction for preference type tasks.

In contrast wiki applications are not very useful for intellectual type tasks: collaborative tasks which have an anticipated outcome and an already known process to use for problems solving are not the field to use wikis, more traditional methods would apply. Therefore these applications appear to be very useful for preference type task; but cannot replace face-to-face problem solving methods, when the details of communication and implementation become vital. This argument is in full accordance with the literature reviewed (Adler 1990; Maznevski 1994).

Another factor hindering the productivity of teamwork, when members have no positive attitudes to use wiki applications and are not keen on teamwork.

**Limitations and further research directions**

However all major recommendations in literature for sample size and distributions were considered, for experimental procedure (test and control groups) and latent variables construction (reliability and convergent and discriminant validity and model fit) and for applicable hypothesis test methods, there are still some basic limitations to this research. Firstly the sampling limitations: the sample of this experiment was part-time higher education business students with financial and accounting specialization, which is an undeniable constraint. The sampling procedures are needed to be extended.

Secondly a systematic problem occurs: it seems complicated to ensure that experimental groups do use wiki applications during the experiments whereas control groups are supposed not to do so.

Further plans are focused to eliminate these limitations and fine-tune the whole experiment procedure. A longitudinal analysis seems a viable option to carry out in a years time resolving the limitations of the procedure and sample and providing an opportunity for both for a dynamic and intercultural (ie. Taiwanese and Hungarian) comparative study.

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# Trust and innovation in Hungarian SMEs

**ILDIKÓ MAROSI**[1]

Hungary is not favourably ranked in the various competitiveness and innovation lists. If enterprises want to develop, they do not only need financial capital (among other factors), but also a high level of innovative activity and cooperative social capital. The basis of cooperation is trust; at the same time, Hungary is an individualistic society with a closed mindset where people follow their own aims and goals. Owing to the "knowledge is power" and "zero-sum game" way of thinking, even if enterprises develop, they do it on their own and trust usually stays within the organizational framework.

The aim of this paper is to look into the relation of trust and innovation. I endeavor to explore the way trust influences innovative activities, the cooperation of business actors as well as economic performance along the way. In the first part of the paper, after a short overview of the relevant literature, an attempt will be made at exploring the influence of trust on innovation in the working practices of Hungarian SMEs. In the second part of the study, preliminary research data are presented in order to verify the hypotheses that arose on the basis of the literature as well as to identify further factors contributing to the understanding of the phenomenon of innovation and its relation with trust.

Based on my researches, I found a medium-strength positive correlation between trust and innovative pursuits. The reason for the relation's strength is that innovation is not only affected by trust but by other factors as well, like customer and supplier relations or network-type cooperation within the cluster, corporate tax, the problem of risk capital etc.

**Keywords:** cooperation, innovation, social capital, SMEs, trust.

**JEL code:** M10.

## Introduction

In line with international researches and literature data trust has a strong influence on the economic actors' innovative tendencies and their

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willingness thereof. Based on the Global Innovation Index scores for 2012, Hungary was placed 31st in the world rankings, which is a quite good rank. However, turning our attention to the most up-to-date figures we can discover that, e.g., on innovation linkages, Hungary ranked only 53rd (Cornell University et al. 2013). Its 88th position on the state of cluster development is yet another indicator to show that the Hungarian economy is in urgent need of change in its economic and social practices, namely its reluctance to facilitate collaboration.

Accordingly, two of the major drivers of the competitiveness of companies and industries are trust and innovation (Kiss 2013). Since Hungary does not rank among the top-performing countries, it is of utmost importance that innovation, especially among SMEs, is fostered and developed.

The aim of this paper is to look into the relation of trust and innovation. I endeavor to explore the way trust influences innovative activities, the cooperation of business actors, as well as economic performance along the way.

In the first part of the paper after a short overview of the relevant literature, an attempt will be made at exploring the influence of trust on innovation in the working practices of Hungarian SMEs.

In the second part of the study, preliminary data of a research on the very topic is presented in order to verify the hypotheses that arose on the basis of the literature on the topic, as well as to identify further factors contributing to the understanding of the phenomenon of innovation and its relation with trust.

## Literature review

### *Innovation*

According to the Frascati manual, innovation is "turning an idea into an either freshly marketed or updated product, into a new or updated process to be used in the industry or commerce or into a new viewpoint for a social service" (OECD 1993). Out of the various innovation types found in the professional literature, we wish to emphasize open innovation. The point of the open innovation business model is that either occasionally or regularly, the company uses outside knowledge in

the initial or perhaps in all phases of the innovation. (Csath 2010). Owing to open innovation, the enterprise is able to enter a new market quicker and it is easier for it to find new technology and get access to new ideas (Mortara et al. 2009). Open innovation builds on social capital and requires the enterprise to remain open towards its own environment.

***Trust as Social Capital Facilitator***

The literature dealing with social capital – with its numerous definitions – has a history of approximately 100 years, beginning with the 1916 definition of Hanifan. *Social capital* appears in knowledge transfer and the ability of the economy to form adaptation techniques (Kun 2008). Social capital is mostly measured with *general trust*. Fukuyama (1997) also traces a country's prosperity and competitiveness to a single prevailing cultural factor, namely the level of trust in the given society. Fukuyama (1995) argues that in lack of trust, partnership at any level can come about only when partners make, enforce and apply precise rules and regulations covering all details. If all else fails, then by legal means or other coercive measures. Evidence of insisting on rules, at times even overregulation resulting, e.g., in a huge body of written and audio-records is common at both micro- and macro-levels, for the sharing of information as well as cooperation call for trust.

The relationships based on trust and cooperation represents a significant social resource (Kopp and Martos 2011). No matter whether social capital is examined from an anthropological, sociological or economic perspective, trust will appear as an important factor in all those approaches. According to Putnam (2000) and Szabó (2011), social capital has both direct and indirect influences on economic performance. Directly, e.g., due to trust, transaction costs as well as the cost of monitoring or that of enforcing contracts go down in just the same way as the costs of deception or crime. Its indirect influence can be felt by means of the interaction between human and social resources, through political channels and the link between social capital and investment. As a result, actors take more risks and make more investments in physical and human capital. The researches of Takács et al. (2012) among agricultural enterprises verified that cooperation does reduce transaction costs owing to better agricultural machinery

capacity utilization. As a result, farmers are beginning to realize the necessity of cooperation.

Based on the way social capital is linked to economic performance, the factors of social capital can be divided into two large groups, namely the factors of social coexistence and those of trust and reciprocity (Kovács 2009) and they are all determined by cultural embeddedness. A lack of bonds of trust and reciprocity between actors of the economy will lead to low-quality relationships or no relationship at all, and as a consequence, social capital will be wasted. In fact, we are not living in the age of lone wolves. No matter whether financial, technological or human capital is considered, cooperation and interaction are essential. Rather than readiness for partnership, however, distrust will feed a negative and inward-looking attitude.

Research at organizational level as well as macro studies reviewed by Simon and Tóth (2010), reveal three measures used for trust indexes. First, it is predictability, i.e., a need for rule-driven behaviour. The second one is expectations implying uncertainty.

Finally, the third one is identified as goodwill, an intention or effort to make progress towards positive goals. A fall in trust may affect micro-level businesses as well. In order to set up and operate a business it is crucial to cooperate and exhibit an intention to meet the others' needs, and it is trust that lays the foundations of this attitude (Tóth-Bordásné and Bencsik 2012). In the Lövey and Nadkarni (2007) model, a successful organization is the same as an effective and healthy organization. A lack of trust means failing to fulfill customer or co-worker demand for harmony, which will lead to unsound, inefficient and unsuccessful operation; nor can innovation be promoted in an atmosphere of distrust and, as a result, in over-controlled and rigidly hierarchical organizations where the motivation for creating and communicating new ideas will be set back (Tóth 2009).

National culture contributes a great deal to economic performance in measurable ways (Moon and Choi 2001). In their survey Tóth and his co-workers (2009) examine the system of values in Hungary, taking Inglehart's (1997) findings based on a large body of research into values, as a point of reference. They have found that:

• Hungary is near the closed-mindedness pole, which is not connected to the state of economic development or the structure of society.

• in the traditional – religious vs. secular – rational scale, preference is given to the secular – rational way of thinking.

• in terms of the value system, self-actualization turns out to be less characteristic, while distrust is prevalent in large measure in the population.

In addition, according to the typical Hungarian mindset, success in business transactions equals to being on the receiving end of zero-sum games. This mindset cannot promote the idea of achieving economic surplus through mutual benefits or that of succeeding through fair play and cooperation, without either party losing the game at the same time (Tóth 2009). In individualistic societies, such as Hungary, the bases of individual labour are individual needs and motivations, actors strive to achieve their individually best position (Lazányi 2012). Accordingly, trust is not a relevant economical phenomenon. Undoubtedly, this attitude continues to negatively affect the country's position through an inability to articulate shared interests and wasted opportunities to collaborate resulting in failed attempts to be in competition or gain a competitive advantage.

When analyzing OECD reports on Hungary, innovation seems to be the other main hurdle in the way of the economy's prosperity. The main weaknesses of the Hungarian innovation system are, first of all, a low-level innovative activity combined with a similarly low-level patent activity. In addition, R&D&I is not regionally balanced, there are not enough innovative SMEs, mobility and collaboration are scarce and human resources for R&D&I are insufficient, mainly as far as science and engineering graduates are concerned. The INNOTARS survey (conducted from May 2009 to January 2011 by a team led by professor Magdolna Csath) that was aimed at exploring and evaluating all those factors which influence small- and medium-sized enterprises, their innovative activity also verified the OECD findings (Csath 2011).

Trust and reciprocity are crucial for innovation. Varga (2012. 19) defines the higher synergy produced by higher social capital as the

re-vitality of the effect of social capital, which makes change, development and modernization simple. In addition, he sets up "very close direct proportion" between economic revitalization and innovation.

All in all, actors in a relationship of trust are interdependent. Trust forms the basis not only for building exchange relationships but also for working around uncertainty and risks. The key to organizational trust is that leaders are capable of building trust in a certain organization, irrespective of the field of operation, workforce or form of business, which brings organizational trust dividends, i.e. an increased value, faster growth, more innovation, more effective cooperation, stable partnerships and stronger loyalty.

According to my previous research of 2008-2009 called "Tertiary Knowledge Management, Internal and External Cooperation Features," conducted among 486 enterprises, there is remarkably little cooperation or even willingness to cooperate between enterprises and tertiary institutions; this is true regardless of the size of the organization. Where there was established relationship, it was mostly dominated by short-term entrepreneurial interests, although the knowledge effect of the universities should be an important factor (Tóth-Bordásné 2011).

Borbás (2007) conducted another research in the North-Hungarian region, finding that half of the sample from that local region had no turnover, which meant they had no effective economic connections either. The companies in question mostly cooperated with companies from the capital in product development (34.8%), while 27% of them cooperated with others in putting their products on the market.

Vadasi (2009) also conducted a research in one of the local regions in North-Hungary and found that most business relations are kept together by business savvy and tactics. Entrepreneurs are more willing to slow down the development of their own companies than to take a risk and share knowledge or cooperate with a partner who is not worthy of their trust.

Vadasi (2009) claims that enterprises keep their information and cooperation within the frames of micro-networks. Relationship between development institutions, incubator houses, chambers, clusters and local enterprises is scarce, and entrepreneurs clearly mistrust the public sector and official regulations (Borbás 2007, Vadasi 2009).

Interpreting cooperation at organizational level, I used my above research to examine company expectations towards employees. Employers primarily expect their workforce to be frank and fair, while the ability to work in a group ranked fifth, ethical norms ranked sixth and helping colleagues ranked eighth. I revealed that employers receive more obedience and flexibility from new entrants, but they expect more creativity than what they get. Participation in team-work is an everyday practice within companies.

Borbás (2007) and Vadasi (2008) pointed out in their researches that the enterprises they interviewed would like to find loyal workforce which is able to bear heavier workload, while they are reluctant to spend on further training or R&D.

In the research described in this paper, the two main influencing factors, namely trust and innovation are addressed together. I was aiming at not only verifying the research results of many others on the topic, but broaden the state of understanding factors influencing economic growth by searching for a connection between trust and innovation. The purpose of the paper is to provide yet another proof for the fact that:

*H1: The level of innovation cooperation among SMEs is low.*

*H2: There are co-worker innovative activities within companies, but firms refuse to spend money on it.*

*H3: Internal cooperation and trust increase innovative capabilities of companies.*

**Methodology and participants in the research**

Present data are an outcome of a broad explorative questionnaire addressing five main topics: changes after Hungary's joining to the EU, innovation activity of enterprises, R&D activity of enterprises, questions about market competition and background information about enterprises. It has been forwarded to 1800 enterprises altogether, which were asked to use a channel of their choice to return their answers by post, fax, e-mail or in person. The selection of enterprises was carried out using the method of stratified sampling, the stratifying criteria being region, operation field and workforce. Out of the incoming questionnaires, 814 were found suitable for further examination.

The questionnaire consisted of 32 questions, 19 closed-format and 13 open-format questions. Most of the closed-format (multiple-choice) questions were yes/no or dichotomous closed-format questions (nominal scales). The 13 open-format (unstructured) questions served the purpose of providing details of the enterprises as well as the respondents' opinions.

The statistical analysis of the questionnaires was done with the SPSS 17.00 program. After preparing (checking and repairing) for an analysis the data obtained from our quantitative survey a decision had to be made as to how to treat missing data. As we did not consider using the method of replacing the missing data with averages, we opted to omit the units with missing data. Therefore, we indicated the number of answers for each part of the analysis, for the sake of clarity.

We started our analysis using the method of simple descriptive statistics (arithmetic mean, frequency), which also formed the basis of further analyses. Bearing in mind that most of the survey questions included nominal scales, as a rule we calculated frequencies and arithmetic means. To examine a correlation between two qualitative variables, we applied a cross-tabulation analysis to show the combined frequency distribution of variants of the criteria at issue and Pearson's $\chi^2$ statistics was used to measure statistical significance of the correlation of two variables. The analysis was carried out at a 5% empirical significance level (95% of reliability), which is a generally accepted practice in economic analyses. It was most interesting to discover an intensity of connections in the proved correlations. In our research, the intensity of associative connections was measured with Cramer's V coefficient, which is generally applied and which can be in the range [0-1].

## Results and discussion

### *Sample specifications*

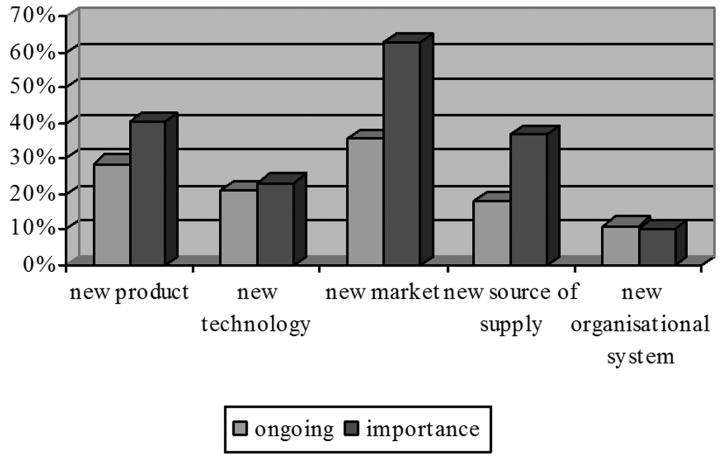
As regards workforce, the details of the 746 enterprises are obtained from the questionnaires. Based on the criteria defined by the EU, a significant number of the enterprises included in the sample (42.6%) qualify as micro-enterprises, one third (32.7%) as small enterprises and

12.8% as mid-sized enterprises. 3.6% of the respondents are large enterprises, and finally, 8.4% did not provide any data concerning workforce, thus they were not categorized on that parameter. The 814 enterprises operate in diverse sectors: 9% operate in agriculture, 14.1% in manufacturing, 8.6% in building industry, 70.6% in service industry, 0.02% in other sectors and 3.6% did not answer.

