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Business Startups: Cultural-Economic Controversy

Nejat Erk
Sinan Fikret Erk

The purpose of this paper is to examine whether national cultural differences and/or economic, macroeconomic indicators are dominant in explaining business startups in selected EU countries. Among Hofstede's national cultural differences, we have used the individualism-collectiveness index measuring preference behavior that promotes one's self interest, while the power distance index measures tolerance of citizens in terms of social inequality in terms of superiors or subordinates; the uncertainty avoidance index reflects tolerance towards uncertainty and ambiguity among citizens, while the masculinity index measures whether the society is male centered (Hofstede 2003). The last variable in the model related to culture is the corruption index (Transparency International 2008), which reflects how sensitive the nation is towards corruption. Among the macroeconomic indicators we have looked at whether the firm birth rate in an economy is strongly influenced by the given average wage rate, overall productivity level among nations, index for profitability and real per capita GDP growth. Findings show that with some exclusion, cultural factors are as important as economic indicators in explaining national business startups. Towards this end we have used factor and principle component analysis towards explaining the strength of the relationship among the variables.

Key Words: business startups, Hoftstede's model
JEL *Classification:* M31, M13

Introduction

There is a rich literature on entrepreneurship's contribution to economic development. The majority of the literature focuses on business creation leading to job creation, and on output creation which may eventually increase productivity through technological change (Acs and Amaros 2008, 122). In the same line of work, the environmental factors shape the interdependencies between economic indicators, and institutions which

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shape up the cultural domain make significant contributions to business startups. Critical economic determinants and the role of economic transactions have strong implications for demand and supply dynamics in an economy (North 1990). This in no way neglects the institutional setting, which strongly influences entrepreneurial activity and its technological reflections (Jorgenson 2001). There are also studies which look at knowledge factors which strongly influence success or failure of the pre-startup phase within a business (Gelderen, Thurik and Bosma 2006). A technological change causes a structural change in the production and decision making process towards a firm's struggle to adapt itself to a competitive environment (Chesbrough 1999) for survival. Following a similar route, Geert Hofstede looks at national cultural differences in mapping the cultural structure of a country. Hofstede's cultural values basically aim to map out a general sociological viewpoint of factors that actually aim to reflect the difference of nations reflected as cultural factors. These factors can be defined by five distinct factors, where some attention is needed for the definition. The power distance index focuses on the power and inequality level of a culture; to elaborate on the matter, this measure looks at the order of hierarchy and equality within a certain culture. In business terms, a view on subordinate and ordinate and the level of distance in formality versus informality can be seen as a good assumption. Individualism looks at how much the culture of nations is geared towards collective action or decision, or quite the opposite of individualistic decision making. Masculinity looks at the male centeredness, or the opposite way around focus of a society within male- versus female-centered values. The uncertainty avoidance index looks at how the culture of a nation is open or closed to the discussion of certain topics, and hence to uncertainty avoidance; in business format this measure tries to approach how a business discusses certain topics at hand in terms of being covert in signifying intent versus being open and direct on the matter. There are several critics who strongly criticize the assumptions behind the cultural factors that Geert Hofstede uses (Gould 1981). More recent critics look at the implications of the criteria factors and the explanatory power of these factors for national comparisons (McSweeney 2002). Although Geert Hofstede's cultural difference index has been discussed both positively and criticially in many studies, its explanatory approach has been used in many academic researches, course books (from international marketing to international business, etc.) and by business world practitioners; it should be considered as a suitable tool to under-

stand the differences between nations and be able to define similarities or groupings based on its framework. Looking at research that reflects differences between nations on cultural levels, some being explanable to an extent in various research studies, has encouraged also incorporating other difference reflecting indexes. One of the issues of greatest concern, both to nations and to business conducted within and in-between, can be seen as corruption. Many institutions including the United Nations have formed conventions, taskforces or policies to overcome this issue. A fairly good measure that reflects differences or similarities between nations is produced annually by Transparency International (2008). From a 10-point scale the index views 178 countries from being highly corruption clean (10) to highly corrupt (0). As well as looking at the defining power of cultural and structural values of nations, economic markers are also included into the research. Determinants like birth (birth rate), wages, productivity (productivity level of the nation), Gross Operating Ratio (in abbreviation GOR; defined as operating expenses divided by operating revenues) and growth (gross domestic product growth rate) are included into the research in order to understand the dominant explaining factors in terms of explaining business startups in selected EU countries.

The Model

To test our hypothesis on whether national cultural factors are as important as economic factors among selected EU member countries towards startups, we have adopted factor analysis (principal component analysis) to test the statistical significance of the relationship between nations. Factor analysis basically allows the study at hand to define relation between multiple variables by narrowing down these variables into 'factors' that are differently formed from each other (Kleimbaum, Lawrence and Keith 1988). Through principal component analysis of maximum variance between variables an attempt is made to define the factors (primary, secondary, tertiary, etc.). For the study at hand, in terms of business startups, the nations involved are viewed through two dimensions, which are also modeled. It is assumed that in model one, cultural factors and the business effects of corruption sensitivity perform a role in business startups. In the second model, it is assumed that economic factors play a role in business startups. Looking at their level of importance will allow us to better understand their importance from a multidisciplinary (but also highly related) point of view. The countries used in this research are: Bulgaria, Czech Republic, Estonia, Spain, Italy, Luxembourg, Hungary, the

Netherlands, Portugal, Romania, Slovakia, Finland, Sweden, the United Kingdom, and the EU15 average has been taken for the analysis (Eurostat 2007, 24–26). Per capita GDP growth has been taken in terms of purchasing power for the selected European countries (Eurostat 2008). All data used in terms of cultural factors and economic factors are originating from variables observed within a 5 year period, which is also covered in the literature, thus encouraging us to do likewise in this research. It is a fact that social trends and cultural knowledge change over time but not at a fast pace, therefore the research conducted is rationalized in order to be suitable and assumed to be applicable.

The first model attempts to measure the significance of Hofstede's model of national cultural factors in terms of the firms birth rate (startups). Below, one can see that factor scores of selected EU countries show that Hofstede's cultural factors are statistically significant in explaining behavioral differences among nations. For the cultural factors, the created correlation matrix requires 0.35 and the above parameter values to be statistically significant. Table 1 shows that the calculated data for most factors, with the exception of the masculinity factor, pass the test. Total variance explained shows that, for the data given for selected EU countries, the model explains 45.286 and 75.017 respectively. This shows the power of significance for the given test. In principle component analysis, one other critical calculation is related to Keiser Meier Olkin (KMO) and Bartlett's test. The critical value for KMO (is within the acceptable value range) and Bartlett's test significance (.000) also confirms that the model structured and tested is statistically significant. But due to Correlation matrix values being less than 0.35 for masculinity, we will omit this factor and re-run our model.

In our first model, running into difficulties related to the significance of the correlation matrix values for masculinity (M), we rerun the model omitting the M variable for the same country groups. Previous research and literature also indicate that the masculinity index of Hofstede's Cultural Values was proven to be found least explanatory (Cateora, Gilly and Graham 2009, 107). Consistent with previous research and literature our analysis also excluded the masculinity variable. Table 4 shows the run of the model with the removal of M. The test passes all statistical requirements. The total variance explained in table 5 shows us that for the data given for selected EU countries, the model explains 61.993 percent of the estimate respectively. This shows the power of significance for the given test. In principle component analysis, one other critical calculation is re-

TABLE 1 Correlation matrix of birth and Hofstede's cultural values model

Correlation	Birth	PDI	I	M	UA	C
Birth	1.000	.499	−.402	.078	.134	−.455
PDI	.499	1.000	−.661	.504	.413	−.747
I	−.402	−.661	1.000	.133	−.678	.523
M	.078	.504	.133	1.000	.084	−.534
UA	.134	.413	−.678	.084	1.000	−.631
Corruption	−.455	−.747	.523	−.534	−.631	1.000

NOTES Abbreviated variables used are birth (birth rate), power distance index (PDI), individualism/collectivism (I), masculinity (M), uncertainty avoidance (UA), sensitivity to corruption (C).

TABLE 2 Total variance explained for birth and Hofstede's cultural values model

C	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1	3.222	53.695	53.695	3.222	53.695	53.695	2.717	45.286	45.286
2	1.279	21.322	75.017	1.279	21.322	75.017	1.784	29.731	75.017
3	.894	14.899	89.917						
4	.399	6.650	96.566						
5	.146	2.436	99.002						
6	.060	.998	100.000						

NOTES Column headings are as follows: (1) total, (2) % of variance, (3) cumulative %; C – component. Extraction method: principal component analysis.