***Analysis of H1***

The survey confirmed the findings of the local and international literature concerning the low level of innovative activity among Hungarian SMEs. The first step was to examine whether the innovation effectiveness of the enterprises surveyed showed any correlation with the type of innovation introduced. The types of innovation in this paper are viewed as defined in Schumpeter (1980).

The answers reveal that the most important type of innovation for the enterprises is the opening of a new market (62.8%), the second most important is the introduction of a new product/service (40.6%), and the




*Source: own research*

Figure 1. Evaluating the importance of Schumpeter's types of innovation and innovative activity in the enterprises surveyed (%)

third is the discovery of a new source of supply (36.8%). Although those are apparently the most required types of innovation, the enterprises face organizational barriers to successful innovation due to limited opportunities and assets. Entering a new market becomes a reality for 35.6% of the enterprises and developing a new product/service is realized by 28.6%. The evaluation of introducing new technology and creating a new organizational system shows nearly the same proportions.

The innovative activity of the examined firms (33%) is mostly present in product and market innovation, and their innovation income (Rammer et al 2008) comes, among other innovative pursuits, mostly from these innovations.

Table 1. Descriptive statistics of relation of innovation income and innovation type

| Income and | $\chi^2$ Value | df | Pearson Chi-Square significance (2-sided) | Cramer V |
|---|---|---|---|---|
| new product /services | 19.504 | 3 | p<0.000 | 0.234 |
| new market | 37.403 | 3 | p<0.000 | 0.328 |
| other innovation | 21.576 | 3 | p<0.000 | 0.381 |

*Source: own research*

In the next section, I am going to examine whether there is innovative cooperation at the level of the questioned companies. Those firms with a development pursuit (64.6%) tend to do it on their own, which is *independently*. In this regard, only 15.7% cooperate with other enterprises, while 8.7% seek cooperation with universities and research institutes, 11.4% with consultant firms and 9.2% with other partners (suppliers, parent company). It is indicative of distrust that R&D services are offered by a minority of enterprises (23.8%).

For the enterprises surveyed, a medium-strength correlation can be seen between R&D workforce and the rates of returns from developing a new product or new service. This means that the larger the R&D workforce, the more positive results the enterprises report on returns from innovation. The average R&D workforce is of 7 people at enterprises.

Table 2. Descriptive statistics of relation of innovation income and R&D workforce

| Income | $\chi^2$ Value | df | Pearson Chi-Square significance (2-sided) | Cramer V |
|---|---|---|---|---|
| new product | 145.367 | 72 | p<0.000 | 0.407 |
| new service | 100.806 | 72 | p<0.014 | 0.356 |
| new market | 105.955 | 69 | p<0.003 | 0.368 |
| other innovation | 95.770 | 45 | p<0.000 | 0.505 |

*Source: own research*

It was yet another aim to prove that enterprises surveyed needed more trust and a higher degree of cooperation with market actors, which would make innovation better and easier. Therefore, the enterprises were asked to define the measures that would help their innovative activity. The answers made it clear that innovation could be enhanced as a consequence of a decrease in bureaucracy (82.4%). According to most of the enterprises (71.2%), a higher level of trust would also add to innovation in the world of business. Around two-thirds of the enterprises (65.8%) assumed that a closer connection and cooperation with customers would boost innovation; in addition, it would be necessary for innovators to feel recognized in society (62.2%). Establishing closer connections with suppliers or forming horizontal integration, i.e., cluster initiatives in order to ensure better cooperation are at the bottom in the rankings of innovation-fostering approaches.

After inter-organizational cooperation, I am also examining cooperation within the organization. I presumed that there is a co-worker innovative activity within companies, but firms refuse to spend money on it. For this reason, I am going to analyze whether the interviewed enterprises involve their co-workers in innovation.

***Analysis of H2***

Creative ideas from employees are welcome in more than half of the enterprises (54.6%; 445) without the employees being rewarded for their ideas. An employee having come up with an innovative idea is singled out for special praise in one out of four enterprises (26.5%; 216).

Employees get even promoted (23%; 187) or rewarded (20.8%; 169) for innovation in one out of five enterprises. New ideas and decisions seem to be management prerogatives, without employee participation in 128 enterprises. Innovation-oriented employees serve as a role model in 9% (74) of the enterprises. Based on the statistics on innovation, employees are not expected to participate in innovation; therefore, ideas are created and decisions are made at management level in an average of 15.8% of the enterprises.

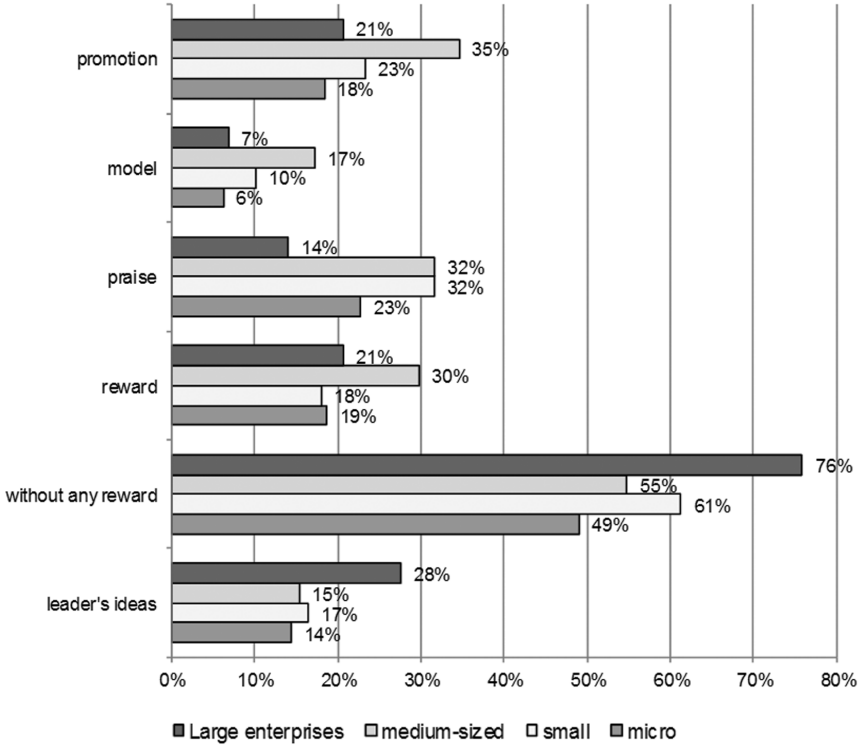
Within the examined companies, *innovative activity* does not correlate with the management, but with the *co-workers included in the innovation*. There is barely any correlation revealed in cases when co-workers are expected to innovate without any material or non-material compensation ($p=0.021$, Cramer's $V=0.081$). Compared to this, when the co-worker's innovative activity is rewarded in some form, the correlation is much stronger ($p<0.000$, Cramer's $V=0.207$).

***Analysis of H3***

I examined the applied motivational tools regarding the internal organizational factors which the enterprises named as hindering innovation: owner preference, the indifference of the co-workers and financial problems.

As far as internal impedimental factors are concerned, a tight budget turned out to be the most common problem (452), while investment risks were the second most problematic issue of the enterprises (363). Owner's preference and employee dissatisfaction appeared as impeding innovative activity in less significant proportions in enterprises (8%; 65 and 16.7%; 136, respectively).

In those 65 enterprises where respondents held the view that the owner's preference impeded innovation, as many as every five enterprises (21.5% being the highest proportion) have executives doing innovative activity themselves. At these companies, lower than average (7.7%) incentive is found to apply rewards such as "example to follow". Praise is least common in those enterprises (18.5%) where owners' preferences pose a problem.




*Source: own research*

Figure 2. Share of the motivation and internal innovative capabilities at the different-sized companies, %

These motivational tools are found more often within companies where the main problem is the indifference of the co-workers. In these enterprises, it is made sure that staff is given credit in significantly higher proportion (27.2%) than the average (20.8%). In these firms employees continuously coming up with new ideas have the best opportunity for a promotion (20.6%). Management innovation at these firms approaches the average figures (17.6%). Return of ideas increase innovation activity (Pearson chi-square sign. $p<0{,}000$; Cramer's $V=0.239$).

**Conclusions**

Trust, one of the pillars of social capital, permeates our everyday life to a degree that its presence or absence has become the focus of my research. The aim of this paper is to prove from a theoretical and practical point of view that trust and cooperation positively correlate with the innovative activity of enterprises.

I conducted a secondary research in the relevant literature and found that Hungary is characterized by low innovative activity and equally low social capital. My primary research confirmed this claim. I could also verify that the few existing innovative enterprises pursuit all such activities on their own: they refuse to open to or cooperate with others. The innovation normally derived from cooperation is also low, and it is characterized and dominated by corruption, bureaucracy, power and decision-making distances etc. – factors which are the subject of another essay (Marosi 2013). Although the results show that co-workers seem to participate in such activities, the enterprise itself mostly fails to give "due" compensation for their effort. The general opinion seems to be that such contribution from the employer is the expected norm, and if this is true, we cannot speak about real trust within the organization.

My researches verified a medium-strength positive correlation between trust and innovative pursuits. The strength of the relation can be explained by the fact that innovation is not only affected by trust, but by other factors as well like customer and supplier relationship, network-type cooperation within the cluster, corporate tax, the problem of risk capital etc.; these factors also mark the continuation and new directions of the research.

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# Virtual life of men. Gender differences in Internet using habits and attitudes[1]

**PÉTER NÉMETH[2] – ÁKOS ANDRÁS NAGY[3] – KRISZTIÁN SZŰCS[4] – MÁRIA TÖRŐCSIK[5]**

Recent surveys show that men and women behave differently in their everyday life, especially during shopping, free time or even housework. The present article aims to present the gender differences in habits, behaviour and attitudes regarding internet usage. We conducted a survey with a sample of 2000 respondents which expressed their attitudes towards internet usage and online behaviour. The sample consists of 956 men and 1044 women. It is important and interesting to observe the gender differences related to the aforementioned topics as it allows us to draw further conclusions concerning the online behaviour of different segments. We analyzed the dissimilarities in habits (e.g. regularity, length, activities etc.) and attitudes of men and women in the sample towards internet usage. We focused on men's virtual life, and this is why we also aimed to analyze the generational differences among male internet users. Furthermore, by using a multivariate analysis, we identified groups of men based on their virtual habits and behaviour. We found that, in general, men are more interested in IT than women, while women are usually more concerned about internet security. Men use internet with a higher participation rate and also more frequently. Men have a higher participation rate when it comes to online activities. On the other hand, women perform more social activities on the internet with a higher participation rate than men. As we

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expected, these results show that the difference between the internet usage habits of men and women exists.

**Keywords:** internet using, virtual life, gender differences, groups of men.
**JEL code:** M31.

## Introduction and objectives

"Men and women are different" – it is a common sentence applicable to almost everything in everyday life. If we think about internet usage, we can say that men have extensively been associated with technology while women have often been depicted as somewhat passive users (Gad 2012). In our study we present a short review of gender differences concerning internet usage and internet connected attitudes, such as internet access, mobile internet access, the proportion of smartphone owners, the frequency of internet usage and internet usage attitudes. Moreover, in order to see the different types of internet user men we established a cluster analysis and identified different groups of male respondents.

At the beginning of our comparable study – in the literature review – we mostly discuss topics in connection with internet usage and online shopping. Thus, we can see the differences between the research presented in this study and other researches on this topic. At the end of the article we compare our results with other researches presented in the literature review.

## Literature review

Gender differences have been of interest to advertisers and marketers for decades. Alreck and Settle (2002) examined online, catalogue and store shopping behaviour of men and women. The result of their study indicated with substantial clarity that women do hold markedly more positive and less negative attitudes toward the shopping experience. Women have a more favourable view toward shopping and they more often use a value to optimise the shopping strategy than men do. According to the study of Alreck and Settle women hold a much more positive image of store and catalogue shopping than men. Moreover, they found that women's attitude towards internet shopping were approximately the same as men's perspective.

Van Slyke et al. (2002) demonstrated in their study that women view Web-based shopping less favourable than men. They offer a few steps for organizations to improve women's perceptions concerning Web-based shopping. In their opinion, Web merchants may consider using a technology in order to increase the sense of community by creating a social forum for their customers. Van Slyke et al. found that women enjoy the social aspect of shopping, so merchants should consider establishing chat rooms and building communities.

Roogers and Harris (2003) examined the attitudes towards e-commerce among different gender internet users. Their findings revealed that the women from their sample were less emotionally satisfied with e-shopping than men, because they were sceptical of this venue and did not find it as convenient as males. Men respondents reported greater trust in internet shopping and perceived the internet as a more convenient shopping outlet than women did. The authors also found that men had more positive attitudes toward internet shopping in general. As Roogers and Harris expected, emotion, trust and convenience predicted women's negative and men's positive attitudes towards the internet, emotion and trust predicted the frequency with which males and females made online purchases during a month. In a nutshell, their research showed that emotion, trust and convenience are three critical determinants of women's and men's shopping attitudes and behaviour.

Yang and Lester (2005) researched the gender differences in e-commerce. They compared the predictors of online shopping for men and women by using a sample of 365 college students. For men, the only predictor of purchasing products online was the number of hours they spent online. For women, the predictors of making purchases online included anxiety about using computers and attitudes towards money, in addition to the number of hours spent online.

Alreck et al. (n.a.) prepared a comparable analysis concerning men and women's attitudes towards online and store shopping. According to their results perhaps the most noteworthy difference between men's and women's ratings were for the statement *"Online shopping is more boring and less fun than store shopping."* Women's enjoyment of store shopping

is obvious as they highly rated the online shopping problem statement. Women were also more concerned than their male counterparts about the time and effort required to find what they want online. It seems to be that for women store shopping is more fun but online shopping is easier. By contrast, men appear to feel that online shopping is an effective way to avoid the hassle of store shopping.

Alreck et al. established a generational comparable analysis. They analyzed three groups: seniors, younger respondents and juniors. They found that the senior group of respondents was more concerned than the junior group about the problems regarding information security and the difficulty and complexity of online shopping. While the younger group was least concerned about the sale of mailing lists, that and the credit card information security were the two top concerns for all three age groups.

Based on the above mentioned literature review we can see that there are differences regarding gender issues in internet using habits, especially when it comes to online shopping habits and attitudes. With our complex questionnaire one of our aims was to highlight the differences about the time spent on the internet, the frequency of internet usage, online activities and also about internet using attitudes. Thus, based on these attitudes, different groups of men will be identified in order to see different behavioural patterns concerning men's internet usage.

**Research methods**

In our research, we examined 2000 respondents in Hungary with a face-to-face questionnaire. This questionnaire is a part of a complex research at the University of Pécs Faculty of Business and Economics. This research project was supported by SROP-4.2.2.A-11/1/KONV-2012-0058, Modelling the effects of the energy production, utilization and waste management technologies to the competitiveness of cities and regions.

The sample represented the Hungarian population by the following demographic characteristics: gender, age, education, region and the residence's type of settlement. We presented a univariate analysis: first,

we performed a comparable analysis of men's and women's attitudes concerning their internet usage. Moreover, we applied a multivariate analysis as well; we identified different groups of men who use internet every day by using a factor and cluster analysis. During our examination and analysis we used SPSS Statistics 20. Table 1 shows the main demographic characteristics of men who participated in the research.

Table 1. The demographic characteristics of male respondents (n=956)

| Type of residence (n=956) | |
|---|---|
| Budapest | 16.9% |
| town with county rights | 23.8% |
| 10.000+ settlement | 22.4% |
| settlement with population between 2.000 and 10.000 | 20.8% |
| settlement with population less than 2.000 | 16.0% |
| sum | 100.0% |

| Age (n=956) | |
|---|---|
| 18-29 years | 26.4% |
| 30-39 years | 20.1% |
| 40-49 years | 21.8% |
| 50-59 years | 17.4% |
| over 60 years | 14.3% |
| sum | 100.0% |

| Education (n=956) | |
|---|---|
| grade school | 7.5% |
| vocational school | 32.9% |
| secondary school | 41.1% |
| college | 10.8% |
| university | 4.7% |
| did not respond | 2.9% |
| sum | 100.0% |

| Marital status (n=956) | |
|---|---|
| single | 27.0% |
| in a relationship | 16.0% |
| married | 45.2% |
| divorced | 4.8% |
| widow | 2.5% |
| common-law marriage | 4.5% |
| sum | 100.0% |

*Source: own research*

We examined the population's internet usage and also its attitude towards this topic. Thus, in this article we present the results concerning the internet access of the respondents, the frequency of internet usage, the average time spent on internet, the activities on internet, the attitudes towards internet usage and the number of connections on different channels (personal, online and mobile phone).

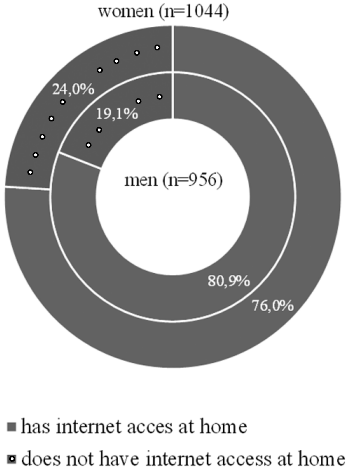
After examining these aforementioned topics, the reader will be able to see the main differences of the gender's internet usage and also will be

able to identify the main behavioural patterns of men and women in connection with virtual life. The frequency, the internet access and the average time spent on internet show us the basic attitudes and habits of men and women. The differences in the evaluation of attitude statements and the number of connections on different channels are good indicators to see the differences of opinion between genders concerning internet related topics and their attitudes on human relationships. Attitude statements provide a starting base in order to establish a factor and cluster analysis to identify the groups of respondents.

In our opinion, due to the research method and the size of the sample, based on the results we can draw general conclusions about the gender differences regarding the examined topics.

**Results and discussion, findings**

Results show that 80.9% of men have internet access at home (Figure 1). The proportion of women with internet access at home is lower (76%).

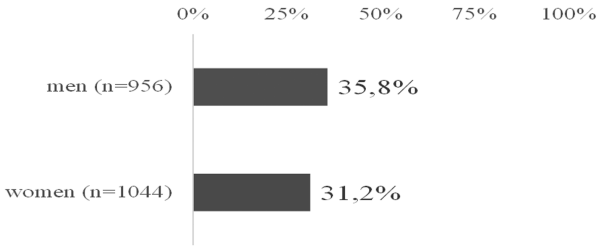



*Source: own research*

Figure 1. Internet access – gender differences

26.8% of men have mobile internet access and the proportion of women who have internet on their mobile phone is 22.1%. 35.8% of

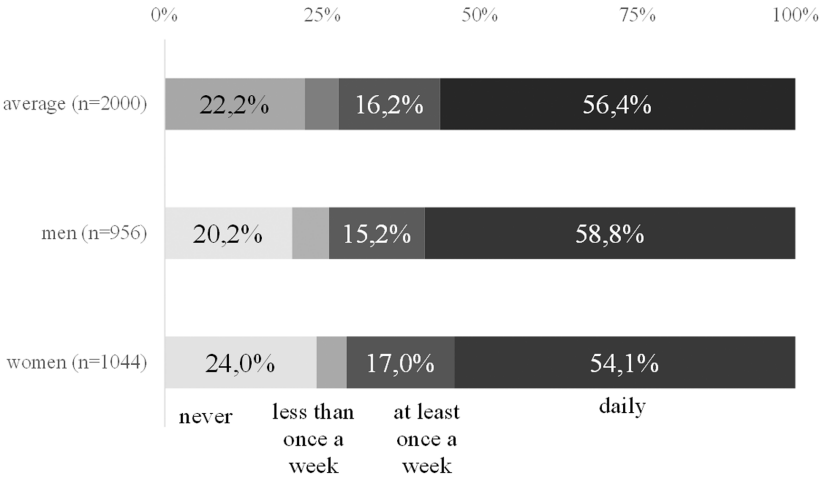
men and 31.2% of women stated that they are smartphones owners – Figure 2.




*Source: own research*

Figure 2. Proportion of smartphone owners – gender differences

In our research we examined the frequency of internet usage by men and women. The proportion of men who use internet every day is higher than the proportion of women who use internet daily. 24% of women and 20% of men never use internet (Figure 3).

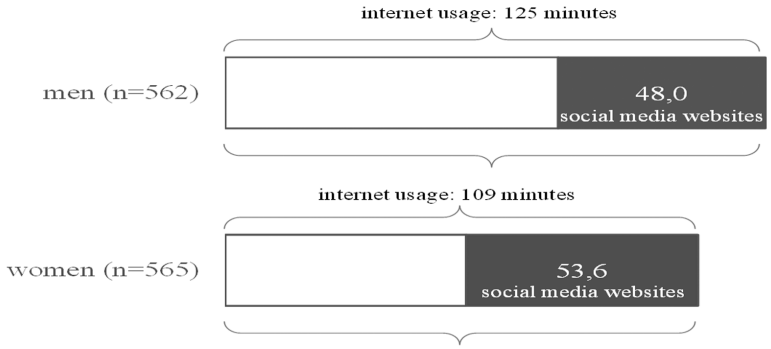



*Source: own research*

Figure 3. Frequency of Internet usage

Among male respondents we examined generational differences: results show that younger respondents spend more time on the internet.

In the further sections of our research we examined the internet usage and the attitudes of those men and women who use the World Wide Web every day. Men spend more time on the internet daily, but women spend more time on the social media websites. Men spend an average 125 minutes on the internet every day, while women spend 109 minutes on the same activity. In terms of time spent on the internet there is a statistically significant difference between genders (Figure 4).



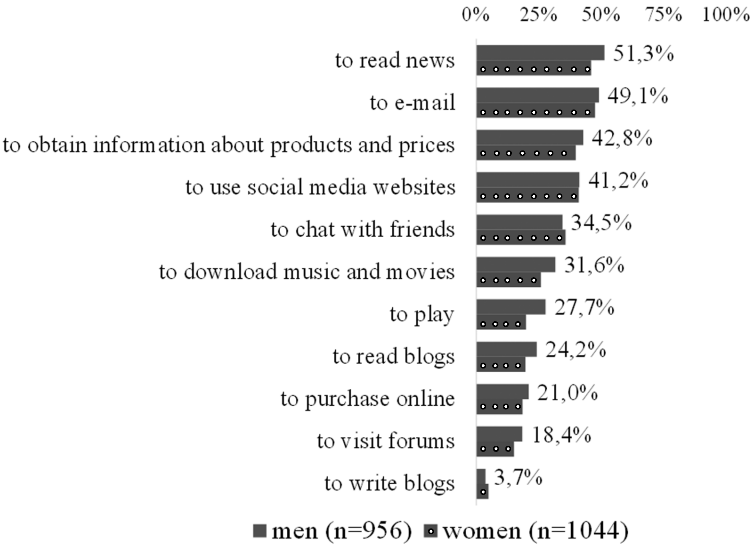

*Source: own research*

Figure 4. Time spent on the internet and social media websites (minutes)

The results of our generational analysis show that young men who use internet every day, use it for the longest time. The internet usage (without social media websites) for men aged between 50 and 59 is longer than the average. Men over 60 use internet for the shortest time among those who use internet every day.

The most popular online activities are reading news and e-mails, obtaining information about products and prices and using social media websites. The least popular activity among the analyzed ones is writing blogs. Results show that men are more active in most of the activities. Women have a higher proportion in having a chat with friends online.

Women and men participate with the same proportion in using social media websites (Figure 5).




*Source: own research*

Figure 5. Online activities – gender differences

We examined the different generations of men respondents and we found that young respondents – between 18 and 29 – have a higher participation rate when it comes to online activities. Middle aged respondents – between 30 and 49 – have a higher participation rate than the average when it comes to obtain information about prices and products, use social media websites, read blogs, visit forums and purchase.

Attitudes towards internet usage were also an element of our comparable study. We compared the average of men's and women's evaluations for each attitude. Figure 6 reveals the differences between these attitudes. This figure shows that men are more likely to watch videos online, to follow important brands and to read blogs. Men are not that worried to give their personal data online and they enjoy more to see informative contents on social media websites. Women are more worried

that others are following their online habits, but they are more entertained if they can research/follow other people's life on the internet. Uploading pictures and other contents is more common among women.


*Source: own research*

Figure 6. Differences between men and women concerning internet usage attitudes

When analysing the different generations of men we found that young respondents are more active and they are more likely to do things online. The elder respondents evaluated were found to be mostly external observers of online contents.

Men reported to have more contacts than women. In general, men have an average of 21 acquaintances and women have an average of 18. On average, men keep in touch with 18 people on mobile phone, while women keep in touch 13 on the same channel. Men have an average of 25

connections on the internet, while women have 17. It is an interesting result that men have a greater number of acquaintances on the internet, in contrast women have more relationships.

***Groups of male frequent internet users***

In order to see the different types of men in terms of internet usage we used a multivariate statistical analysis. The main aim of this kind of analysis was to identify different groups of men based on their attitudes towards internet usage. These groups (clusters) are homogeneous inside and externally heterogeneous, thus the groups are different from each other, but in a group we can find similar respondents.

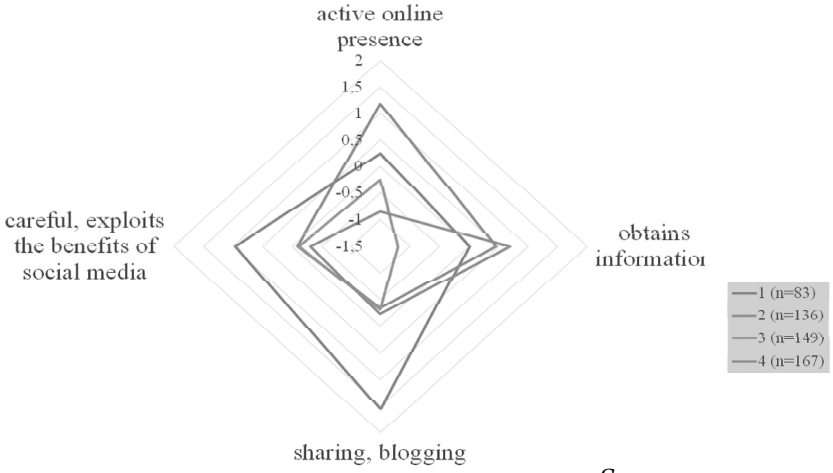
Table 2. Rotated component matrix (factor analysis)

| Rotated Component Matrixa | | | | |
|---|---|---|---|---|
| | Component | | | |
| | **active online presence** | **obtains information** | **sharing, blogging** | **careful, exploits the benefits of social media** |
| I am usually an external observer of the online contents. | -0,784826742 | | | |
| I often upload pictures and other contents on social media websites. | 0,78050866 | | | |
| I often tell my opinion about a topic on social media websites. | 0,72887802 | | | |
| I am an active member of online fanclubs. | 0,603894087 | | | |
| I often ask for help via social media. | | | | 0,611012664 |
| I am afraid of others following my habits on internet. | | | | 0,809982611 |
| In the virtual anonimity it is easier to share my problems as in reality. | | | 0,582317992 | |
| I enjoy reading blogs. | | | 0,674352532 | |
| I enjoy writing blogs. | | | 0,782335136 | |
| Most people only show their good side on social media websites. | | 0,485207491 | | |
| I am glad to follow the important brands on social media websites. | | 0,428944402 | | |
| I enjoy watching videos made by professionals on video sharing websites. | | 0,763162439 | | |
| I enjoy watching videos made by non-professionals on video sharing websites. | | 0,759730407 | | |
| I am glad to see informative contents on social media websites. | | 0,768144959 | | |
| Extraction Method: Principal Component Analysis. | | | | |
| a. Rotation converged in 7 iterations. | | | | |

*Source: own research*

As a first step we established a factor analysis. This analysis helps us to reduce the attitudes into factors without having a massive information loss. The Kaiser-Meyer-Olkin Measure was 0.879 which means that the attitudes involved in the factor analysis are appropriate for the analysis. The rotated component matrix (Table 2) is the result of the factor analysis. We involved 14 attitudes into our analysis and it resulted in 4 factors. These factors are the following: *active online presence*, *obtains information*, *sharing-blogging* and *careful, who exploits the benefits of social media*. The names of these factors depend on their meanings, so the attitudes explain the factors.

The cluster analysis is the second step of our multivariate analysis. The essence of this method is to identify different groups of respondents based on these factors. We used k-means cluster analysis and we identified four different groups of men who use internet every day. Figure 7. emphasizes the connection between the factors and clusters (respondents' groups).




*Source: own research*

Figure 7. The relationship between clusters and factors

Based on the demographic differences of the clusters and the connection between factors and clusters we provide a short introduction of the groups of men:

*1. Sharing youth*: in this group the proportion of younger members – between 18 and 39 – is higher than the average. The proportion of respondents from Budapest and with an education of secondary school is also higher than the average. They assessed the sharing-blogging, and carefully exploiting the social media factors over the average.

*2. Information seeker, online active youth*: in this group the proportion of 18-39 years old respondents is higher than the average. They mostly live in smaller settlements and have a lower education. They are mostly active online and obtain information on the World Wide Web.

*3. Non-interested*: the members of this group are mostly over 40, they live in smaller settlements and have a lower education. They are not interested in any of the factors.

*4. Information seeker seniors:* among these respondents the proportion of men over 40 is higher than the average. Also, people who live at least in a middle-sized settlement and who are high educated are more likely to be the member of this group. They highly rated the factor called "obtains information".

**Conclusions**

The results of our research show that men are more open when it comes to internet and things which are in connection with the World Wide Web. On the other hand, women are more focused on internet security issues. Women's enjoyment of store shopping is higher while men's enjoyment is higher in case of online shopping. Men use internet more frequently than women, and they enjoy it more. Men develop online activities more than women; while women are more socially active (e.g. having a chat with friends).

According to these results we conclude that women are more emotional when it comes to internet usage. We drew this conclusion as we found that for them internet usage is rather connected with social activities. Van Slyke et al. (2002) arrived to the same conclusion during their research. For men internet usage is rather an entertaining activity: men like to watch videos online and they participate in most of the examined online activities with a higher participation rate than women do. The results of this study justify our presuppositions that men and

women are different in terms of internet usage, and while women have a "social" role, men have more like a "player" role in their online presence.

These results can be helpful for decision makers. As Van Slyke et al. (2002) demonstrated: due to the fact that women are more socially open, Web merchants may consider using a technology to increase the sense of community by creating a social forum for their customers. Roogers and Harris (2003) found that women are more sceptical and they do not find this venue as convenient as men do. In our research, we reached the conclusions that these statements are correct: women are more afraid that others are following their habits on the internet; furthermore, men are less reluctant to give personal data online. Also, we found that men agreed with a higher rate that they can find many informative contents on the internet. Alreck et al. (n.a.) discovered in their research that men find online shopping more effective and they can find online what they want easier than women do. In parallel, in our research we found that men have a higher participation rate in case of online shopping.

An idea and plan for further research that can be a new perspective is to study the group of all men – not just those men groups who use internet every day – by approaching internet connected things and attitudes. Also, another interesting topic is to identify the groups of women frequent internet users and compare them to the groups of men.