TABLE 3 KMO and Bartlett's test for birth and Hofstede's cultural values model

Kaiser-Meyer-Olkin measure of sampling adequacy = .534
Bartlett's test of sphericity: approx. chi-square = 48.611, df = 15, sig. = .000

lated to KMO and Bartlett's test. The critical value for KMO (in acceptable value range) and Bartlett's test significance (.000) also confirms that the model structured and tested is significant, as can be seen in table 6.

Given the above calculations, the factor scores of Romania, Bulgaria, Portugal, Slovakia, Czech Republic and Spain have a changing sign with respect to the EU15 Average, and with respect to the higher average of Estonia, Hungary, Italy, Luxembourg, Finland, Netherlands, United Kingdom and Sweden. Factor scores reflecting a ranking, high positive

TABLE 4 Correlation matrix table for startups with Hofstede's cultural values model with masculinity variable removed

Correlation	Birth	PDI	I	UA	C
Birth	1.000	.499	–.402	.134	–.455
PDI	.499	1.000	–.661	.413	–.747
I	–.402	–.661	1.000	–.678	.523
UA	.434	.413	–.678	1.000	–.631
Corruption	–.455	–.747	.523	–.631	1.000

NOTES Abbreviated variables used are birth (birth rate), power distance index (PDI), individualism/collectivism (I), uncertainty avoidance (UA), sensitivity to corruption (C).

TABLE 5 Total variance table for birth and Hofstede's cultural values model with masculinity removed

C	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	(1)	(2)	(3)	(1)	(2)	(3)
1	3.100	61.993	61.993	3.100	61.993	61.993
2	.920	18.391	80.384			
3	.488	9.769	90.153			
4	.398	7.965	98.118			
5	.094	1.882	100.000			

NOTES Column headings are as follows: (1) total, (2) % of variance, (3) cumulative %; C – component. Extraction method: principal component analysis.

TABLE 6 KMO and Bartlett's test for birth and Hofstede's cultural values model with masculinity removed

Kaiser-Meyer-Olkin measure of sampling adequacy = .536
Bartlett's test of sphericity: approx. chi-square = 33.961, df = 10, sig. = .000.

value shows a stronger relationship between cultural factors and business startups with respect to negative scores. In this sense we can say that, based on variables of birth rate, power, distance index, individualism, uncertainty avoidance and corruption, countries do have a single explanatory factor. However, in any case all statistical findings seem to be significant. Consequently, table 7 illustrates the distribution of factor scores for selected EU countries. This simply shows that the first groups of countries are far more influenced by cultural factors with respect to the second half.

Our second model attempts to explain the role of the economic factors

TABLE 7 Factor scores for birth and Hofstede's cultural values with masculinity removed

Country	Factor scores	Country	Factor scores
Romania	2.06816	Hungary	–0.15480
Bulgaria	1.28998	Italy	–0.16357
Portugal	0.92318	Luxembourg	–0.52304
Slovakia	0.84320	Finland	–0.98542
Czech Republic	0.34033	Netherlands	–1.15468
Spain	0.25490	United Kingdom	–1.16669
EU15 Average	–0.00482	Sweden	–1.52414
Estonia	–0.04259		

TABLE 8 Correlation matrix of birth rates and other economic indicators

Correlation	Birth	Wage	Productivity	GOR	Growth
Birth	1.000	–.564	–.511	–.068	.548
Wage	–.564	1.000	.969	.089	–.642
Productivity	–.511	.969	1.000	.130	–.550
GOR	–.068	.089	.130	1.000	–.226
Growth	.548	–.642	–.550	–.226	1.000

NOTES Abbreviated variables used are birth (birth rate), wage (wage), productivity level of the nation (productivity), gross operating ratio (GOR) (defined as operating expenses divided by operating revenues), gross domestic product growth rate (growth).

for business startups. Towards this goal, we have selected the birth rate of startups, average wage rate, average labor productivity, gross operating ratio and gross domestic product growth rate in explaining the statistical significance of these factors for business startups. Accordingly, table 8 shows that, with the exception of the gross operating ratio, the rest of the variables are statistically significant in explaining firm birth rates defined as business startups. As stated earlier, the correlation matrix values for given variables should be above 0.35 to be statistically acceptable.

The total variance explained in table 9 shows that for the data given for selected EU countries, the model explains 58.923 percent of the estimate, respectively. Thus, this forces us to eliminate the GOR variable which is a measure of firm level operating efficiency. One can clearly at this point look at the GOR variable as not being a value-sharing variable in explaining business startups with the economic indicators of birth, wages, productivity and growth. At a micro level this shows us that the operating

TABLE 9 Total variance explained for birth rates and other economic indicators

C	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	(1)	(2)	(3)	(1)	(2)	(3)
1	2.946	58.923	58.923	2.946	58.923	58.923
2	.996	19.911	78.834			
3	.616	12.316	91.150			
4	.421	8.417	99.566			
5	.022	.434	100.000			

NOTES Column headings are as follows: (1) total, (2) % of variance, (3) cumulative %; C – component. Extraction method: principal component analysis.

TABLE 10 KMO and Bartlett's test for birth rates and other economic indicators

Kaiser-Meyer-Olkin Measure of sampling adequacy = .605
Bartlett's test of sphericity: approx. chi-square = 63.640, df = 10, sig. = .000.

TABLE 11 Correlation matrix for birth rates and other economic indicators with GOR removed

Correlation	Birth	Wage	Productivity	Growth
Birth		.006	.013	.008
Wage	.006		.000	.002
Productivity	.013	.000		.007
Growth	.008	.002	.007	

NOTES Abbreviated variables used are birth (birth rate), wage (wage), productivity level of the nation (productivity), gross domestic product growth rate (growth).

efficiency which might affect the profitability of a firm is not statistically significant in explaining business startups. This could be due to the average values which will not influence sector startups.

The critical value for KMO (in acceptable value range) and Bartlett's test significance (.000) also confirms that the model structured and tested is significant, as can be seen in table 10, but due to the low value of relation among correlation/s the significance levels and factor analysis run with the GOR variable has to be discarded.

After the elimination of GOR we have the following calculations. The correlation matrix shows us that there is a good relationship between the variables with their correlation values on table 11. The total variance of the variables within factor analysis basically describes 72.825 percent of

TABLE 12 Total variance explained for birth rates and other economic indicators with GOR removed

C	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	(1)	(2)	(3)	(1)	(2)	(3)
1	2.913	72.825	72.825	2.913	72.825	72.825
2	.619	15.463	88.288			
3	.445	11.116	99.404			
4	.024	.596	100.000			

NOTES Column headings are as follows: (1) total, (2) % of variance, (3) cumulative %; C – component. Extraction method: principal component analysis.

TABLE 13 KMO and Bartlett's test for birth rates and other economic indicators with GOR removed

Kaiser-Meyer-Olkin measure of sampling adequacy = .653
Bartlett's test of sphericity: approx. chi-square = 62.675, df = 6, sig. = .000

the estimate in terms of the European countries considered within the research (table 12).

The critical value for KMO (in good value range) and Bartlett's test significance (.000) also confirms that the model structured and tested is significant, as can be seen from table 13.

Considering the above calculations, the factor scores for Sweden, Italy, Finland, Netherlands, Luxembourg, Cyprus, United Kingdom, EU15 average, Portugal and Slovenia have a changing sign with respect to Spain, Czech Republic, Hungary, Slovakia, Lithuania, Latvia, Bulgaria, Estonia and Romania, where all factor scores are statistically significant for both signs. As stated earlier factor scores reflecting a ranking, high positive value show a stronger relationship between cultural factors and business startups with respect to negative scores. Table 14 shows the distribution of factor scores for selected EU countries in terms of economic indicators. This divides the countries into two groups: those which are more heavily influenced by the economic indicators than those within the second group.

Conclusion

This paper aims to explore whether Hofstede's model on national cultural factors and selected economic indicators shows significant differences influencing startups among selected EU countries. The research findings

TABLE 14 Factor scores of birth after GOR with economic indicators

Country	Factor scores	Country	Factor scores
Sweden	1.43510	Portugal	0.16859
Italy	1.37428	Slovenia	0.11819
Finland	1.27406	Spain	–0.04685
Netherlands	0.95383	Czech	–0.47536
Luxembourg	0.89521	Hungary	–0.60180
Cyprus	0.79525	Slovakia	–0.75243
United Kingdom	0.63036	Lithuania	–1.01568
EU15 Average	0.53673		

indicate that Hofstede's model based on national cultural factors is statistically significant in explaining firm birth rates for the given EU countries. Thus, this assessment emphasizes that cultural factors influence risk taking and other cultural attributes in explaining the entrepreneurial behavior of the selected EU countries.

The estimated model simply shows that, although Hofstede's national cultural factors are statistically significant in explaining the business startups in the addressed countries, Romania, Bulgaria, Portugal, Slovakia, Czech Republic and Spain are far more positively influenced by national cultural factors.

But, for the given EU countries, it is also true that factors such as wage rate, productivity, economic growth are also relevant in explaining firm birth rates. But one should note that, Sweden, Italy, Finland, Netherlands, Luxembourg, Cyprus, United Kingdom, EU15 average, Portugal and Slovenia are far more sensitive to selected economic factors in terms of business startups. Thus, subsequently these indicators can be used as predictive factors for future calculations.

The paper finalizes the analysis comparing two sets of data groups, (cultural and economic) by ranking them in terms of their impact on business startups. The major outcome of this paper is that the relatively new EU countries are far more responsive to cultural factors in explaining business startups, while the prosperous founder EU countries are far more responsive to macroeconomic indicators.

All these findings are restricted to the variables included and to the selected years in terms of statistical testing. For future research one can test whether the statistical findings of the paper will be consistent for different years, in order to test the long run stability of the study.

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Extended Model of Managing Risk in New Product Development Projects

Dušan Gošnik

The aim of this research was to study new product development (NPD) projects-related risks and the literature in this field, as well as to develop a specific extended model of managing risks in NPD projects, which will consider the nature of NPD projects. Data were collected with the help of the developed questionnaire, and project managers with several years of experience in the field of NPD projects were included. The data and hypotheses were tested with the use of statistical methods. Results of the study show that for NPD projects, it seems to be crucial to plan risks in the early stages of the project, especially focused on the definition of the technical requirements for the product and the related clear project objectives. Poorly defined technical requirements for the product present an important risk related with the design uncertainty of the product. The more imprecise the technical requirements for the product before the project starts, the higher is the design uncertainty of the product after its development. Unclear project objectives have a significant effect on the time-delay of NPD projects. The more imprecisely the project objectives are defined before the project starts, the greater is the time-delay on the NPD project.

Key Words: project management risk, factors, product development, planning, model

JEL *Classification:* M11

Introduction

New product development (NPD) projects are often managed to achieve a faster time-to-market objective through a shorter iterative process (Ammar, Kayis, and Sataporn 2007). Many different approaches, such as concurrent engineering and team work are adopted to achieve that objective (Salamone 1995). This leads to achievement of the right design in the first attempt and helps attain clarity for the issues in the implementation phase of the project, resulting in overall lower development costs and quicker response to the market as compared to a traditional over-the-wall approach (Jo, Parasaei, and Sullivan 1993). The design pro-

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cess determines the product geometry, materials, functional specifications, machining processes, assembly sequences, tools, and equipment necessary to manufacture a product (Ammar, Kayis, and Sataporn 2007). Production plans and control tools, such as inventory controls, resource allocations and job scheduling, are other important outputs of the design process.

It can be detected that design influences to a great extent the quality and the cost of the product (Salmone 1995; Jo, Parasaei, and Sullivan 1993). Shortcomings in the product design process result in extra costs generated through project delays, penalties, an excess of materials used, labor, additional operations, resource relocations, additional planning, and re-scheduling. They are all related to different risks. Therefore, management of the risk has to be employed in all these stages of a project.

Several definitions of risk are available in the literature, as in the following examples. Risk management presents one of the main areas of the project management (Palčič et al. 2007). Risk management is a life-cycle process which covers the project from its definition to customer service. Risk focuses on the avoidance of loss from unexpected events (Williams 1995). Risk is usually referred to as an exposure to losses in a project (Webb 1994; Chapman and Ward 1997) or as a probability of losses in a project (Larson and Kusiak 1996; Remenyi and Heafield 1996; Taha 1997). While uncertainty is not measurable, it can be estimated through subjective assessment techniques (Raftery 1994). The risk management process refers to uncovering weaknesses in methods used in product development through a structured approach, so that timely treatment actions are initiated to avoid risk, transfer risk, reduce risk, or reduce risk impact (*Risk Management Standard* AS/NZS 4360 1999). It is an organized proactive process of identification, measurement and developing, selecting, and managing options for handling those risks (Kerzner 2004). The risk management process blends itself to product design and development, as changes and interactions in the design stage cost less than changes initiated in the implementation phase (Salamone 1995; Jo, Parasaei, and Sullivan 1993). Early discovery of risk events leading to downstream losses is much more preferable than treating losses when they cannot be prevented (Ammar, Kayis, and Sataporn 2007).

In the literature, different authors offer different approaches which help us to manage risk on the projects. An overview of some of the models is presented in table 1.

Tseng, Kyelleberg, and Lu (2003) have identified a four-stage risk ma-

TABLE 1 Overview – risk management as a several stage process by different authors

Author	Risk management process	Stages
Mulcahy (2003)	5-step risk management process	Risk management planning, risk identification, risk analysis, risk response planning, risk monitoring and control.
Raz and Michael (2001)	4-step risk management process	Identification, assessment, treatment, monitoring.
Chapman (1998; 2001)	9-step risk management process	Definition, strategic approach, identification, information structuring, ownership, uncertainty estimation, magnitude of risks, response, monitoring and controlling.
Klein and Cork (1998)	4-step risk management process	Identification, analysis, control, reporting.
Fairley (1994)	7-step risk management process	Identification, assessment, treatment, monitoring, contingency planning, managing the crisis, recovery from crisis.

nagement process; risk identification, analysis, response development and control (Tseng, Kyelleberg, and Lu 2003). Durofee uses a four-stage process to manage risk; risk identification, quantification, response development and control (Durofee et al. 1996). Klein and Cork have described risk management as a four-phase process: risk identification, analysis, control and reporting (Klein and Cork 1998). Boehm (Boehm 2001) suggested risk assessment (identification, analysis and prioritization) and risk control (risk management planning, risk solution and risk monitoring planning, tracking and corrective action). Chapman (Chapman 1998) proposed seven phases: definition, strategic approach, uncertainty estimation, magnitude of risks, response, monitoring and controlling. Fairley (Fairley 1994) proposed seven steps: identification, assessment, mitigation, monitoring, contingency planning, managing the crisis and recovery from the crisis.

Thus, risk management models are generally composed of four stages (Conroy and Soltan 1998; Raz and Michael 2001): risk identification, risk assessment, risk treatment and risk monitoring. Several risk types are included in every NPD project. These risks are also covered in project management literature (Chapman 2001; Kayis et al. 2003; Kusumo et al. 2003; Zhou et al. 2002). Also Stare (2004) defines the risk management process as a five-stage process: risk identification, evaluation and structuring; risk evaluation; risk planning; risk control and corrective actions.

Risks can also be of different categories, such as business-, project- or product-related risks.

Risk Identification

Risk identification is studying a situation to realize what could go wrong in the product design and development project at any given point of time during the project. Sources of risk and potential consequences need to be identified before they can be acted upon and mitigated. Experts in their own domain have intuitive methods of recognizing a risk situation. As such, the identification tools presented in this section are more general in nature and need a collaborative approach so that all aspects of the project are examined for risk situations (Ammar, Kayis, and Sataporn 2007).

The description of the risk types is as follows (Kayis et al. 2007):

1. Schedule risk – is a plan of procedures for a specific project with reference to a sequence of operations that encapsulates the milestones, task dependencies, lead times, production planning, etc.
2. Technical risk – is related to a professional trade involving mechanical, industrial or applied sciences. It includes design specific issues as well as manufacturing specific issues such as quality assurance, product/process design, technological know-how, innovation and technical support.
3. External risk – is related to any issues with regard to any parties outside of the organization (e. g. changes in customer requirements) despite the 'Design WITH' customers as the core approach adopted. Furthermore, legal, government, regulatory requirements, etc., are considered as well.
4. Organizational risk – is related to the management or administration personnel of the business. More specifically it is defined by the organizational structure, ownership, stakeholders, leadership and the organization's culture.
5. Communication risk – is the ability to effectively convey ideas and information within the company and externally to suppliers and customers. Communication encompasses language barriers, cultural differences and communication channels.
6. Location risk – is the physical distance/barrier between two respective parties, including their geographic location, proximity to each other, number of project sites and their size.

7. Resource risk – is the available capabilities relating to supplies or support, including material, labor, equipment and facility specific issues.
8. Financial risk – is related to monetary receipts and expenditure. More specifically, it includes currency exchange rates, inflation, budget and costs.