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# Eight methods for decomposing the aggregate energy intensity with special regard to the industrial sector[1]

**TEKLA S. SZÉP**[2]

The energy intensity of East-Central Europe strongly improved in the last two decades and it has two main reasons. The first one is that after the change of regime the heavy industry collapsed, and there was a shift from agriculture towards the service sector. The second is the technological development of the economy, which increased the energy efficiency of the economic sectors. The subject of this paper is to give a comprehensive analysis and decompose both the energy intensity of the industrial sector and the aggregate energy intensity of the economy in East-Central Europe (Czech Republic, Slovakia, Slovenia, Poland and Hungary) between 1990 and 2010. We study how the aggregate energy intensity is influenced by the structural and the intensity effects.

**Keywords:** energy consumption, energy intensity, East-Central Europe, change of regime, industry sector.

**JEL classification codes:** P28, Q43.

## Introduction

There are serious differences in the size of the energy intensity of economic sectors. The energy intensity of an economy is affected by two factors. On one hand it is affected by the role of the given economic sector (such as the value added in percentage of GDP) and on the other hand by its energy intensity.

Our analysis can be divided into two main parts. In the first part we aim to examine these two factors, we analyze the transformation process of the East-Central European region after the change of regime, with

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special regard to the shifts among the economic sectors and the changes of the sectoral energy intensity. In our database we used the final energy consumption of economic structures (primary, secondary, tertiary sectors, 1000 toe) and the value added of these sectors (constant 2000 US$; % of GDP). “Final energy consumption covers energy supplied to the final consumer for all energy uses. It is calculated as the sum of final energy consumption of all sectors. These are disaggregated to cover industry, transport, households, services and agriculture.” (IEA, 2005) The examined countries and time spans: Hungary (1990-2010), Poland (1993-2010), Czech Republic (1990-2010), Slovakia (1993-2010) and Slovenia (1990-2010). We used the Eurostat and the Worldbank database, which enable the results to be comparable.

In the second part we examine the changes of the industry sector, because in the last two decades the improvements of the energy intensity in the economy stemmed from the development of energy efficiency of the industry sector. For our analysis we also use the final energy consumption (Mtoe) and the added value (constant 2000 €) of the industrial subsectors (chemical industry; primary metals; non metallic minerals; wood industry; paper, pulp and printing industry; food industry; textile and leather industry; machinery; transport equipment; other industries; mining; construction). We apply the Odyssee database and the division of the industry sector is based on the UN ISIC (International Standard Industrial Classification of All Economic Activities).

We use the following abbreviations: $D_{tot}$ means the changes of the aggregate energy intensity (energy intensity of the primary, secondary and tertiary sectors), $D_{int}$ is the intensity effect and $D_{str}$ is the structural effect.

**Theoretical background**

The effects of economic activities on energy intensity have become a central research topic of the energy and environmental economy after the first oil price shock (Boyd and Roop 2004.). The Index Decomposition Analysis (IDA) is a widespread method: it is used for the analysis of energy consumption and emission both in the energy and environmental economy; furthermore in the last years it appeared as a toolbar of human

resource economy (Achao and Schaeffer 2009) and it gives new additives for the examination of income inequalities. It can be easily interpreted and nowadays it is a frequently used tool for the decision-makers (Ang 1995, 2000; Hoekstra et al. 2003; Zhao et al. 2010; Liu and Ang 2003; Unander 2007).

Table 1 contains relevant publications regarding this reviewed topic, which includes not only methodology surveys, but empirical results as well. It is somewhat odd – with some exceptions – that they use only one method and they do not aim to compare their results with others. The analyzed area is quite wide: Achao and Schaeffer (2009) try to explain Brazil's income inequalities, Mairet and Decellas (2009) decompose the energy intensity of the French service sector and Ang (2005) studies the emission in the Canadian industry sector. The examined number of subsectors fluctuates heavily: the minimum is 3, the maximum is 28 in the reviewed publications, but Ang (2000) mentioned as well that an analysis ranging between 2 and 400 subsectors is not rare.

The index decomposition method has many similar characteristics with the shift-share analysis which is presented by Nemes Nagy (1995). The latter is an additive approach; the former one can be additive and multiplicative as well. The target of both analyses is the decomposition of an aggregate data into components. While the shift-share analysis can be mainly observed in the regional studies, the index decomposition analysis is the result of increasing energy interests caused by the 1973 oil crisis. At this time the general target of the governments was to restrain energy consumption and enhance energy efficiency. The first step was to determine factors which have influence on the energy consumption and to work out the exact methodology, with special regard to the index decomposition analysis.

The essential of the IDA is that it can explain the changes of an indicator at sectoral level, and another advantage is the low data request (Hoekstra 2003). The starting point is the final intensity in the economic structure (aggregate energy intensity) which is essentially affected by two factors: changes in energy intensity of economic sectors (intensity effect)

and the shift in the mix of products or activities (structural effect) (Liu and Ang 2003). The method disaggregates the economy into sectors and then weights the sectoral energy intensity by their output shares. In our paper the final intensity in the economic structure reveals the ratio of the final energy use of primary, secondary and tertiary sectors to the added value they produce.

Table 1. Summary of the reviewed publications

| Publication | Examined country | Time period | Method | Type of method | Subsector number |
|---|---|---|---|---|---|
| Zhao et al. 2010. | China | 1998-2006 | LMDI | Additive | 15 |
| Mairet and Decellas 2009. | France | 1995-2006 | LMDI | Additive | 7 |
| Achao and Schaeffer 2009. | Brazil | 1980-2007 | LMDI | Additive | 4 |
| Hatzigeorgiou et al. 2008. | Greece | 1990-2002 | AMDI<br>LMDI | Additive | 3 |
| Mercados-EMI et al. 2007. | Cyprus, Estonia, Hungary, Lithuania, Latvia, Poland, Czech Republic, Slovakia, Slovenia | 1995-2004 | Divisia | Additive | 10 |
| Unander 2007. | Australia, Denmark, Finland, France, Italy, Japan, Norway, Sweden, Great-Britain, USA | 1973-1998 | Laspeyres | - | 7 |
| Ang 2005. | Canada | 1990-2000 | LMDI | Multiplicative | 23 |
| Boyd and Roop 2004. | USA | 1983-1998 | AMDI<br>Fisher Ideal | Multiplicative | 19 |
| Farla and Blok 2000. | Netherlands | 1980-1995 | simple average parametric Divisia method 2. (AVE-PDM2) | Additive | 5 and 21 |
| Ang 1995. | Singapore | 1982-1990 | general parametric Divisia 1 | Additive | 28 |

*Source: own compilation*

The index decomposition analysis is a really wide research topic. We used the most popular methods: the Laspeyres-, Paasche-, Marshall Edgeworth-, Walsh-, Fisher Ideal, Drobish, LMDI and the AMDI-methodology. The Laspeyres-index shows the changes in the examined time span and it uses the weights based on values in base year. In contrast, the Paasche-index uses values of the current year as weight. The Marshall-Edgeworth index calculates the arithmetic average of basic and target years, the Walsh-index uses the geometric means. The Fisher Ideal-index is the geometric mean of the results of

the Laspeyres and Paasche methods, while the Drobish-index argues for their arithmetic average (Liu and Ang 2003). According to Boyd and Roop (2004), the perfect index decomposition method is the Fisher Ideal index, because it is fit for all of the strict requirements and the value of residual term is one of them. Both the AMDI and LMDI are integral index numbers and they have many advantages such as "path independency, ability to handle zero values and consistency in aggregation" (Zhao et al. 2010. 1382).

Let V be an energy-related aggregate. We assume that it is affected by n variables, $x_1, x_2, \ldots x_n$. The aggregate can be divided into *i* subsector, where the changes happen (the structural and the intensity changes). The connection among the subsectors can be described as following:

$$V = \sum_i V_i = x_{1,i} x_{2,i} \ldots x_{n,i}$$

By using the multiplicative method we decompose the relative changes (Ang 2005. 867):

$$D_{tot} = \frac{V^T}{V^0} = D_{x1} D_{x2} \ldots D_{xn}$$

where:

$$V^0 = \sum_i V_i = x^0_{1,i} x^0_{2,i} \ldots x^0_{n,i} \qquad V^T = \sum_i V_i = x^T_{1,i} x^T_{2,i} \ldots x^T_{n,i}$$

By using the additive method we decompose the absolute changes:

$$\Delta V_{tot} = V^T - V^0 = \Delta V_{x1} + \Delta V_{x2} + \ldots + \Delta V_{xn}$$

where:

$$V^0 = \sum_i V_i = x^0_{1,i} x^0_{2,i} \ldots x^0_{n,i} \qquad V^T = \sum_i V_i = x^T_{1,i} x^T_{2,i} \ldots x^T_{n,i}$$

Hereafter we present the methodology of index decomposition analysis with the Laspeyres-index. We chose this one, because this is the most frequently used method (Ang 2000, Mairet and Decellas 2009), and the methodology is easily realized.

**Table 2. Multiplicative methods of index decomposition analysis**

| Method | Formula |
|---|---|
| Laspeyres | $D_{x_1} = I_L = \frac{\sum_i x_{1i}^T * x_{2i}^0 \dots x_{ni}^0}{\sum_i x_{1i}^0 * x_{2i}^0 \dots x_{ni}^0}$ |
| Paasche | $D_{x_1} = I_P = \frac{\sum_i x_{1i}^T * x_{2i}^T \dots x_{ni}^T}{\sum_i x_{1i}^0 * x_{2i}^T \dots x_{ni}^T}$ |
| Marshall Edgeworth | $D_{x_1} = I_{ME} = \frac{\sum_i x_{1i}^T * (x_{2i}^0 + x_{2i}^T) * (x_{3i}^0 + x_{3i}^T) \dots (x_{ni}^0 + x_{ni}^T)}{\sum_i x_{1i}^0 * (x_{2i}^0 + x_{2i}^T) * (x_{3i}^0 + x_{3i}^T) \dots (x_{ni}^0 + x_{ni}^T)}$ |
| Walsh | $D_{x_1} = I_W = \frac{\sum_i x_{1i}^T * \sqrt{x_{2i}^0 * x_{2i}^T} * \sqrt{x_{3i}^0 * x_{3i}^T} \dots \sqrt{x_{ni}^0 * x_{ni}^T}}{\sum_i x_{1i}^0 * \sqrt{x_{2i}^0 * x_{2i}^T} * \sqrt{x_{3i}^0 * x_{3i}^T} \dots \sqrt{x_{ni}^0 * x_{ni}^T}}$ |
| Fisher 1(Fisher Ideal) | $D_{x_1} = I_F = \sqrt{I_L * I_P}$ |
| Drobish | $D_{x_1} = I_D = \frac{I_L + I_P}{2}$ |
| AMDI (Arithmetic Mean Divisia Index) | $D_{x_1} = \exp\left(\sum_i \frac{\frac{V_i^0}{V^0} + \frac{V_i^T}{V^T}}{2} * \ln\left(\frac{x_{1i}^T}{x_{1i}^0}\right)\right)$ $L(a,b) = \frac{a-b}{\ln(a) - \ln(b)}$ , $a \neq b$ |
| LMDI 1 (Log Mean Divisia Index 1) | $D_{x_1} = \exp\left(\sum_i \frac{L(V_i^0, V_i^T)}{L(V^0, V^T)} * \ln\left(\frac{x_{1i}^T}{x_{1i}^0}\right)\right)$ $L(a,b) = \frac{a-b}{\ln(a) - \ln(b)}$ , $a \neq b$ |

where: t=0 (year 0); t=T (year T); i: economic sector

*Source: own compilation by Granel 2003. 35*

Excluding the Laspeyres-index, the other methods can also be easily conducted (Ang and Zhang 2000. 1157). In every case the multiplicative type was supported, because it is insensible for the units (in contrast with the additive type which can lead to serious differences) and the results can be perfectly illustrated. Ang et al. (2003) also suggest this method in every case when the researchers analyze long time series (Ang et al. 2003. 1564). Every method has three main parts:

$$D_{tot} = D_{int} * D_{str} * D_{res} = \frac{I_t}{I_0}$$

where: *Et:* total energy consumption; *Ei,t:* energy consumption of sector *i; Yt: G*DP; *Yi,t:* GDP of sector *i; Si,t:* share of sector $(=Y_{i,t}/Y_t)$; $I_t$: energy intensity of the economy, $(=E_t/Y_t)$; $I_{i,t}$: energy intensity of sector *i* $(=E_{i,t}/Y_{i,t})$.

The first part shows ($D_{tot}$) the changes of energy intensity in the economy within two years.

$$D_{str} = \frac{\Sigma_i S_{i,T} I_{i,0}}{\Sigma_i S_{i,0} I_{i,0}}$$

The next two indicators ($D_{str}$, $D_{int}$) are the difference of final intensity in the economic structure belonging to the year *0* and year *t*. The difference between them is the factor that is unchanged (base year) in the counter. The $D_{str}$ leaves the energy intensity of subsectors unchanged so it shows the structural effect, which means the size of the effect in the final intensity (in the economic structure) caused by the shift in the economic structure (from agriculture and industry sector towards the service sector).

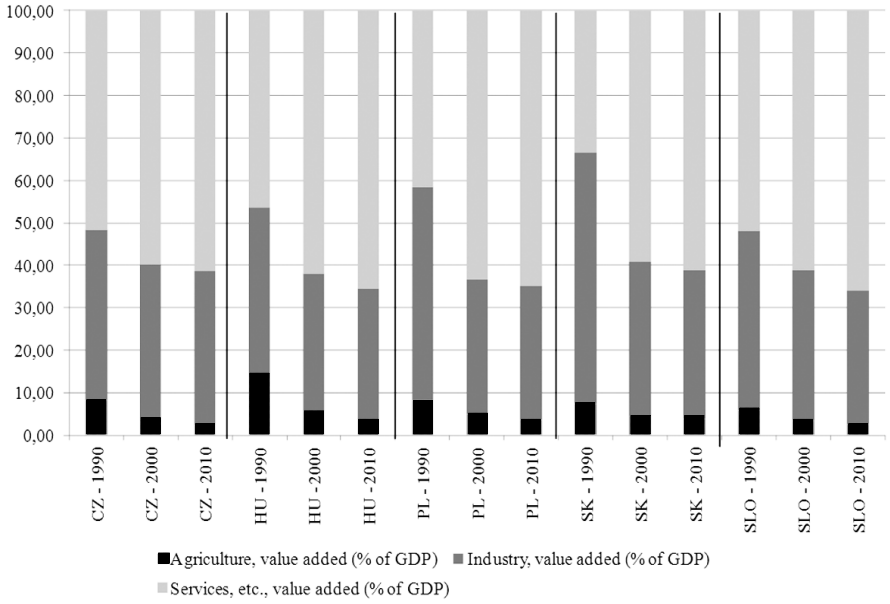
$$D_{int} = \frac{\Sigma_i S_{i,0} I_{i,T}}{\Sigma_i S_{i,0} I_{i,0}}$$

The $D_{int}$ leaves the share of subsectors unchanged and it presents the effect of energy intensity changes (intensity effect), which reveals how the changes of the subsectors' energy intensity affect the final intensity in the economic structure. The closer $D_{str}$, $D_{int}$ are to the value 1, the less the effect is. The equation includes a residual term for every method, which shows all the effects that are not explained by the model. The value of the residual term is ideal if it is close to 1 (in multiplicative method).