Several tolls can be used for risk identification, such as:

- checklists,
- an influence diagram,
- failure mode and effect analysis (FMEA),
- hazard and operability study (HAZOP),
- fault tree analysis,
- event tree analysis, and similar.

Risk Analysis

After risks are identified, their characteristics need to be assessed in order to determine whether the risk event is worth further analysis. Once it is decided that a risk event needs analysis then it needs to be determined whether the risk event information can be acquired through quantitative or qualitative means. Measurement metrics for risk also need to be determined so that these metrics can be used for computation of risk magnitude and risk analysis leading to risk mitigation plans (Amornsawadwatana 2002).

Risk is measured using two parameters: risk probability and risk consequence (*Risk Management Standard* AS/NZS 4360 1999; Chapman and Ward 1997; Conroy and Soltan 1998). Risk probability or likelihood indicates a chance of a risk event occurring, while risk consequence, severity or impact represents an outcome generated from the risk event. Risk magnitude is the product of risk probability and consequence. To measure risk magnitude, the probability and consequence of a risk event need to be determined, which constitutes the risk assessment function. In practice, the risk quantities are either quantitative or qualitative in nature. The quantitative approach to determination of risk parameters requires analysis of historical data through statistical analysis. In many instances, quantitative data are hard to achieve and are restricted to a very small domain of the problem where historical trends could be sustained. An example of quantitative data for determining risk consequence is a historical record of money spent on correcting non-compliance of tooling

usually used in the fabrication of the type of product currently being developed (Ammar, Kayis, and Sataporn 2007).

Risk Evaluation

Risk evaluation is the function of risk management, where risk events need to be prioritized so that risk mitigation plans are determined either based on past experience, lessons learnt, best practices, organizational knowledge, industry benchmarks or standard practices (Ahmed et al. 2003; Amornsawadwatana and Kayis 2003). In risk evaluation, different aspects of the project – strategic, budget or schedule may be considered in light of a risk event, in order to determine risk mitigation options and incorporate the most suitable option into a mitigation plan. Several evaluation techniques that can be applied for risk evaluation are:

- decision tree analysis,
- portfolio management,
- multiple criteria decision-making method.

The multiple criteria decision-making method considers different project attributes including the negative and the positive factors of a decision (Webb 1994; Remenyi and Haefield 1996). Project attributes are weighted according to project predominance of the predefined criteria. The product of the relative weight and the score for an attribute gives a weighted score for that attribute. The project is then evaluated through a difference from a standard project attribute. If the total weighted score turns out to be positive, then the project should be selected; otherwise, the project should be rejected. This technique can be applied to risk analysis if risk events are compared to standard events and weighted against them (Ammar, Kayis, and Sataporn 2007).

Risk Mitigation

Risk management attempts to study in detail all aspects of project management, so that all controllable events have an action plan or a risk mitigation plan. A reactive approach or a feed-back approach refers to risk mitigation actions initiated after risk events eventuate and can be seen as an initiation of contingency plans. On the other hand, a proactive approach or a feed-forward approach refers to actions initiated, based on the chance of a risk event occurring, such as insurance (Kartam and Kartam 2001; DeMaio, Verganti, and Corso 1994). A combination of these two approaches is applied to risk management in order to avoid

risk, reduce the likelihood of risk, reduce the impact of risk, transfer risk, or to retain risk (*Risk Management Standard* AS/NZS 4360, 1999). A risk query mechanism may then be formulated through techniques presented in the fourth section of this paper and imposed on the process model through interactive or collaborative interfaces to collect quantitative and qualitative data as described in the fifth section. Risk evaluation consists of decision support systems using techniques presented in the sixth section. Risks worth investigating further due to their high chance of occurring, or high potential impacts or leading to new opportunities are then pursued, leading to being treated. This whole process of risk management is collaborative and requires incremental contributions from all participants within the organization and supplements a project management approach, which is more proactive (Ammar, Kayis, and Sataporn 2007).

In this paper we have focused on the product-related design risks which affect design-related uncertainties of the product and prolonged time-to-market of the project/product.

The risk management process blends itself to product design and development, as changes and interactions in the design stage cost less than changes initiated in the implementation phase (Salamone 1995; Jo, Parasaei, and Sullivan 1993). Ammar, Kayis, and Sataporn (2007) also say that early discovery of risk events leading to downstream losses is much more preferable than treating losses when they cannot be prevented. Thus the most crucial effect on the project and product success on the market can cause changes in the latest stages of the NPD process as well as corrective actions if and when the project objectives in NPD are not achieved, or if customer-related expectations about the product which has been developed are not fulfilled. The research is primarily focused on the analysis of the design risks which affect design-related uncertainties of the product and causes of prolonged time-to-market of the project/product.

The new technologies, computing and communication have become indispensable in every aspect of the design and manufacturing process, leading to structural changes in social and economic dimensions also in NPD.

The full scale involvement of different stakeholders in NPD at operational levels has not yet been achieved due to a lack of complete understanding of NPD projects. According to Tseng, Kjellberg, and Lu (2003) this is mainly because not every aspect of engineering design and/or manufacturing capabilities has been linked with customers and suppliers

proactively throughout the process of collaborating across boundaries.

The significant impacts in NPD would be in three major areas (Kayis et al. 2007):

1. Speed of decisions in NPD (the exchange of information including requirements, drawings, models, test results, etc., dramatically reduced time to market, cost of uncertainty and inventory in product design and development).
2. Expansion of scope (web inter-connectivity integrated contributions to product design and development regardless of time, geographical distances, stakeholders, suppliers and customers anywhere around the world).
3. Degree of concurrency (people as well as machines can interact in parallel inside and outside of organizations, anywhere around the world).

Thus, to transform from designing products to designing the complete NPD process is rewarding but challenging, introducing several risks to NPD projects. This paper examines the new challenges in NPD projects in manufacturing industries which expose them to several risks.

The collaborative design process inherits several risks due to knowledge sharing, decision sharing, process sharing and resource sharing in NPD projects. In this section of the paper, product design, NPD environment and management of risks in such an environment will be discussed.

Many risks can occur at the product and project definition phase, which can affect the project results. Problems can occur in connection with on-time information sharing, collaborative decision-making, compatibility of processes and resource sharing, all of which are important for enhanced effectiveness and efficiency of the product design and development on one hand, while introducing new risks on the other. A methodology to analyze a collaborative design process and management of product design conflicts was developed by Lu and Cai (2000) and Lutters et al. (2001). Within the context of new NPD, supported by new information technologies (IT), the first stages in the NPD process must be changed from the 'Design OF' of the past, through the 'Design FOR' at present, to the 'Design WITH' in the future (Tseng, Kjellberg, and Lu 2003).

NPD projects require multiple parties to work collaboratively. Particularly with new information technologies (IT) in NPD, the numbers of

participants have increased. For example, supplier collaboration early in the design reduces a product's lifecycle cost and extends a company's ability beyond its traditional boundaries to intorduce improvements and to improve the total cost of doing business together (Lutters et al., 2001). Hence, to increase the chances of success for NPD organizations, Lu and Cai (2000) emphasized the importance of collaboration between project partners during engineering design. This collaboration will eventually lead to the competitiveness of organizations, due to better knowledge utilization and sharing with every project partner and incorporating the changing design style from the 'Design OF' of the past, via the 'Design FOR' at present, to 'Design WITH' in the future. In order to successfully achieve 'Design WITH' in NPD projects, knowledge management needs to be incorporated into the risk management practices of manufacturing organizations.

Two main hypotheses related to this research have been developed:

H1 *Undefined technical requirements for the product present an important risk related with the design uncertainty of the product. The more imprecise the technical requirements for the product before the project starts, the higher is the design uncertainty of the product after its development.*

H2 *Unclear project objectives have a significant effect on the time-delay of* NPD *projects. The more imprecisely the project objectives are defined before the project starts, the greater is the time-delay on the* NPD *project.*

The aim of the research was to determine impact factors related with risks of new projects and products, as well as to establish their profile by:

> *Identification of the impact factors which most frequently affect design uncertainties on the* NPD *projects; identification of the weight of each impact factor; identification of the impact factors which most frequently affect time-delays on the* NPD *projects of development of white goods; and identification of the weight of each impact factor.*

In line with the findings, the study at the end focuses on developing a specific extended model of managing risks in NPD projects, which will consider the detected risks of NPD projects.

Methodology

Because the research is oriented to the NPD projects, we decided to carry out the survey among project managers with several years of experience

in the field of NPD projects (table 1). The methods used were both quantitative and qualitative and a survey of questions was employed.