**Results**

By change of economic structure we mean the changes of the share of the primary, secondary and tertiary sectors. As a starting point we examine the changes of the share within the economic sectors with regard to its value added (% of GDP). Similar processes can be observed in the examined region. The share of agriculture and industry sectors declined in comparison with the development of the service sector. "The

main reason is that the ratio of the capital and labor and so the productivity grows faster in the manufacturing than in the service sector so the free labor is integrated by the tertiary sector." (Szalavetz 2008. 503-504)

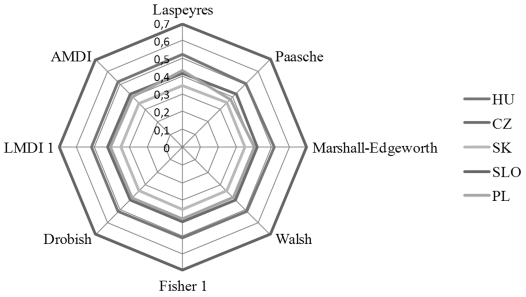



*Source: Worldbank database*

Figure 1. Changes of the shares of the main economic sectors with regard to the GDP, 1990-2010 (%)

Both the industry sector and the industrial subsectors underwent significant changes: the value added increased (in contrast with the energy consumption) which denotes a serious technological development and it is an evidence of a reindustrialization process (Barta et al. 2008). At the same time the share of the subsectors in industry changed, which shows the altering conformation for the industry restructuring. In the economic development the subsectors producing higher value added displace the others. So the automobile, the pharmaceutical and the electronics industry have become more and more important in the

developed industrial structure…" (Barta et al. 2008. 3). The energy-intensive heavy industry had a central role in the socialist industrial policy, but after the change of regime the magnitude of these subsectors decreased, gave space for more developed and less energy intensive branches. The effects of reindustrialization can be found in the energy consumption as well: the decrease of its value is significant, which is caused by the development of energy efficiency, the technological and production changes. The energy consumption of the secondary sector, with special regard to the heavy industry decreased significantly in the Czech Republic, Poland and Hungary and slightly in Slovakia (Figure 1).




*Source: own compilation*

Figure 2. Index decomposition analysis results for aggregate energy intensity of the economic structure ($D_{int}$, 1990-2010)

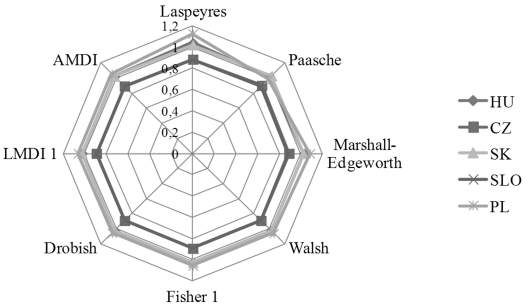



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Figure 3. Index decomposition analysis results for aggregate energy intensity of the economic structure ($D_{str}$, 1990-2010)

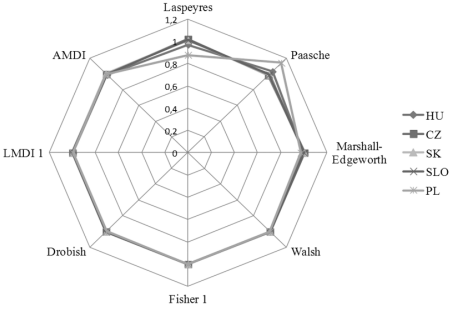


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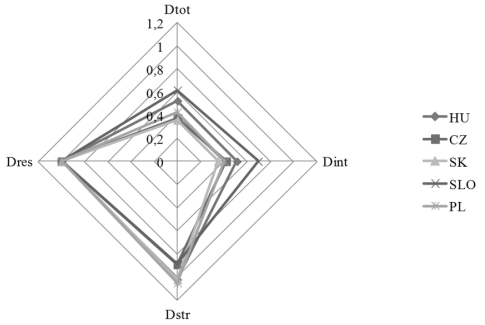
Figure 4. Index decomposition analysis results for aggregate energy intensity of the economic structure ($D_{res}$, 1990-2010)




*Source: own compilation*

Figure 5. Index decomposition analysis results for aggregate energy intensity of the economic structure (Fisher I, 1990-2010)

Barta et al. (2008) divided the countries of the world into three main groups by the changes of their industrial sector: the first group is characterized by the process of deindustrialization and delocalization. To the second group belong the dynamic developing economies, such as China and these countries are under the process of industrialization. The third group contains those countries (the East-Central-Europe also belongs to this group), where the reindustrialization is determining: "new industrial subsectors come into the life, mainly caused by the foreign direct investments" (Barta et al. 2008. 4).

The objective of this paper is to determine the sources of the energy efficiency and to quantify their roles and measures. The method of Laspeyres-, Paasche-, Marshall-Edgeworth, Walsh-, Fisher 1, Drobish-, LMDI-, and the AMDI- index are applied. The deviation of the results is really small and this highly confirms the reliability of the analysis and facilitates the interpretation.

***The results of the index decomposition analysis with regard to the aggregate energy intensity***

The results of the decomposition analysis presented in this paper show that between 1990 and 2010, mainly in East-Central Europe, the intensity changes have significantly affected the energy use in the industrial sector and the whole economy as well (Figures 2, 3, 4 and 5). These results confirm Ang and Zhang's conclusion that "… for the industrialized countries, declining sectoral energy intensity has generally been found to be the main contributor to decreases in the aggregate energy intensity … The impact of structural change is smaller in comparison." (Ang and Zhang 2000. 1162). The publication of Mercados-EMI (2007) gives similar results and it is also supported by Kuttor's statement, that "it is important to state and emphasize that in spite of the vigorous tertiarisation of the economies, the industry has maintained its significance in the economies of the region [Visegrád countries], both in terms of the employment of workers and of the production of added value." (Kuttor 2011. 51).

The impact of the structural change would have increased the energy use in Hungary, Slovakia and Poland (in these countries, the mix of industrial output moved away towards energy intensive sectors), but the intensity effect was so strong that in the end the final energy intensity in the economic structure improved everywhere.

Results of the 5 years period are presented in Table 3.

Leamer and Uliha (2011) suggests the extreme bounds analysis (EBA) as an appropriate method: „EBA addresses the issue of specification uncertainty by computing the maximum and minimum values on a large set of model specifications. The highest and lowest estimates are called the upper and lower bounds." (Uliha 2011. 237). At

Table 3. The results of the index decomposition analysis with regard to the aggregate energy intensity

| Country | | 1990-1995 | | 1995-2000 | | 2000-2005 | | 2005-2010 | | 1990-2010 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| HU | $D_{int}$ | 0.842 | 0.848 | 0.788 | 0.803 | 0.840 | 0.847 | 0.913 | 0.916 | 0.505 | 0.520 |
| | $D_{str}$ | 0.976 | 0.983 | 1.022 | 1.042 | 0.996 | 1.004 | 1.000 | 1.003 | 1.008 | 1.039 |
| | $D_{res}$ | 0.993 | 1.007 | 0.981 | 1.019 | 0.992 | 1.008 | 0.997 | 1.003 | 0.970 | 1.031 |
| CZ | $D_{int}$ | 0.866 | 0.887 | 0.778 | 0.780 | 0.796 | 0.796 | 0.772 | 0.777 | 0.415 | 0.423 |
| | $D_{str}$ | 0.867 | 0.888 | 1.022 | 1.025 | 1.002 | 1.003 | 0.985 | 0.991 | 0.884 | 0.901 |
| | $D_{res}$ | 0.976 | 1.025 | 0.997 | 1.003 | 1.000 | 1.000 | 0.994 | 1.006 | 0.981 | 1.020 |
| PL | $D_{int}$ | 0.868 | 0.875 | 0.702 | 0.712 | 0.832 | 0.833 | 0.781 | 0.796 | 0.379 | 0.432 |
| | $D_{str}$ | 1.041 | 1.049 | 0.983 | 0.998 | 0.997 | 0.998 | 1.012 | 1.031 | 0.987 | 1.125 |
| | $D_{res}$ | 0.992 | 1.008 | 0.985 | 1.015 | 0.999 | 1.001 | 0.981 | 1.019 | 0.877 | 1.140 |
| SK | $D_{int}$ | 0.809 | 0.810 | 0.774 | 0.775 | 0.686 | 0.688 | 0.802 | 0.805 | 0.348 | 0.351 |
| | $D_{str}$ | 0.993 | 0.993 | 0.988 | 0.990 | 1.087 | 1.090 | 0.966 | 0.969 | 1.019 | 1.030 |
| | $D_{res}$ | 1.000 | 1.000 | 0.998 | 1.002 | 0.997 | 1.003 | 0.997 | 1.003 | 0.989 | 1.011 |
| SLO | $D_{int}$ | 0.984 | 0.997 | 0.979 | 0.980 | 0.887 | 0.887 | 0.808 | 0.809 | 0.692 | 0.699 |
| | $D_{str}$ | 0.894 | 0.905 | 1.018 | 1.019 | 1.006 | 1.007 | 0.960 | 0.962 | 0.882 | 0.891 |
| | $D_{res}$ | 0.987 | 1.013 | 0.999 | 1.001 | 1.000 | 1.000 | 0.998 | 1.002 | 0.990 | 1.010 |

*Source: own compilation*

the end this interval is the result. In Table 3 this method is applied, and the maximum and minimum values are presented here.

In the first time span (1990/1993-1995) the aggregate energy intensity in East-Central-Europe decreased, but its measurement was different. In Hungary, Slovakia, Poland and Slovenia the decline was caused mainly by the changes of energy intensity of the economic sectors (the Fisher Ideal index's results are the following, sequentially: 0.844; 0.81; 0.87; 0.89), not by the shift of the sectors (the Fisher Ideal index's results are the following, sequentially: 0.98; 0.99; 1.04; 0.98). In the Czech Republic the strength of these two effects was nearly equal (according to the Fisher Ideal index the results are 0.88 for both of these effects). For example, in Hungary these values reveal that as a result of the intensity effect the aggregate energy intensity in 1995 would have been 0.84 times of the value in 1990 and as a result of the structural effect in 1990 it would have

been 0.98 times of the value in 1990, so finally the aggregate energy intensity changed by 0.83 times at the end of the period.

Between 1995 and 2000, excluding Slovakia, the intensity effect became stronger, the value of the Fisher Ideal index dispersed around 0.78 (Hungary – 0.795, Slovakia – 0.774, Czech Republic – 0.779, Poland – 0.707). The value of the structural effect is close to 1 which means the aggregate energy intensity was not significantly affected in this period. In Slovenia this tendency is the opposite, the aggregate energy intensity did not change, because the two effects exactly offset each other (the Fisher Ideal index with regard to the structural effect was 1.02 and the intensity effect was 0.98).

These trends were the same in the next intervals of time (2000-2010) but it is interesting that the structural effect in Slovakia exceeded the value of 1 (the Fisher Ideal index is 1.08) which probably was the consequence of the automobile industry development.

Analyzing the entire period of time, in Hungary the aggregate energy intensity is 0.524 times in 2010 compared to 1990, which is mainly caused by the intensity effect (the Fisher Ideal index of it is 0.513), not by the structural effect (the Fisher Ideal index of it is 1.02). Elek (2009), who examined the Hungarian energy intensity (1992-2007) – using the additive approach –, concludes that the intensity effect is more significant than the structural effect.

The same tendencies can be observed in the other countries (strong intensity and weak structural effect); except Poland and Slovakia, the structural effect is close to 1. In Poland and Slovakia the structural effect would have worsened the energy intensity (the Fisher Ideal index is 1.05 and 1.02), but it was offset by the intensity effect.

***The results of the index decomposition analysis with regard to the energy intensity of the industrial sector***

In the last two decades the increasing energy efficiency has been mainly caused by the industry sector, because not only in the macro level, but also in the sectoral level the structural changes can be observed. With regard to this process two controversial opinions were developed: "one group believes these tendencies are the expression of the deindustrialization, (...), while the others think the structural changes are

the consequences of the natural evolution of the developed production processes." (Kiss 2010. 11).

Next, our objective is to determine and measure the main sources of the developing energy efficiency. We suppose that the value of the intensity and the structural effect can significantly differ from the former results.

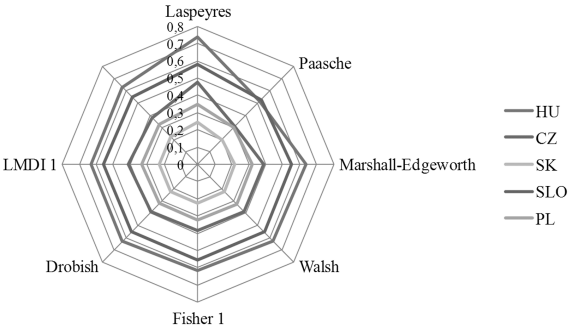
The value added of industrial subsectors underwent significant growth (contrary to energy consumption). It is a mark of the developing energy efficiency and an evidence for a reindustrialization process (Barta et al. 2008.). In parallel the share of the subsectors has also changed, which indicates the industrial structural changes. "During the development the higher value added subsectors displace the lower ones. So the automotive, the pharmaceutical, the electronic etc. industry sectors have increasing weight in the developed industrial structure..." (Barta et al. 2008. 3). In the socialist industrial policy the energy intensive heavy industry had a central role, but after the change of regime these subsectors have become less important and more efficient and modern branches gained space.

Reindustrialization can be observed in the field of the energy consumption: the indicator has significantly decreased, which is mainly caused by the developing energy efficiency and changes of the product structure and technology. The energy consumption of the sector (mainly the heavy industry) dramatically decreased in the Czech Republic, Poland and Hungary, and slightly in Slovakia and Slovenia.

Barta et al. (2008) divided into three main parts the world's countries based on the processes taking place in the industrial sector. The first group can be characterized by deindustrialization and delocalization. The dynamic developing economies (such as China) belong to the second group, where the industrialization processes represent the main characteristic feature. In the third group the reindustrialization and delocalization determine the economic growth: "new industrial branches emerged, thanks to the growth of the FDI" (Barta et al. 2008. 4).

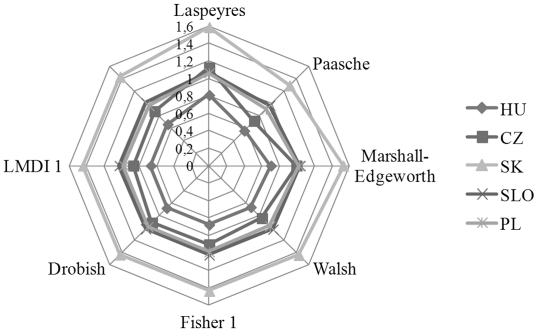
With regard to the industrial sector, between 1995 and 2010 in every country the intensity effect was the strongest, but regarding the value of the intensity one can observe huge differences (Figures 6, 7, 8 and 9). While in Poland the magnitude of the intensity effect is more than twice

as the structural one, in Slovenia the structural effect is insignificant (The Fisher Ideal index is 1.02). In Hungary the difference between the effects is relatively small (by the intensity effect the Fisher Ideal index is 0.62, by the structural effect it is 0.68). In the Czech Republic and Slovakia – similar to Poland – the difference is significant: for both these countries the intensity effect is close to 0.3, the structural effect is 0.9 for the Czech Republic and 1.43 for Slovakia. The publication of the Mercados-EMI (2007) has similar results: they assess the intensity effect more significant than the structural effect in East-Central Europe.



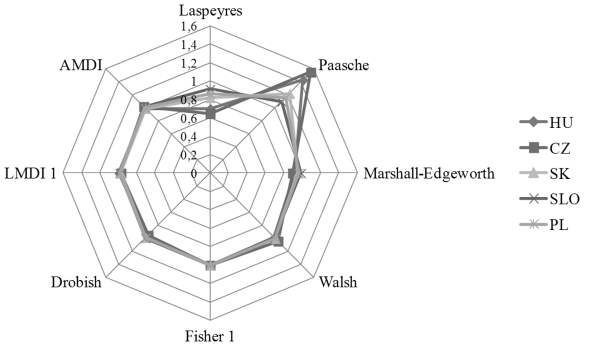

*Source: own compilation*

Figure 6. Index decomposition analysis results for the industrial sector ($D_{int}$, 1995-2009)



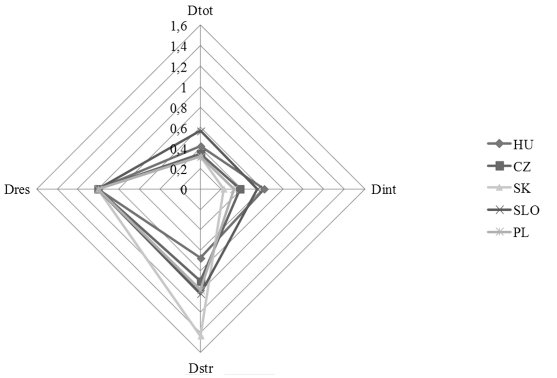

*Source: own compilation*

Figure 7. Index decomposition analysis results for the industrial sector ($D_{str}$, 1995-2009)




*Source: own compilation*

Figure 8. Index decomposition analysis results for the industrial sector ($D_{res}$, 1995-2009)




*Source: own compilation*

Figure 9: Index decomposition analysis results for the industrial sector (Fisher I, 1995-2009)

Our results contradict the former analysis (such as Unander 2007) made in Western-Europe and in the USA, which emphasizes the relevance of the structural effect. These different results are given by the dramatic industrial structural changes after the change of regime and the technological changes.

As before, table 4 shows the maximum and minimum results, but the Laspeyres and Paasche indexes are omitted, because their residuum is

higher than 1.1. In our evaluation their results are unreliable so we do not present them.

Table 4. The results of the index decomposition analysis with regard the energy intensity of the industrial sector

| Country | | 1995-2000 | | 2000-2005 | | 2005-2010 | | 1995-2010 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| HU | $D_{int}$ | 0.853 | 0.860 | 0.846 | 0.848 | 0.882 | 0.883 | 0.618 | 0.640 |
| | $D_{str}$ | 0.794 | 0.802 | 0.879 | 0.881 | 0.937 | 0.937 | 0.666 | 0.705 |
| | $D_{res}$ | 0.985 | 1.000 | 0.996 | 1.000 | 0.999 | 1.000 | 0.926 | 1.000 |
| CZ | $D_{int}$ | 0.707 | 0.716 | 0.856 | 0.867 | 0.683 | 0.684 | 0.382 | 0.410 |
| | $D_{str}$ | 0.965 | 0.993 | 0.873 | 0.881 | 0.962 | 0.965 | 0.851 | 0.995 |
| | $D_{res}$ | 0.981 | 1.010 | 0.994 | 1.009 | 0.997 | 1.000 | 0.897 | 1.045 |
| PL | $D_{int}$ | 0.616 | 0.618 | 0.839 | 0.847 | 0.667 | 0.687 | 0.321 | 0.329 |
| | $D_{str}$ | 0.986 | 0.997 | 0.875 | 0.880 | 1.028 | 1.086 | 0.971 | 1.025 |
| | $D_{res}$ | 0.990 | 1.001 | 0.990 | 1.002 | 0.974 | 1.005 | 0.962 | 1.003 |
| SK | $D_{int}$ | 0.784 | 0.790 | 0.741 | 0.749 | 0.394 | 0.396 | 0.219 | 0.228 |
| | $D_{str}$ | 1.034 | 1.041 | 1.019 | 1.034 | 1.299 | 1.321 | 1.433 | 1.527 |
| | $D_{res}$ | 0.995 | 1.002 | 0.995 | 1.000 | 0.988 | 1.000 | 0.955 | 1.000 |
| SLO | $D_{int}$ | 0.848 | 0.852 | 0.824 | 0.829 | 0.785 | 0.787 | 0.550 | 0.559 |
| | $D_{str}$ | 1.036 | 1.038 | 1.039 | 1.040 | 0.950 | 0.953 | 1.018 | 1.036 |
| | $D_{res}$ | 0.995 | 1.000 | 0.998 | 1.004 | 0.998 | 1.000 | 0.986 | 1.011 |

*Source: own compilation*

Between 1995 and 2000, with the exception of Hungary, the intensity effect was more significant and the value of the structural effect was close to 1. In Hungary the structural effect is more relevant and its value is far from 1 (the Fisher Ideal index is 0.8). In the following five year period the intensity effect became stronger in all countries, but in Hungary, Czech Republic and Poland the size of the two effects is nearly the same (close to 0.85), while in Slovakia and Slovenia the structural effect is really small (the Fisher Ideal index close to 1).

Between 2005 and 2010 the structural effect magnified (by contrast in the whole economy it ceased) which reveals the shift between the economical sectors. In Slovakia and in Poland its value is higher than 1.

In the Czech Republic, Hungary and Slovenia the intensity effect is stronger, but the structural effect is also present.

Our conclusions are similar to the analysis of the Odyssee project (2009) which concluded that both the structural and intensity effects influenced the development of the energy intensity in the industrial sector. Taylor et al. (2010) examined the member states of the IEA. He concluded that more than half of the energy intensity development in the industrial sector is given by the structural effect.

**Conclusions**

The main difference between the neoclassical and energy economy is the different opinion regarding the role of energy in the economic development. According to the former one the energy is just an intermediary input among other production factors (land, capital and workers), which determines directly or indirectly the economic development. For the energy economists (Cleveland C. J., Herring H. and Stern D. I.) the energy significantly affects the income and the economy depends on the changes in energy consumption. The relationship between economic development and energy use was a core topic for many centuries.

In this paper we study how the aggregate energy intensity is influenced by the shift in the mix of products or activities (structural effect) and the changes in energy intensity of economic sectors (intensity effect). The starting hypothesis was that both these effects were significant. We carried out the examination with the index decomposition analysis and we used eight methods. Significant differences between the results did not appear, therefore the size of the residual term was treatable.

In East-Central Europe the aggregate energy intensity includes the primary, secondary and tertiary sectors which underwent significant development in the last two decades. It is mainly caused firstly by the intensity effect and secondly by the structural effect. By using the 8 methods of the Index Decomposition Analysis we divided the changes of the aggregate energy intensity into their components. We quantified the intensity and the structural effect for the whole time span (1990-2010)

and for a 5 year-period as well. In our analysis, between 1990 and 1995, the intensity effect was more significant than the structural one in all countries, except Slovakia.

In the second section we examined the industrial sector, because the development of the aggregate energy intensity mainly stems from the secondary sector and it is also interesting whether the processes are the same in the whole economy and at sectoral level. There was only one situation in the industrial sector (Hungary, 1995-2000) when the structural effect was more significant, so generally the processes in the secondary sectors are similar to the processes within the whole economy. So, we drafted the following conclusions:

1. In East-Central Europe (Czech Republic, Poland, Hungary, Slovakia, Slovenia) between 1990 and 2009 the intensity effect contributed more to the improvement of final intensity in the economic structure than the structural effect.

2. The magnitude of structural effect is smaller than the intensity effect from the energy intensity perspective.

3. The development of the energy intensity in the industrial sector of the Czech Republic, Slovakia, Hungary and Poland is mainly caused by the intensity and structural effect, but the intensity effect is more significant.

4. In Slovenia the development of the energy intensity in the industrial sector is mainly caused by the intensity effect, the structural effect is insignificant.

5. The processes developing the aggregate energy intensity of an economy can be different at the level of the economy and the sectors.

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# Evaluating Romania's regional competitiveness using Analytic Hierarchy Process

**OANA STĂNCULESCU**[1]

In recent years, the evaluation of regional competitiveness aroused the interest of academics as well as policymakers. In the specialized literature many definitions for the concept of regional competitiveness and also several evaluation methods of the level of regional competitiveness can be found. From our point of view, regional competitiveness is regarded as a matter of decision, in which all factors of influence, seen as criteria, should be analyzed in order to identify the best method to improve the regional competitiveness level. In our paper we applied the Analytic Hierarchy Process (AHP) method, a multi-criteria decision-making method by which we can evaluate the competitiveness of the Romanian regions using quantitative data and define the position of these regions in the national ranking.

**Keywords:** regional competitiveness, analytic hierarchy process, factors, pair wise comparison.

**JEL codes**: C61, P25, P48, R11, R58.

## Introduction

There are many ways in which regional competitiveness can be assessed either by analyzing a single factor, or a set of factors, using theoretical models of competitiveness (Lengyel 2003, Ecorys Group 2003) or by creating composite indices (Snieska and Bruneckiene 2009).

In this paper, regional competitiveness is seen as a decision-making process where determinants are the criteria of the process. Based on this approach, the competitiveness of the Romanian regions (except for the Bucharest-Ilfov region) will be evaluated through a multi-criteria analysis method, namely the Analytic Hierarchy Process (AHP).

The purpose of the paper is to rank the Romanian regions taking into

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account a set of criteria in the form of measurable indicators. This method can be used to examine the influence factors of regional competitiveness and to provide directions to improve the regional competitiveness level.

**Literature review**

As a concept, regional competitiveness is not very sharply defined and there is no universally accepted definition in the literature. As a phenomenon, regional competitiveness is strongly exploited in the regional development strategies; authors such as Porter, Storper, Camagni and Krugman admit that the regions play a key role in terms of stimulating economic growth and competitiveness (Bosma et al. 2011).

In order to assess regional competitiveness, we must first understand its meaning. The literature is not devoid of economists' interventions tackling the regional dimension of competitiveness; for example, Michael Porter tried to define regional competitiveness by connecting it with the regional living standard. He believes that productivity is the most suitable definition of regional competitiveness, as it depends on the value of goods and services and the efficiency with which they are produced (Porter 2002).

According to Storper, one of the meanings of regional competitiveness is „the ability of an economy to attract and maintain firms with stable or rising market shares in an activity while maintaining or increasing standards of living for those who participate in it" (Storper 1997. 20).

Lengyel (2003) groups the different approaches of competitiveness into two categories:

1. „Ex-post competitiveness" or „revealed competitiveness" aimed at measurable results of the economy, represented by indicators such as the GDP growth rate, productivity, trade balance and export market shares;

2. „Ex-ante competitiveness" focuses on sources of competitive advantages of firms, rather than on a set of indicators of economic performance, an approach that aims primarly business conditions, seen as inputs. Briefly, this approach offers a number of arguments which may be useful for assessing regional competitiveness: knowledge base, skilled labour, infrastructure etc.

Other studies address this issue in terms of increasing the level of living standards and reducing the differences between revenues. In most of these studies, regional competitiveness is correlated with high levels of employment.

The most common method for assessing regional competitiveness, widely accepted in the European Union, is based on the calculation of per capita GDP, considered to be the indicator that best describes the development of the regions, respective its level of competitiveness. This indicator is representative for the measurement of the generated revenue volume per capita in a region, offering a high degree of comparability. According to Lengyel, the measurement of regional competitiveness can be achieved through three economic categories. The correlation between these categories is the following (Lengyel 2003):

$$\text{Regional income} \approx \text{Labour productivity} \times \text{Employment rate}$$

Lengyel (2003) treats regional competitiveness as the growth generated by high labour productivity (measurable indicator: GDP/employment) in the region, a higher employment rate (measurable indicator: employment rate) and the degree of economic openness of the region (meaurable indicators: the values of imports and exports). He also built a pyramid model that classifies the factors influencing the quality of life and living standard and hence the regional competitiveness on three levels, as follows (Lengyel 2003):

*1. Basic factors*: consisting of measurable indicators of competitiveness: labour productivity, employment and the economic openness of the region.

*2. Growth factors*: influencing the first category, are being used to improve the competitiveness of a territory: R&D, SMEs, FDI, infrastructure and human capital, institutions and social capital;

*3. Success factors*: which build up over time; their influence is visible only after long periods of time: economic structure, innovation, regional accessibility, qualified labour, social structure, regional identity.

In our opinion, GDP/capita could also be considered a basic factor.

Experts of the Ecorys Group assessed regional competitiveness by taking into account a number of factors and grouping them in an

arborescent structure (Competitiveness tree model): human resources, innovation, connectivity and industrial structure are the factors which form the roots of the tree, the productivity represents the trunk; income, employment, profits and taxes are the branches. The most important components are considered those from the roots, as they represent the deteminants of competitiveness. (Ecorys Group 2003)

Regional competitiveness is a topical issue partially covered; regional competitiveness evaluation methods are not standardized. At national level, several studies that address this issue were identified. Most of them establish a hierarchy of the Romanian regions based on the calculation of a regional competitiveness index. The Group of Applied Economics (GAE 2007) developed a regional competitiveness index based on economic, social and technology-related indicators and obtained a ranking of the Romanian regions using this index. In the study conducted by the IRECSON Institute regional competitiveness level was calculated based on the analysis of 171 indicators and the situation of the regions was also compared. (IRECSON 2012)

However, competitiveness can't realistically be measured by analyzing a limited set of indicators, because it is a complex concept. We can believe that the assessment of competitiveness should be carried out using an easy to apply method which offers some indication of the factors that should be supported in the future. The AHP method helps breaking the complex problem down into several easily understandable and less complex pieces (sub-problems) by establishing priorities. The strategic decisions in the planning process should be based on the results of the competitive position measurement and the regions' potential.

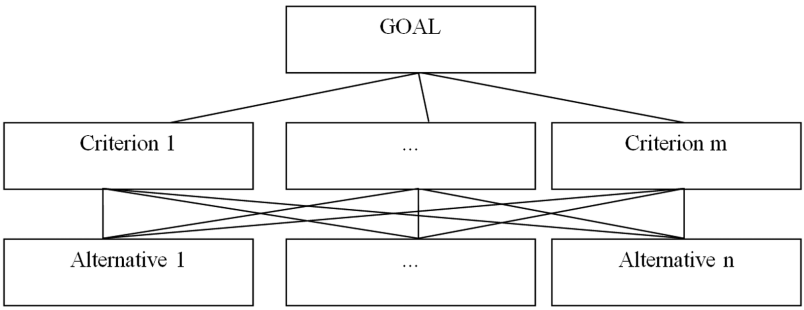
The AHP method is accessible and allows a rapid assessment of the regional competitiveness level. There have been studies in which regional competitiveness has been evaluated using the AHP method, applied to the Czech Republic and Slovakia between 2000-2006, taking into account measurable macroeconomic indicators (GDP, gross fixed capital formation, gross domestic expenditures on research and development, net disposable income, knowledge intensive services and

patents). The results of these studies showed that GDP has the greatest influence on regional competitiveness. (Kiszová and Nevima 2012)

**Methodology**

As mentioned above, the evaluation of regional competitiveness is a decisional process. Starting from this premise, the AHP multi-criteria analysis method can help us with our approach. Through this method we will try to evaluate the regional competitiveness in Romania – with the exception of Bucharest-Ilfov region which, from a development point of view, is situated at quite a distance from the other regions –, in the 2006-2010 time frame, using official statistical data. The final result of applying the AHP method will be the hierarchy of these regions within the chosen analysis margins.

The multi-criteria analysis helps with the evaluation of more options in case of a problem or complex decision-making situation. In the case at hand, regional competitiveness is a problem and a complex decision. The analysis implies the existence of a set of methods: for each objective, one or more methods of measuring each option's performance in solving the problem will be used.




*Source: Nevima and Kiszová 2012*

Figure 1. Three-level hierarchic structure

The multi-criteria analysis implies:

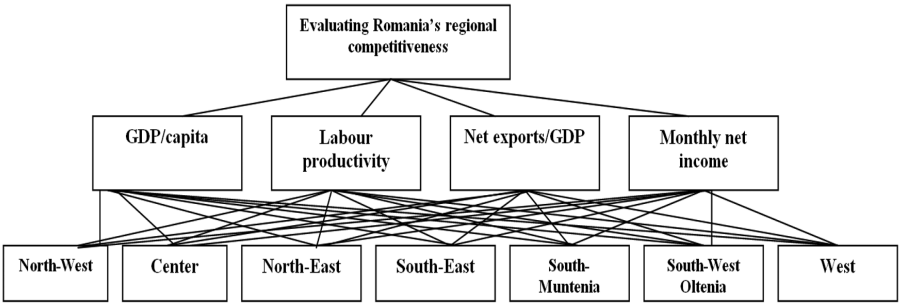
• very well expressed objectives: the goal, in this case, is the evaluation of Romania's regional competitiveness;

• each criteria must be assigned a certain weight/value based on its importance: in this case, the criteria will be the indicators which we will be using for comparing the regions;

• each alternative must be evaluated/noted according to each criteria (the extent to which each alternative leads to achieving the goals of the public policies): in this case, the alternatives are the regions;

• for each alternative the sum of all the given grades is computed, the alternatives being ranked based on each result.