Prior to that, interviews were also performed with the project managers included in the research. We expected that only with such a combination of methods could we achieve the research objectives. The interviews were selected because we wanted to collect as much experience as possible from the different project managers in the field of different NPD projects, such as new products, design upgraded projects of NPD, etc. (see also table 1). Possible impact factors which affect the design risks and prolonged time-to-market of NPD projects were collected. The data collected were used to create a questionnaire which considered realistic, first-hand information from the actual environment of various projects (table 1).

The questionnaire consisted of both closed and open types of questions, and comprised two contextual contents (Questionnaire A and B, see also tables 3, 4, 6, 7, and 8). In the first stage, some impact factors which cause design-related uncertainties on the market were evaluated and in the second stage the frequency of impact factors was evaluated. Also for the second questionnaire (B1 and B2), the impact factors which affect time-to-market delay in the NPD projects were evaluated and the weight of the factors was evaluated. In the first stage the significance of the claims was marked using the extended Likert scale of measuring opinion (1, 2, 3, . . . 9, 10) (Toš 1976). In addition, participants marked the weight of the top five (from 1 to 5) factors with the biggest focus of Questionnaire A on design uncertainties, and Questionnaire B on time-to-market delay of NPD projects in the past.

The questionnaires were selected to collect individual data from the different project managers and projects (table 1) which were finished (1997-2007) and to study the following:

- Identification of the impact factors which most frequently affect design uncertainties on the NPD projects (Questionnaire A).
- Identification of the weight of each impact factor (Questionnaire A).
- Identification of the impact factors which most frequently affect the time-delay of the NPD projects of development of white goods (Questionnaire B).
- Identification of the weight of each impact factor (Questionnaire B).

TABLE 2 Background of the projects included in this research

Up to today, how many times did you participate in NPD projects?	Number of projects for total eight project managers
Totally new product for market	0 projects
New generation of existing products	25 projects
Existing product – technically improved	19 projects
Design upgrade of an existing product	36 projects
Total	80 projects

Results and Discussion

Based on the interviews with project managers, we have defined real potential reasons for design-related risks of new products, as well as the potential reasons for the time-to-market delay of NPD projects.

As table 1 shows, many of the included project managers have already participated in several NPD projects. The most common practice of project managers was in the field of managing design-upgraded new product projects (36 projects), followed by new generations of existing products (25 projects) and NPD projects which were oriented to the development of technically improved existing products (19 projects) (table 2).

In the study, eighty different NPD projects in the field of domestic appliances, managed by the eight project managers, were analyzed (table 2).

The primary objective of the research was to analyze the key impact factors which are related to the design uncertainties of the product after the project is finished. Questionnaire A was used (see results in table 3).

The most frequently detected impact factor in this research was a lack of time for testing technical solutions (average mark 9.375 on the Likert 1–10 scale) related to product design. The second most frequent cause that was detected was the fact that the technical requirements for the product had not been defined (average 9.125 on the Likert 1–10 scale). That presents a very strong issue which has its foundations in the market/customer definition of its needs at the beginning of the NPD project, which shows a lack of planning management in the NPD projects. The technical definition of the product is the final result as an output of the definition of customer needs. The third most frequent cause detected was the lack of knowledge in the field of managing NPD projects (average 8.50 on the Likert 1–10 scale), and the fourth was the lack of time for developing solutions in the NPD process (average 8.375 on the Likert

TABLE 3 Results of the analysis of the impact factors related to the design-related risk of the product

Which of the following impact factors, in your opinion, most frequently cause design-related uncertainties of the product? For each statement use the Likert 1–10 scale (1 – factor does not affect design uncertainty, 10 – factor extremely affects design uncertainty of the product).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Lack of time for testing solutions	9.375	8	10	0.92	14.26	5.64
2	Technical requirements for the product are not defined	9.125	6	10	1.36	13.88	5.04
3	Lack of knowledge in the field of management	8.50	4	10	2.00	12.93	4.33
4	Lack of time for development of solutions	8.375	7	10	1.06	12.74	3.58
5	Insufficient control over research and development (R&D) department	8.125	5	10	1.81	12.36	7.39
6	Lack of human resources	8.00	7	10	1.07	12.17	6.00
7	Lack of know-how for testing	7.50	5	10	1.85	11.41	9.16
8	Lack of know-how in R&D	6.75	5	9	1.83	10.27	9.57

NOTES Column headings are as follows: (1) rank, (2) impact factor on the design-related risks of the product, (3) average mark (1–10), (4) min. mark, (5) max. mark, (6) standard deviation, (7) % of all points, (8) t-value at $\alpha = 0.05$ (95% certainty).

1–10 scale). These results very clearly show the lack of planning in NPD projects, which results in the occurrence of many risks which could already have been managed in the early stages of the planning phase of the project.

The aim of the detailed analysis of the impact factors which are related to the design uncertainties of the product after the project is finished was also to identify the weight of the factors (see table 4). The results show that the strongest influence on the design uncertainty of the product was undefined technical requirements of the product (average 3.125 on the Likert 1–5 scale), followed by the lack of time to test solutions (average 2.375 on the Likert 1–5 scale).

By combining the data collected from Questionnaire A (table 3 and table 4), the summary is that undefined technical requirements for the product and the lack of time for testing present the most common risks in an NPD project, which cause design-related uncertainties of the product on the market. Thus, we can claim that Hypothesis H1 can be confirmed.

TABLE 4 Results of the analysis of the impact factors related to the design-related risk of the product

Which of the following impact factors, in your opinion, has the strongest effect on the design-related uncertainties of the product? For each statement use the Likert 1–10 scale (1 – factor has a very small effect on the design-related uncertainty; 10 – factor has a very big/significant effect on the design-related uncertainty of the product).

(1)	(2)	(3)	(4)
1	Technical requirements for the product are not defined	3.125	22.32
2	Lack of time for testing solutions	2.375	16.96
3	Lack of human resources	2.25	16.07
4	Lack of time for development of solutions	2.125	15.18
5	Insufficient control over research and development (R&D) department	1.625	11.61
6	Lack of knowledge in the field of management	1.25	8.93
7	Lack of know-how in R&D	0.75	5.36
8	Lack of know-how for testing	0.625	4.42

NOTES Column headings are as follows: (1) rank, (2) impact factor on the design-related risks of the product, (3) average mark (1–5), (4) % of all points.

TABLE 5 Combined results of tables 3 and 4 together (impact factors are multiplied with weight from table 4)

(1)	(2)	(3)	(4)	(5)
1	Technical requirements for the product are not defined	9.125	3.125	28.5
2	Lack of time for testing solutions	9.375	2.375	22.2
3	Lack of human resources	8.00	2.25	18.0
4	Lack of time for development of solutions	8.375	2.125	17.8
5	Insufficient control over research and development (R&D) department	8.125	1.625	13.2
6	Lack of knowledge in the field of management	8.50	1.25	10.6
7	Lack of know-how in R&D	6.75	0.75	5.0
8	Lack of know-how for testing	7.50	0.625	4.6

NOTES Column headings are as follows: (1) rank, (2) impact factor, (3) average value from table 4, (4) average value of the impact from table 3, (5) column 3 × column 4. $\alpha = 0.05$ (95% certainty), factor is significant at $t > t\,\min = 2.14$.

The second objective of the research was to identify the impact factors which most frequently affect the time-delay on the NPD projects of development and determine the weight of each impact factor. The research was performed using Questionnaire B (see results in tables 6 and 7). The

TABLE 6 Results of the analysis of the biggest impact factors related with the time-delay of the NPD project

Which of the following impact factors, in your opinion, most frequently affect the time-delay of the NPD project? For each statement use the Likert 1–10 scale (1 – factor has a very small effect on the design-related uncertainty, 10 – factor has a very big/significant effect on the design-related uncertainty of the product).

(1)	(2)	(3)	(4)
1	After a major change to the product no adaptation of the project plan follows	9.50	5.2
2	Unrealistic time plan	8.75	5.2
3	The role of the project manager is not clear (limited authority)	8.75	8.3
4	Waiting for a decision	8.50	7.1
5	Unrealistic objectives	8.38	6.8
6	Frequent changes during the project	8.25	7.0
7	Sources for the project are not available on time	8.13	7.3
8	Project objectives are not clear	8.00	4.23
9	Lack of human resources on the project	8.00	6.8
10	Responses of the suppliers	7.88	7.7
11	Not proper project management/leadership	7.88	16.2
12	Lack of control over the project	7.63	7.02
13	Relations with the environment are not clear (organizational)	7.38	9.4
14	Responses of other support functions	7.25	4.5
15	Inadequate human resources for support	7.25	6.23
16	Lack of competences of the project team	7.25	9.7
17	Decisions are not based on an expert basis	7.00	6.9
18	Frequent wrong decisions	6.88	2.6
19	We are not using the prescribed product development process	6.63	16.9
20	The phases of the project are not clear	6.38	6.6
21	Unclear role of the team members	6.25	16.0
22	NPD process is not adequate	6.25	14.0
23	Working environment is not adequate	6.00	11.16

NOTES Column headings are as follows: (1) rank, (2) impact factor on the design-related risks of the product, (3) average mark (1–10), (4) t-value at $\alpha = 0.05$ (95% certainty). $\alpha = 0.05$ (95% certainty), factor is significant at $t > t\,\min = 2.14$.

most frequent impact factor for time-to-market delay on NPD projects was that after a major change to the product during the NPD project, no adoption of the project plan follows (average 9.500 on the Likert 1–10

TABLE 7 Results of the analysis of the biggest impact factors related to the time-delay of the NPD project

Which of the following impact factors, in your opinion, has the strongest effect on the time-delay of NPD *projects? For each statement use the Likert 1–10 scale (1 – factor has a very small effect on the design-related uncertainty; 10 – factor has a very big/significant effect on the design-related uncertainty of the product).*

(1)	(2)	(3)	(4)
1	Project objectives are not clear	2.375	15.32
2	Unrealistic time plan	2.125	13.71
3	The role of the project manager is not clear (limited authority)	2	12.90
4	After a major change to the product no adaptation of the project plan follows	1.5	9.68
5	Unrealistic objectives	1.375	8.87
6	Waiting for a decision	0.875	5.65
7	Not proper project management/leadership	0.875	5.65
8	Lack of human resources on the project	0.625	4.03
9	Frequent changes during the project	0.625	4.03
10	Lack of control over the project	0.625	4.03
11	Responses of other support functions	0.5	3.23
12	Sources for the project are not available on time	0.5	3.23
13	NPD process is not adequate	0.375	2.42
14	Responses of the suppliers	0.375	2.42
15	Inadequate human resources for support	0.25	1.61
16	We are not using the prescribed product development process	0.25	1.61
17	Relations with the environment are not clear (organizational)	0.125	0.81
18	The phases of the project are not clear	0.125	0.81

NOTES Column headings are as follows: (1) rank, (2) impact factor on the design-related risks of the product, (3) average mark (1–5), (4) points (%).

scale). The second most frequent impact factor is an unrealistic time plan of the NPD project (average 8.750 on the Likert 1–10 scale), followed by limited authority of the project manger (average 8.750 on the Likert 1–10 scale). That can be related to the planning phase of the project, where also risk management must be considered. In the second stage of Questionnaire B (table 7) also the weights of the impact factors from table 6 were defined (table 7).

With Questionnaire B, we analyzed which of the impact factors have the biggest influence on the time-delay of the product after the project

TABLE 8 Combined results from tables 6 and 7

(1)	(2)	(3)	(4)	(5)
1	Project objectives are not clear	8.00	2.375	19.00
2	Unrealistic time plan	8.75	2.125	18.59
3	The role of the project manager is not clear (limited authority)	8.75	2	17.50
4	After a major change to the product no adaptation of the project plan follows	9.50	1.5	14.25
5	Unrealistic objectives	8.38	1.375	11.52
6	Waiting for a decision	8.50	0.875	7.44
7	Not proper project management/leadership	7.88	0.875	6.90
8	Frequent changes during the project	8.25	0.625	5.16
9	Lack of human resources on the project	8.00	0.625	5.00
10	Lack of control over the project	7.63	0.625	4.77
11	Sources for the project are not available on time	8.13	0.5	4.07
12	Responses of other support functions	7.25	0.5	3.63
13	Responses of the suppliers	7.88	0.375	2.96
14	We are not using the prescribed product development process	6.63	0.375	2.49
15	NPD process is not adequate	6.25	0.25	1.56
16	Relations with the environment are not clear (organizational)	7.38	0.25	1.85
17	The phases of the project are not clear	6.38	0.125	0.80
18	Inadequate human resources for support	7.25	0.125	0.91

NOTES Column headings are as follows: (1) rank, (2) impact factor on the design-related risks of the product, (3) average mark (1–10) from table 6, (4) average mark (1–5) from table 7, (5) column 3 × column 4.

is finished. For data collection, we used a closed questionnaire in which participants, according to their opinion, marked from 1–5 the top five impact factors. Results are shown in tables 7 and 8.

Unclear project objectives, an unrealistic time plan, and limited authority of the project manager were detected as the impact factors which have the biggest effect on the time delay of NPD projects, also by considering the weights of each factor (table 7). Hypothesis H2 can be confirmed.

As presented in this article, today's known risk management models are mostly general and define a risk management process that is divided into several stages, such as: risk management planning, risk identifica-

tion, risk analysis, risk response planning, and risk monitoring and control. General models of risk management do not offer us a precise solution for managing risks in NPD projects. The solution would be to study impact factors and to develop an extended model for project risk management in the planning phase, which would systematically study this problem for NPD projects. Many models exist which consider project risk management as a multiple stage process. They are mainly general, but for specific projects, such as NPD projects, we need to develop an extended model which will consider special requirements for certain NPD projects. We have therefore decided to examine the characteristics of NPD projects to develop a more specific model of managing risks in NPD projects.

Different authors observe project risk management as a multi-stage process (table 2). Regarding the results of the analysis and past practical experiences an extension of the basic risk management model (Picture 1) has been developed. Including some additional key areas which are based on this research and which are crucial for the success of NPD projects, an extension of the basic model has been developed:

Key sub-areas in NPD projects for the risk planning phase are:

- project objectives;
- organization of the project;
- project human resources;
- NPD process.

Regarding the research in this paper, all significant influence factors are included in the risk planning activities in NPD.

Extended Model of Project Risk Management in NPD Projects

Further on, some sub-criteria for each key area are presented as questions for project managers in the NPD project planning phase.

Key Area 1: Project Objectives

1. Are the project objectives clear and defined?
2. Are the project objectives defined by agreement or defined by authoritative command?
3. Are the project objectives SMART? (Specific, measurable, ambitious, realistic, time achievable)
4. Does the project team know all the objectives of the project before the start?

5. Do the project team members agree with the objectives?
6. Have the project objectives been defined with the cooperation of middle and operational management?
7. Has the project been planned regarding objectives and available resources?
8. Is the time plan of the project defined authoritatively by top management?
9. Is the project time plan dynamically adopted in accordance with resources?

Key Area 2: Organization of the Project

10. Do we have the project management of the project defined? (Members, roles, responsibilities, relations)
11. Does the project have a decision-making organ?
12. Is our project divided into some sub-phases?
13. Are the contents of the sub-phases of the project clear?
14. Did we plan a testing phase of the product inside the time-plan of our project?
15. Are the conditions of progressing from one to another phase of the project clearly defined?
16. Did we plan decision points in the project for all sub-phases of the project?
17. Are the roles of the project management organs and members clear?
18. Did we plan expert-based decision-making at the decision points?
19. Did we plan for decision-making time in the time plan?
20. Did we plan support of other functions in the company? Have all needs been detected and planned?
21. Do we have all support activities for regular team work in place? (Premises, computers, rooms, communication tools, etc.)

Key Area 3: Project Human Resources

22. Have human resources been planned as will be required by our needs on the project?
23. Do we have clear criteria for team members' selection?
24. Did we define a role of each team member on the project?
25. Did we plan for team members' full-and part-time work on the project?

26. Do we have a system of evaluation and motivation of individuals on the project?
27. Did we consider cooperation of all major activities and necessary outsourcing with cost estimation?

Key Area 4: NPD *Process*

28. Do we have a clear marketing and technical definition of the product before the start of the development phase?
29. Are we planning interdisciplinary support in the NPD process?
30. Do we have an information system for efficient data and information exchange and communication?
31. Did we plan prototype testing and confirmation of the solutions before regular tool orders?
32. Do we plan to find suppliers of the components based on the finished and tested solutions and final drawings?
33. Do we have a system for tracking the changes in the design of the product and components?
34. Do we have the support of contract management with suppliers?
35. Do we have clear traceability from marketing requirements to technical requirements for the components of the product?
36. Are we planning a validation of the product, testing and certification of the solution from real tools and materials before the market launch?
37. Do we have a clear product quality/production/service plan and clear criteria for the product launch?
38. Do we have a detailed technology, market and product development plan synchronized?