Thus, in our case, the hierarchical structure levels will look like Figure 2.




*Source: own research*

Figure 2. Regional competitiveness – Three-level hierarchic structure

The method's criteria (the indicators which are at the base of the evaluation) were selected by taking into consideration the influence that each of them has on the region's competitiveness, representing that category of base factors described in the literature review. They are measurable indicators, offering a high degree of comparability. Of course, the research can be extended by using other indicators, such as: business environment structure, research and development activities, infrastructure, FDI, etc. However, the paper at hand is confined to the base indicators of regional competitiveness, unanimously accepted in the specialized literature: GDP per capita, labour productivity (GDP/employment), net exports/GDP and monthly net income.

As already mentioned, GDP/capita is one of the most representative indicators of regional competitiveness. It measures the economic activity generated by the production of new goods and services in a certain region. This indicator was chosen because it reflects the living standard of a region's inhabitants. The source of these data is the National Institute of Statistics (NIS).

Labour productivity (GDP/employment) is an indicator agreed upon by the majority of specialists from this field, considering it to be at the essence of regional competitiveness. This indicator measures how effective is the use of human capital in obtaining the regional GDP, as well as how competitive a certain region is in comparison with the others by evaluating the contribution of its human capital to the regional GDP. The data has been provided by the National Institute of Statistics.

Net exports represents the difference between the total value of exports and imports at regional level. In the comparative analysis, the absolute value of the net exports is less relevant, because it shows the excess of demand in the region regardless to the size of the regional economy. That is why we consider it is necessary to report net exports to the regional GDP (net exports/GDP). The value of a region's exports is dependent on the size of the economy of that region, and a high level of exports represents a high level of competitiveness.

Monthly net income represents the difference between the gross income and the income tax, contributions for health and social insurance and any taxes on other income generating assets, setting the effective purchasing power of a regions population.

The AHP method (Analytical Hierarchy Process) is a method practiced in order to solve a complex decisional problem which implies the comparison of attributes or variants. Generally speaking, the method developed by Saaty (1982) allows the deciders to represent the interaction of multiple factors, attributes, characteristics or variants. The AHP method is based on building a series of "pair comparison" matrices which compare all the criteria between each other. Saaty elaborated a scale for the Intensity of Importance with 9 points which properly reflect the priorities of the comparison between the two elements (Table 1).

Table 1. Saaty's fundamental scale

| Intensity of importance | Definition |
|---|---|
| 1 | Equal importance |
| 3 | Moderate importance |
| 5 | Strong importance |
| 7 | Very strong importance |
| 9 | Extreme importance |

*Source: Saaty 1982*

The values 2, 4, 6 and 8 represent intermediate values or compromise values. They can be used to represent shades of judgment in completing the 5 base evaluations. (Roman 2012)

The Analytical Hierarchy Process has at its base three stages of decision-making:

1. Initiation – the criteria used to define the decision are set, by brainstorming or based on the decision-maker's judgment. The hierarchical relations between the criteria are represented using a matrix;

2. Evaluation – the criteria added in the hierarchical matrix are compared based on their relative importance;

3. The final evaluation – the potential solutions are sorted out based on each criteria.

The application of the AHP method involves the following steps: building the hierarchical structure of the decision problem, determining the alternative relative weights compared with the hierarchy attributes and sub-attributes, calculating the total score of each alternative, determining the indicators of consistency by the pairwise comparison and developing the final decision based on the results.

**Results and discussion**

This research aims to assess the competitiveness of the Romanian regions for each particular year in the period 2006-2010 (the last year for which official data are available).

According to the methodology, the alternatives are the Romanian regions, namely North-West (NW), Center (C), North-East (NE), South-East (SE), South-Muntenia (S), South-West Oltenia (SW) and West

(W). These alternatives were evaluated from the perspective of the following criteria: GDP/capita, labour productivity (GDP/employment), net exports/GDP and monthly net income. Table 2 presents the values of the indicators for 2010.

Table 2. The absolute values of the indicators, in 2010

| 2010 | GDP/capita (RON) | Labour productivity (RON) | Net exports/GDP | Monthly net income (RON) |
|---|---|---|---|---|
| NW | 21827.2 | 51393.3 | -0.000037 | 2307.9 |
| C | 23428.3 | 59013.9 | -0.000333 | 2299.0 |
| NE | 15014.8 | 46114.2 | -0.000129 | 2047.4 |
| SE | 20076.8 | 56628.3 | -0.000054 | 2029.7 |
| SM | 20288.2 | 57252.2 | 0.000002 | 2369.2 |
| SWO | 18735.1 | 50361.7 | 0.000014 | 2134.1 |
| W | 27640.0 | 65306.7 | 0.000028 | 2344.6 |

*Source: own calculations based on official statistical data*

In the second stage, pairwise comparison between alternatives was applied, with the aim to establish a hierarchy between the decisional alternatives. The pairwise comparison is used in order to determine the degree of relative importance of the elements. In other words, regions will be compared to each other in terms of the proposed criteria. Note that if the information is quantitative, as in the present case, the comparison has as the result the ratio between the alternatives' values. The comparisons should be made to determine the relative importance of the criteria to achieve the intended purpose. Thus, the criteria pairwise comparison matrix is as follows:

Table 3. Pairwise comparison matrix

| | GDP/capita | Labour productivity | Net exports | Monthly net income | Total score | Overall weights or priorities |
|---|---|---|---|---|---|---|
| GDP/capita | 1 | 3 | 7 | 5 | 16 | **0.557892** |
| Labour productivity | 1/3 | 1 | 5 | 3 | 9.33 | **0.263345** |
| Net exports/GDP | 1/7 | 1/5 | 1 | 1/3 | 1.68 | **0.056890** |
| Monthly net income | 1/5 | 1/3 | 3 | 1 | 4.53 | **0.121873** |
| Total | | | | | 31.54 | **1.00** |

*Source: own calculations*

For example, value 3 in the first row of Table 3 shows that, in our opinion, the GDP/capita criteria is contributing in a greater degree to accomplish the established objective (which is regional competitiveness), than labour productivity.

From the comparison of the four criteria a square matrix resulted. This comparison can be considered subjective by the fact that the ranking criteria is left to the appreciation of the decision-maker. We considered that GDP/capita is the most important criteria which best reflects the state of regional competitiveness, associating it with the living standard of the inhabitants; the next indicator, in the order of their importance, is labour productivity. The monthly net income is the third in the order of importance as it shows the purchasing power and living standard of the regions' inhabitants. The "net exports/GDP" indicator was considered the least important; therefore it obtained a lower score.

The results obtained by applying the AHP method have ranked the Romanian regions, capturing some influences of the indicators used in the analysis.

Table 4. The results obtained by considering the overall weights

| 2010 | NW | C | NE | SE | SM | SWO | W | Overall weights or priorities |
|---|---|---|---|---|---|---|---|---|
| GDP/capita | 0.148474 | 0.159365 | 0.102134 | 0.136567 | 0.138005 | 0.127441 | 0.188014 | 0.557892 |
| Labour productivity | 0.132689 | 0.152364 | 0.119059 | 0.146205 | 0.147815 | 0.130025 | 0.171842 | 0.263345 |
| Net exports/GDP | 0.074788 | 0.666395 | 0.258818 | 0.108187 | -0.00425 | -0.02934 | -0.05682 | 0.056890 |
| Monthly net income | 0.148588 | 0.148016 | 0.131819 | 0.130679 | 0.152538 | 0.137403 | 0.150957 | 0.121873 |
| **Results** | **0.140139** | **0.184983** | **0.119123** | **0.136773** | **0.134267** | **0.120416** | **0.165310** | 1.00 |

*Source: own calculations*

While analyzing the impact of the indicators, we observed different results on how they influence the competitiveness of each region across the years. What we also noticed is that some regions tend to be more influenced by a certain indicator rather than the rest. For example, net exports/GDP has a high and constant impact on the Center regions'

competitiveness, while GDP/capita tends to determine the competitiveness of the West region; out of all the indicators, labour productivity has the biggest impact on the South-Muntenia regions' competitiveness. It is a rather peculiar result, that the competitiveness of the North-East region, where living standards are the lowest, is greatly influenced by the monthly net income.

Table 5. Ranking of the regions, 2006-2010

| Rank | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| **NW** | 3 | 3 | 3 | 7 | 3 |
| **C** | 1 | 1 | 1 | 1 | 1 |
| **NE** | 7 | 7 | 7 | 5 | 7 |
| **SE** | 4 | 5 | 4 | 6 | 4 |
| **SM** | 5 | 4 | 5 | 4 | 5 |
| **SWO** | 6 | 6 | 6 | 3 | 6 |
| **W** | 2 | 2 | 2 | 2 | 2 |

*Source: own calculations*

The hierarchy of the regions is presented in Table 5. We notice that, for some of the regions, substantial changes were captured in 2009. The least competitive region in the mentioned year was the North-West region that had registered the highest deficit. This result has significantly influenced its economic performance. In all the analysis years, the region which topped the rankings was the Center region, followed by the West region. Due to the fact that the analysis is based on complex indicators, it is difficult to identify some other types of influences on regional competitiveness. However, the AHP method has provided an alternative ranking of Romania's regions.

**Conclusions**

The research at hand aimed at prioritizing the Romanian regions (except for the Bucharest-Ilfov region) using the AHP multi criteria analysis. Thus, the most relevant indicators were selected in order to properly assess the competitiveness of the Romanian regions.

Among the advantages of this method we can mention: the ease with which it can be used, the use of qualitative and quantitative factors and

that different hierarchies can be performed according to the complexity of the problem. The method gives the freedom of choosing the most appropriate criteria with the purpose of making a good decision. The study is intended to the local governments, in order to assess regional competitiveness and compare their policies with those of other regions; the business community, to achieve investments plans, and to academics, who can use it to better understand and analyze how regions compete in the market.

Like any other method, the AHP has also some limitations. It is important to note that this method involves a high degree of subjectivism especially in the stage of establishing the weight of each indicator.

In the future, we will try to prove the applicability of the method by applying at industry level (as alternatives) in one specific region and choosing specific indicators (such as the turnover, number of employees, labour productivity etc.) in order to identify the most competitive industry in the regional economy.

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# Comparison of the equity effect of progressive income and consumption taxation

**ERZSÉBET TERÉZ VARGA**[1]

The paper compares the progressive income tax with the progressive consumption tax from the aspect of equity. The progressive taxation of personal consumption is possible since Irving and Herbert Fisher published their conception in 1942. The comparison of linear taxes is prevailing while the analysis of various progressive tax types is not typical in the economic literature. The paper defines an equivalence conception for the progressive case to create an opportunity for contrasting. The social inequality is measured by the Gini coefficient in a two-period model with four types of consumers who earn different amounts of income, smooth their consumption and are levied by two-bracket progressive tax systems. According to the results of the model the inequality depends on the composition of the population and the rate of wages; both progressive income tax and consumption tax can lead to a more equitable distribution in adequate circumstances.

**Keywords:** progressive taxation, expenditure tax, social inequality, equivalent tax, Gini coefficient.

**JEL codes:** H23, H24.

## Introduction

The fundamental reason for the application of progressive taxation is the principle of equity: while progressive taxation unambiguously worsens the efficiency of the economy more than linear taxation does, it is still widely adopted in the world for the sake of social justice (Stiglitz 2000). The tax base of progressive taxation is income earned everywhere in the world. While the opportunity of progressive taxation of personal consumption has existed since 1942 only India and Ceylon have tried to introduce it.

The paper discusses the progressive income based tax with the

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progressive consumption based tax from the aspect of equity to decide if progressive consumption taxation is worth using for improving the equity of tax policy.

For determining a more equitable tax base a well-defined measure is needed. While the concept of deadweight loss is a plausible asset of measuring the efficiency there is not any obvious measure of justice. While a tax which has less excess burden is more efficient the principles of equal sacrifice or horizontal and vertical equity do not offer acceptable instruments in answering the question: which tax system is more equitable? The Gini coefficient presents an opportunity to compare the effect that different tax systems have on reducing the distribution of the goods.

Social inequality is an evergreen problem which stands in the focus of governmental policy. The (re)distribution is one of the three functions (beside allocation and stabilization) of the modern state according to Musgrave. (Balogh 2007)

The ground for comparison means another problem: there are many opportunities to compare tax systems with linear tax rates but what kind of progressive taxes are comparable? I define an equivalence conception for progressive tax rates which harmonizes with the linear tax case. Following this I construct a model in which I can measure the distributional effect of different taxes using the Gini coefficient. Finally I sum up the results. The purpose of this methodology is to find the most efficient manner of reducing inequality in different circumstances.

**Literature review: the opportunity of progressive consumption taxation and its advantages**

The progressive taxation of income is widely applied in the world, so its reasonableness is not questionable. The discovery of the personal progressive consumption tax is an outcome of an age-long controversy about the best tax base. From the income versus consumption debate here I mention only the consumption side because this leads us to the practicability of the so called expenditure tax.

It is likely to have started with Thomas Hobbes in the 17$^{th}$ century when he asked in his Leviathan: *"For what reason is there that he which*

*laboureth much and, sparing the fruits of his labour, consumeth little should be more charged than he that, living idly, getteth little and spendeth all he gets; seeing the one hath no more protection from the Commonwealth than the other?"* (Hobbes 1651, Ch. XXX. 17th paragraph).

After 200 years John Stuart Mill (1875) returned to consumption taxation on the ground of another consideration, namely dealing with the problem of double taxation of savings in the case of income based systems. If all income (both from labour and capital) is levied on income tax we tax the saved part of the income twice while the consumed part is levied only once. This different handling discriminates negatively future consumption against present consumption.

Later came Alfred Marshall and Arthur Cecil Pigou who were advocates of consumption taxation but they recognized its degressive effect. The result of this effect is namely the fact that a poorer taxpayer spends a greater part of his income on consumption than a richer one consequently they suggested a second role for consumption taxes after income taxation. (Musgrave 1996, Kaldor 1955)

In the middle of the last century Fisher and Fisher (1942) and later Kaldor (1955) constructed practicable plans for a *personal (direct) progressive consumption based* tax, namely the *expenditure tax*. The expenditure tax has two main elements: its tax base and its tax rate. The *tax base* is the personal annual consumption which first seems very complex and untreatable.

Controlling a detailed shopping list on every taxpayer at the end of the year would be a real disaster for tax authorities. This task becomes all at once simple if we use the definition of saving: saving of a given period is the part of the income of this period which is not consumed in the same period. Mathematically:

$$S_i = Y_i - C_i \qquad (1)$$

where: $S_i$ is the savings in period *i*,
$Y_i$ is the income in period *i* and
$C_i$ is the consumption in period *i*.

After rearranging equation (1) we get a new definition of consumption: namely it is the non saved part of the income. Mathematically:

$$C_i = Y_i - S_i \quad (2)$$

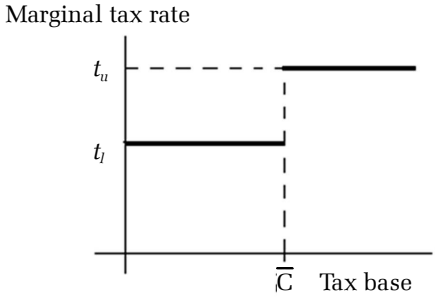
Why is it such a clever and magnificent idea? While the controlling of shopping lists would be an absolute nonsense concept, the income and saving data are available and verifiable information. The taxpayer would have no other task than prove her savings in the period to decrease his tax base while the tax authority should collect information on income as till now (Stiglitz 2000).

The second element of the expenditure tax is its *tax rate*. To eliminate the degressive effect of consumption taxation the tax rate has to be progressive. A tax system is progressive if its average tax rate (which shows the tax burden imposed on the tax base) increases when the tax base increases (Rosen and Gayer 2010).

**Methodology**

***The assumptions of the model***

The study applies the progressive two-bracket tax both in the case of income and consumption taxes. Figure 1 illustrates the corresponding marginal tax rate which shows the burden on the last unit of the tax base. The different brackets of the tax base are levied by different tax rates: only the part above the bracket limit is charged with the upper tax rate while the burden of the lower bracket does not change. (Galántainé 2005)




*Source: Varga 2012. 602*

Figure 1. Marginal tax rates of two-bracket progressive tax

Equation (3) gives the burden of expenditure tax ($T_i$) in period *i* in function of annual consumption ($C_i$).

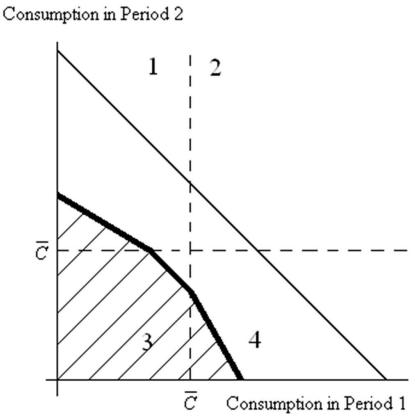
$$T_i = f(C_i) = \begin{cases} t_l \cdot C_i & \text{if } C_i < \overline{C} \\ t_l \cdot \overline{C} + t_u \cdot (C_i - \overline{C}) & \text{if } C_i \geq \overline{C} \end{cases} \quad (3)$$

where: $\overline{C}$ is the bracket limit,

$t_l$ is the lower marginal tax rate (valid under $\overline{C}$) and

$t_u$ is the upper marginal tax rate (valid from $\overline{C}$).

Assuming two periods the expenditure tax modifies the intertemporal budget constraint as shown in Figure 2. The budgetary set is pentangular since its brakes at the two bracket limits (signed by the thick line in Figure 2). In the 1st quarter (where the consumption in the 2nd period is higher while in the 1st one it is lower than the bracket limit) the budget constraint is less steep than the original one while in the 4th quarter just the reverse holds. In the 3rd quarter the budget constraint is parallel to the original one: from equations (4) and (5) the steepness of both lines is *–(1+r)*.




*Source: Varga 2012. 607*

Figure 2. The intertemporal budgetary set in the case of progressive consumption tax

The intertemporal budget constraint before taxation (which is marked by the thin line in Figure 2) is given by equation (4):

$$Y_1(1 + r) + Y_2 = C_1(1 + r) + C_2 \quad (4)$$

where $Y_i$ is the income in period $i$, $i$=1, 2
r is the (real) interest rate.

The budget constraint after taxation in the 3rd quarter (where $C_1, C_2 < \overline{C}$) modifies as equation (5) shows:

$$Y_1(1 + r) + Y_2 = C_1(1 + t_l)(1 + r) + C_2(1+ t_l). \quad (5)$$

The income tax is similar to the consumption tax. Its lower rate will be $\tau_l$ (it is valid until the bracket limit denoted by $\underline{w}$) while the upper rate will be $\tau_u$ which is valid only above $\underline{w}$.

In the model two periods are assumed: every agent lives for two periods and depletes all of his wealth in the second period. In both periods $p_L$ part of the society earns $w_L$ while $p_H$ part earns $w_H$, where $p_L + p_H=1$ and $p_L, p_H > 0$. The wages of the particular periods are independent. Consequently there are four types of consumers with different lifetime income as Table 1 shows.

Table 1. Lifetime income before taxation

| | | Period 2 | |
|---|---|---|---|
| | | $(w_L, p_L)$ | $(w_H, p_H)$ |
| Period 1 | $(w_L, p_L)$ | $Y_{LL} = w_L + w_L/(1+r)$ | $Y_{LH} = w_L + w_H/(1+r)$ |
| | $(w_H, p_H)$ | $Y_{HL} = w_H + w_L/(1+r)$ | $Y_{HH} = w_H + w_H/(1+r)$ |

*Source: own calculation*

In general $Y_{ij}$ lifetime income belongs to $p_i \cdot p_j$ part of the society where $Y_{ij} = w_i + w_j/(1+r)$. Let us denote the $p_i \cdot p_j$ product by $p_{ij}$ henceforward.

***Gini coefficient***

In the model we measure the social inequality by Gini coefficient. Here this statistical indicator shows the average absolute difference of the lifetime income data relative to their average value. Equation (6) shows the formula of average absolute difference while equation (7) shows the concentration coefficient. (Hunyadi et al. 2000)

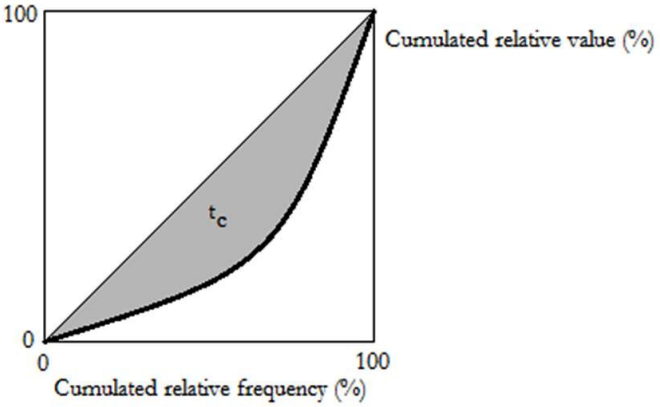
$$G = \Sigma_i \Sigma_j \left| Y_i - Y_j \right| / (N * (N-1)) \quad (6)$$

$$L = G / 2 * \underline{Y} \quad (7)$$

where $\underline{Y}$ is the average lifetime income and equation (8) gives its value in the model.

$$\underline{Y} = p_{LL} \cdot Y_{LL} + p_{LH} \cdot Y_{LH} + p_{HL} \cdot Y_{HL} + p_{HH} \cdot Y_{HH}. \quad (8)$$

The concentration coefficient L measures the deviation from the perfectly equable distribution of income. In this model Figure 3 shows the so-called Lorenz curve which illustrates the cumulated relative lifetime income as a function of cumulated population. If the Lorenz curve coincides with the diagonal there is perfect equality in the society. The deviation from perfect equality can be featured by the area between the Lorenz curve and the diagonal. Let us denote this so-called concentration area by $t_C$. The Gini coefficient defined by equation (7) is just twice this area: $L = 2\ t_C$.




*Source: Hunyadi et al. 2000. 124*

Figure 3. The Lorenz curve

In the model the average absolute difference is calculated according to eq. (9):

$$G = p_{LL}\cdot p_{LH}\cdot|Y_{LL}-Y_{LH}| + p_{LL}\cdot p_{HL}\cdot|Y_{LL}-Y_{HL}| + p_{LL}\cdot p_{HH}\cdot|Y_{LL}-Y_{HH}| + \\ + p_{LH}\cdot p_{HL}\cdot|Y_{LH}-Y_{HL}| + p_{LH}\cdot p_{HH}\cdot|Y_{LH}-Y_{HH}| + p_{HL}\cdot p_{HH}\cdot|Y_{HL}-Y_{HH}|. \quad (9)$$

Now assume that the government introduces a progressive income tax. The income tax modifies the lifetime income denoted by $Y^{\tau}_{ij}$ as eq. (10)–(13) shows assuming the following relations: $w_L < \underline{w} < w_H$.

$$Y^{\tau}_{LL} = w_L(1-\tau_l) + w_L(1-\tau_l)/(1+r) \quad (10)$$

$$Y^{\tau}_{LH} = w_L(1-\tau_l) + [w_H(1-\tau_u) + \underline{w}(\tau_u-\tau_l)]/(1+r) \quad (11)$$

$$Y^{\tau}_{HL} = w_H(1-\tau_u) + \underline{w}(\tau_u-\tau_l) + w_L(1-\tau_l)/(1+r) \quad (12)$$

$$Y^{\tau}_{HH} = w_H(1-\tau_u) + \underline{w}(\tau_u-\tau_l) + [w_H(1-\tau_u) + \underline{w}(\tau_u-\tau_l)]/(1+r) \quad (13)$$

The Gini coefficient is calculated similarly as without taxation. Now we only have to change the pre-tax lifetime income variables ($Y_{ij}$) to taxed variables ($Y^{\tau}_{ij}$). Let us denote the Gini coefficient after income taxation by $L^{\tau}$.

Taxation reduces the differences in disposable income so the aftertax Lorenz curve will be closer to the diagonal than the pre-tax curve was. Consequently the concentration area (let us denote it by $t^{\tau}_C$) and from it the concentration coefficient (the amount of $L^{\tau}$) will be smaller than the original one ($t_C$ and L respectively). The smaller Gini coefficient means more equable distribution.

***Equivalent taxes***

Now let us calculate the effect of progressive consumption. For a comparable result we have to use adequate rates. Comparison of linear tax systems is by far simpler, consequently its literature is also extensive. The most usual approach of equivalence is the equal tax revenue of the state (sometimes including the riskiness of it as well) or the equal utility achieved by consumers (Bonds and Myles 2007, Hashimzade and Myles 2006).

These equivalence concepts cannot be applied in the case of progressive taxation because they would not be unambiguous. Three elements determine a two-bracket progressive tax: its lower tax rate, its upper tax rate and its bracket limit. If we used the principle of equal tax

revenue for determining equivalent tax systems we would get one equation for three variables which problem generates an infinite quantity of solutions and this would result in different measures of inequality and also Gini coefficients.

Now I introduce an unusual equivalence concept for the case of progressive tax rates. Henceforward I regard two tax systems as equivalent if the same part of the earned income is consumable. It means that if someone's gross wage is $y_i$ the consumable part of it will be $x_i$ in both tax systems. This requires the following relation between income and consumption tax rates and bracket limits (Varga 2012):

$$t_j = \tau_j/(1-\tau_j),\ j \in (l, u) \tag{14}$$

$$\overline{C} = \overline{w}(1-\tau_l). \tag{15}$$

This equivalent concept meets the following requirement as well: "any two sets of taxes that generate the same changes in relative prices have equivalent incidence effects" (Rosen and Grayer 2010. 320). Assuming only one period the budgetary constraints in the case of progressive income and consumption taxation are the same so their effects on relative prices are identical as well. Regarding more periods the budget lines are not the same but they are parallel accepting the assumption of consumption smoothing (see later) so they generate the same changes in relative prices (Varga 2012).

***The Gini coefficient regarding the consumption tax***

For the calculation of Gini coefficients in the case of consumption taxation (let us denote its value by $L^t$) the lifetime income data are modified (reduced) by the discounted value of the consumption tax. For calculating the consumption tax burden we need information on the consumption decision of the consumers. Let us assume that when the decision makers maximize their lifetime utility they choose a smooth consumption path: an agent consumes the same amount in both periods of his life regarding his net lifetime income.

This assumption is really factual, accepted and proved by many economists. It works according to the Life Cycle/Permanent Income Hypothesis (Modigliani and Brumberg 1954, Friedman 1957) and even corres-

ponds to the buffer-stock behaviour (Carroll 1996) or the habit persistence approach by Deaton (1987). Actually all of them support the concept of consumption smoothing. Consequently in the model the consumption decision of a person are determined by equations (16) and (17):

$$C_{ij} = Y_{ij}(1 + r)/[(2 + r)(1 + t_l)] \text{ if } Y_{ij}(1 + r)/[(2 + r)(1 + t_l)] \leq \overline{C} \quad (16)$$

$$C_{ij} = [Y_{ij} + C(2 + r)(t_u - t_l)/(1 + r)](1 + r)/[(2 + r)(1 + t_u)] \text{ if } Y_{ij}(1 + r)/[(2 + r)(1 + t_l)] > \overline{C} \quad (17)$$

where $C_{ij}$ is the one-period consumption of a taxpayer who has $Y_{ij}$ lifetime income.

After calculating consumption in the two periods the consumption tax is determined by equation (3).

**Results and discussions**

***The calibration of the model***

The lower and upper income tax rates are calibrated respectively with 20 and 40 per cent. The lower and upper consumption tax rates come from eq. (14) and their values are 25 and 67 per cent.

The bracket limit of the income tax ($\underline{w}$) is the simple (not weighted) arithmetic average of the low and high wage: $\underline{w} = (w_L + w_H)/2$.

The income is standardized assuming $w_L$ equals to 1. I investigated two cases of high wage. In the first version high wage ($w_H$) is 2 while in the second version its value is 10.

I calculated the impact of the different tax systems on the Gini coefficient by different distribution of population. I calculated the concentration coefficients as a function of the value of $p_L$ (the rate of the "poorer" people of the society in a given period) both for income and consumption taxes.

Thereafter I determined the difference of the Gini coefficients of income and consumption taxes (let's denote it by $\Delta L$) as equation (18) shows.

$$\Delta L = L^y - L^t \quad (18)$$

The sign of $\Delta L$ reflects which tax reduces social inequality more.

When income tax is more efficient in reducing inequality then $L^r$ is lower than $L^t$ so $\Delta L$ is negative and vice versa (when consumption tax is more efficient $\Delta L$ is positive).

***The results of the model***

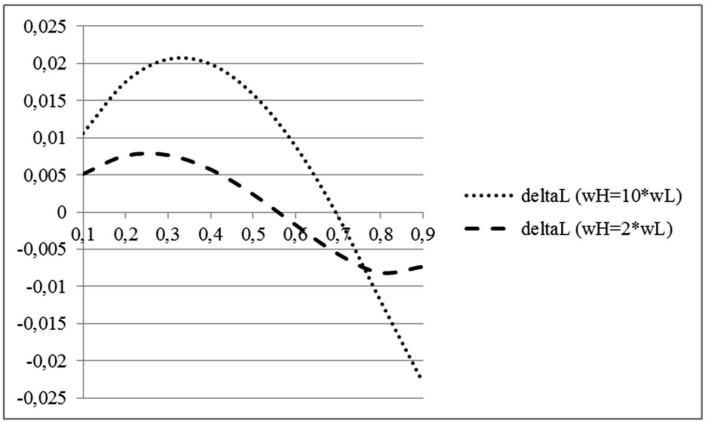
According to my calculations $\Delta L$ can be both positive and negative. It depends on the composition of the population and the difference of the lower and higher wages as Figure 4 depicts.

The income tax reduces inequality more than the consumption tax when the rate of people with higher income is less.

When the higher wage is more times bigger than the lower wage the consumption tax performs better in a wider interval of possible society structures.

When the high wage is 10 times the low wage the consumption tax is more effective if the rate of poorer is not greater than 70 per cent whereas if the high wage is only twice the low wage the consumption tax has a more favourable impact until the rate of poorer is around 55 per cent.

In both cases the consumption tax works better in a broader interval.




*Source: own figure*

Figure 4. The difference of the Gini coefficients as a function of the rate of the poorer part of the society

**Conclusions**

Equity is a main argument in the debate over the ideal tax base. I investigated the reduction in inequality implied by different taxes measured by the Gini coefficient. According to my model the effectiveness of reducing inequality depends on the own features of a given society: the composition of the population and the rate of wages.

The higher the rate of poorer persons the better the equalizing effect of the income tax and the higher the difference between wages the better the consumption tax. It means that the effect on inequality is favourable but not as high as the problems of the introduction of a progressive consumption tax. Certainly if other aspects prefer the consumption tax the effect on inequality can contribute to a favourable assessment as well.

Necessarily the assumptions of the model limited its adaptability. I assumed two periods, only two income categories and they were certain and known in advance. Taking account of the riskiness of the income path would deliver further solutions to the problem.

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