Conclusion

The business environment and challenges of NPD projects have always been interchangeable. Consequently, also some models which study project risk management are changing. None of the models of project risk management available in the literature is detailed and related to the NPD projects, especially white goods. Authors mainly study a general approach, but rarely specific products and projects. Different authors mention several step processes with no detailed insight into each step, and none of them relate risks of design uncertainty and factors which affect a late

project finishing time. General models are usually too general to be effective, but precise ones are usually very difficult to manage. A balanced attitude must be used to achieve the goals of NPD projects.

For special types of NPD projects, a detailed view into some factors which cause the risks must be considered. Undefined technical requirements for the product present an important risk related to the design uncertainty of the product. The more imprecise the technical requirements for the product before the project starts, the higher is the design uncertainty of the product after its development. Based on our results, an extended model of risk management in the planning phase in new product development projects has been developed and presented.

According to the new approaches in project management and changes and new challenges in today's environment, we may expect that also new models will be additionally developed .

All the mentioned authors study risk management on the projects from a general perspective. Managing an NPD project from a risk management perspective requires detailed information about the specific product in development; therefore, further investigation and research is oriented in NPD to white goods products. A general model of the NPD process which would suit any company and project does not exist. An adopted model of the NPD process for specific projects is needed. The basic element of this model includes risk management, which must also be developed regarding specific requirements for NPD projects in the white goods industry. For the successful achievement of NPD project objectives, we need to consider risks related to the special type of the projects. This requires that we know the key risk factors which cause risk in specific NPD projects. Project management practice and theory consists of several key areas which enable sophisticated managing of the projects. One of them is project risk management.

Research shows that undefined technical requirements for the product present an important risk related to the design uncertainty of the product. The more imprecise the technical requirements for the product before the project starts, the higher is the design uncertainty of the product after its development. Unclear project objectives have a significant effect on the time-delay of NPD projects. The more imprecisely the project objectives are defined before the project starts, the greater is the time-delay on the NPD project.

Both conclusions reflect a lack of planning in the early phases of NPD projects. These phases consist also of project risk management study. By studying risks in the early stages of NPD projects, we can systematically

reduce the effect of risk on the project. Consequently, the success of the project and product which has been developed can be increased.

Based on the research findings, an extended model of risk planning in NPD has been developed. It consists of many sub-areas where results of this research show us opportunities for improvements, such as risk planning for the NPD project objectives, project organization, project human resources and NPD process.

This research presents a basis for future studies. One might be on the influence of virtual teams on the efficiency and success of the projects which include also the study of risk management of virtual projects.

Limitations

The research is limited to NPD projects. Analysis is oriented to the specific environment of NPD projects in the domestic appliances industry. A limitation is presented by data collected with this type of questionnaire.

Implications

The developed model of risk management can be applied to any R&D project which deals with NPD. The model can be used and applied in practice because it is based on the latest literature findings, and because of the results of the research and the strong background of the author in this field in practice. The findings can be useful for consultants, project managers and project teams and managers in companies which perform NPD projects, as well as for further studies in this field.

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Certain Aspects of Providing Customer Satisfaction: Research Results from Serbia

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The paper presents research results obtained during the process of modeling a system (processes) for providing satisfaction of a company's customer needs. The cybernetic model assumes a process approach and appropriate marketing research at the beginning and corresponding evaluation at the end; it is also harmonised with the conditions in which Serbian companies (production and services) work and it is created to enable easier managing of these processes with the aim of achieving business excellence.

Key Words: QMS, TQM, relationship marketing, customer satisfaction, cybernetic model
JEL *Classification:* M11, M31

Introduction

In modern economies, characterized by global trends, achieving business excellence and creating world class products and services, as basic preconditions of company's growth and development, are not functions of one organizational unit within the company, but they represent the result of synchronized activities of all company's functions, according

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to precisely defined objectives of the company (Cockalo and Djordjevic 2006).

The objective of an organisation should be achieving and understanding the optimum level of customer's satisfaction (Sajfert, Đorđević and Bešić 2008). This field represents a base of three concepts: quality management, total quality managemnt and business excellence and relationship marketing.

Quality components, such as solving complaints, cooperation of company's representatives with customers, availability of products and services, cost and price policy and activities related to making contracts, have a great influence on customers' satisfaction (Courage and Baxter 2005; Conca, Llopis and Tari 2004; Saraph, Benson and Schroeder 1989; Hanna, Backhouse, and Burns 2004). On the other hand, customers' satisfaction also influences the company's characteristics, such as spreading positive information about the company and its services and products (Cockalo and Djordjevic 2008; Saad and Siha 2000; Evans and Burns 2007).

The concept of 'total quality' extends well beyond the marketing customer-perceived view of quality (Garvin 1988; Zeithaml, Parasuraman, and Berry 1990) including all key requirements that contribute to customer-perceived quality and customer satisfaction. Total quality broadens prior notions of quality in that it includes consideration of business processes for providing complete customer satisfaction on the full range of product and service needs. Essentially, the total quality concept is a general philosophy of management (Price and Chen 1993; Mohr-Jackson 1998).

Business excellence presents a business strategy which demands complete commitment and acceptance of this concept from the management (Terziovski and Samson 1999; Irani, Baskese and Love 2004; Dale 1997). The EFQM model of business excellence is based on eight principles. The belonging criteria are: leadership, policy and strategy, people – management of employees, partnership and resources, processes, customer results – customer satisfaction, people results – employees' satisfaction, society results – the influence on society and key performance results (EFQM ed. 2002). All of these are the basis for self-evaluation whose purpose is to evaluate the 'maturity phase' of the organization and to focus on the problems of further business improvement (Rusjan 2005; Teo and Dale 2007; Dale and Ritchie 2000; Motwani 2001; Tari 2005).

The term 'relationship marketing' was first introduced by Berry in a services marketing context (Berry 1983). Managing relationships is,

however, nothing new in business. Many entrepreneurs do business by building and managing relationships and always have, but without using the term relationship marketing. Relationship marketing is a process by which a company builds a long lasting relationship with possible and also the existing customers in such a way that both sides (sellers and buyers) are focused on commonly defined objectives (Evans and Laskin 1994; Grönroos 1994). Brookes and Little (1997) give a broader explanation, saying that this concept is based on data base management, interactive market communication and web marketing. The achievement of these objectives is reached through: (1) the understanding of customers' needs, (2) treating customers' as partners, (3) making such conditions that employees satisfy all customers' needs; this can demand initiative and efforts from employees that can exceed the norms of the company, and (4) providing the best possible quality in accordance with customers' individual needs (Evans and Laskin 1994).

Building partnership with suppliers, especially with service companies which make the selling-service network, educating and motivating employees, encouraging and stimulating personnel to express free initiative and creativity in solving problems through communication with customers and the concept of business excellence are, beside the relationship with customers, crucial inputs in the relationship marketing concept.

Positive results of effectively positioned relationship marketing are: (1) high percentage of satisfied customers, (2) greater loyalty of customers, (3) quality of products/services is better perceived by customers, and (4) increasing profit of a seller-company (Evans and Laskin 1994; Grönroos 1994).

The Methodological Setting of the Research

The objective of the research (see Cockalo 2008) was to create and present a theoretic model of a system for providing satisfaction of a company's (firm's) customers' needs. This model assumes a process approach, appropriate marketing research at the beginning and corresponding evaluation at the end. The model is harmonised with the conditions in which Serbian companies (production and services) work and it is created to enable easier managing of these processes with the aim of achieving business excellence.

Pre-conditions of the research were:

General. It is possible to create a universal theoretic model for providing satisfaction of customers' requirements that will integrate the re-

quirements of marketing research, quality requirements precisely given by the ISO 9000:2000 series of standards as well as the needs of productive and non-productive organizations, especially when the requirements of the Republic of Serbia economy surroundings are in question.

Specific pre-condition 1. It is possible to carry out a systemic analysis and a synthesis of a model for providing satisfaction of customers' requirements that integrate: criteria of business excellence in modern business conditions, the requirements of research marketing and quality requirements precisely given by the ISO 9000:2000 series of standards, particularly by using the following:

- By analysis, criteria of business excellence in modern business conditions, marketing requirements for satisfying customers' needs, as well as specific requirements given by the ISO 9000:2000 series of standards, relevant for the model, can be postulated;
- By analyses a group of procedures for monitoring, measuring and analysis, of company- customers' satisfaction can be obtained;
- Basic functions, and sub-processes can be analyzed;
- On the base of previous analyses and by synthesis a starting model structure can be approached;

Specific pre-condition 2. The existence of the model is justifiable, but there are requirements, elements and activities that were not considered during preparation of the proposed model although they are specific and important for companies' work (productive and non-productive) in the Republic of Serbia. They are:

- New elements/activities should be integrated in the model.
- Proposed elements/activities that should be integrated in the model will depend on specific needs of a company and the experts' opinion, from the sphere of quality.

Research target groups were:

- companies (productive and/or services), which are, in accordance with the objective, certified according to the system of QM standards (ISO 9000 series of standards) and which are registered and work in Serbia, or managers – working in the quality and/or marketing sector in these companies, as the primary group,
- experts, in the field of quality and/or marketing, as a control group.

Interviewing of available companies and experts was primarily carried out by e-mail survey. The reasons for this type of survey were fast response and costs, which were considerably lower compared to surveying by mail or some other type of interview, paying attention to the main characteristics and problems (Hanic 1997) (the biggest response, from 20 to 30%, but sometimes it does not exceed 5%, therefore the sample is not representative). A part of the questionnaire was personally distributed to some companies and experts. About 600 companies and 100 experts were included in the survey.

For the sake of the survey, a questionnaire was created (taking care of the methodology of the research). The communicative principle was: one questionnarie – one company/expert; 84 companies and 37 experts accepted to participate in the survey. The sample is representative because it includes more than 5% of companies in the Republic of Serbia which have the certificate ISO (JUS ISO) 9001:2000. Reference data on the certificate number were taken from the the ISO Survey (2006), the last available one during the research realization. Here, 1551 certified companies are mentioned.

According to Courage and Baxter (2005) the response in researches of this type is 20-60%, while in other works (Conca, Llopis and Tari 2004; Saraph, Benson and Schroeder 1989; Cockalo and Djordjevic 2008; Terziovski and Samson 1999; Irani, Baskese and Love 2004; Motwani 2001; Tari 2005; Segars, Grover and Kettinger 1994) it is not greater than 30%. In this research work, companies' response is 14%, and the experts' 37%, which indicates uninterest and/or dismotivation of the employees for cooperation.

The part of the problem which influenced a smaller response (especially) of companies in this research includes 'technology factors,' taking into account IT (il)literacy of the employees (Preradovic 2008), as well as the implementation of antispam programs on servers in companies. However, these claims are not confirmed.

The survey was mainly realized in November and December 2007 and in January 2008.

The structure of the surveyed companies was:

- According to ownership structure the companies were mainly private 61 (72.6%), then public 10 (11.9%), socially owned 8 (9.5%) and other 5 (6%);
- According to the field of work: agriculture, hunting, forestry and

water management 3 (3.4%), ore and stone mining 1 (1.1%), manufacturing industry 46 (52.3%), electrical, gas and water generation and supply 5 (5.7%), building construction 9 (10.2%) wholesale and retail trade; motor vehicles, motorcycles and house-ware/personal repair 8 (9.1%), traffic, warehousing and connection 3 (3.4%), administration and defence; compulsory social insurance 2 (2.3%), education 3 (3.4%), health and social care 3 (3.4%), other communal, social and individual services 5 (5.7%);

- According to the size: micro 6 (7.2%), small 8 (9.5%), medium 38 (45.2%), big 32 (38.1%);
- Position of the interviewed: director (general manager) 10 (11.9%), leading manager 49 (58.3%), consultant 3 (3.6%), the rest 22 (26.2%).

The structure of the interviewed experts:

- The majority of the interviewed were male 31 (83.8%) while females were only 6 (16.2%);
- The greatest number of the interviewed were over 50 years of age 13 (41.9%), 11 (35.5%) were between 30 and 40, and the smallest number comprised those between 40 and 50 years of age 7 (22.6%). Six experts did not answer this question;
- Level of education: the majority were PhD 15 (40.6%), experts with Master's degree and Bachelors were 10 (27%) and 2 (5.4%) of the experts had college diplomas;
- Occupation answered by 22 (59.5%) of the interviewed: the majority were university professors/college professors – 11, five experts were employed as consultants, there were 2 assistants and 2 technologists, 1 director (manager), 1 engineer and 1 programmer;
- Position of the interviewed in their organizations answered by 36 (97.3%): directors (managers) 5 (13.2%), leading managers 10 (26.3%), consultants 1 (2.6%), owners 2 (5.3%), others 20 (52.6%).

Methods of statistical analysis and presentation. During the checking phase of statistically relevant differences in the answers of different-size-companies (types of companies: 1 – micro and small, 2 – medium, and 3 – big), the data types which appeared in the survey led to the application of two different methods of statistical analyses:

1. Kruskal Wallis – one-way analyses of the variants among the ranks for data types of lower level (nominal), as well as with data without

beginner's presumption on the existence of a certain distribution (most frequently normal);

2. One way ANOVA – one-way analyses of the variant, but in this case for more superior data of interval level, such as significance grades;

ANOVA was also used in comparison of companies (total) and experts' data.

It was taken that the evaluation limit of reliability results, i. e., probability which enabled claiming that the data were error consequences or random variations, was $p = 0.05$. This means that for $p \leq 0.05$ there exists a statistically significant difference in results.

It was determined that there was no significant statistic exception in the answers of companies' (total) and experts, therefore there is no discussion on this matter.

Where appropriate, in processing and analysing the research results, Pareto analyses were used in order to sort the answers according to degree of importance both for the companies and experts. The research results presented in this paper, include the answers that belong to the categories 'very important' and 'important.' The category 'other' was neglected.

The Model

This part of the paper presents a model for providing satisfaction of customers' requirements, which is derived from theoretic research, but whose justifiability has been proved by research into attitudes of companies and experts in Republic of Serbia.

Structure presentation and the ties within the model are supported by additional explanations and statistic indicators which justify the model and its elements (modules). The model itself, as well as its function, is supported by additional explanations and statistic indicators which justify the model and its elements (modules).

THE BASIC FUNCTION OF THE MODEL

The basic function of the model is providing satisfaction of customers' requirements. By implementing this model harmonization is provided of the basic function with the principles and criteria of business excellence, as well as with marketing requirements in relation to customers' requirements and their satisfaction and also specific requirements of the ISO 9000:2000 series of standards. However, all requirements and interests of suppliers and other stakeholders have to be respected.

MODEL STRUCTURE

The explanations of sub-process (module) elements which represent the extension of the basis given by ISO 9001:2000 are mentioned below. The structure of the standard is used for better description and explanation of the model which, in fact, relies upon it.

Management responsibility

Apart from responsibilities defined by the standard, the management should:

1. Take care about the principles and the criteria of business excellence while defining policy, objectives and tasks, as well as processes.
   The principles are:
   - results orientation,
   - customer focus,
   - leadership,
   - management by processes and facts,
   - people development and involvement,
   - continuous learning, innovation and improvement,
   - partnership development,
   - corporate social responsibility.

   The criteria are:
   - leadership,
   - policy and strategy,
   - people,
   - partnership and resources,
   - processes,
   - customer results,
   - people results,
   - society results,
   - key performance results.
2. During the process of management review they should take care about the criteria of business excellence incorporated in business policy.
3. Provide taking care about input elements of relationship marketing concept while defining policy, objectives and tasks, as well as the planning and realization of processes:

- understanding customers' expectations,
- building service partnerships,
- empowering employees,
- total quality management,

that also includes evaluation of customer satisfaction.

4. Provide monitoring, evaluation and analysis of output elements in relationship marketing concept:
   - quality product,
   - customer satisfaction (effects: complaints, recommendations, re-buying),
   - customer loyalty,
   - increased profitability (also one of the key indicators of business results in the business excellence model).
5. Take care about output elements of the relationship marketing concept during the management review phase.

When asked to evaluate the importance (in the research (survey) the Likert 5-point scale was used) that should be given to the principles of business excellence while defining policy, objectives and tasks in the organization, 66 (85.7%) out of 77 (91.7%) of the interviewed in companies, or 33 (91.7%) out of 36 (97.3%) experts gave the answers which are shown, comparably, in table 1. All the principles were evaluated as significant or particularly significant (the lowest grade was given to corporative social responsibility by the experts 3,39).

Having been asked to evaluate the significance given, or which should be given to criteria of business excellence when defining policy, objectives and tasks in the organization, the interviewed 63 (85.1%) out of 74 (88.1%) in companies, and experts 33 (91,7% out of 36 (97.3%) evaluated the criteria and their application as significant (table 2).

Table 3, including the companies' and experts' grades, shows how important it is to take care about the criteria of business excellence by the leading management in management review. Affirmative answers were given by 65 (83.3%) out of 78 (92.9%) companies, and 33 (91.7%) out of 36 (97.3%) experts. Here, a statistically significant difference was noticed in the answers of the different-type companies ($p = 0.043 < 0.05$) and the grades are shown separately. A high average grade of significance given to the criteria of business excellence was noticed, in other words, they were evaluated as significant and particularly significant – the lowest grade was 3.50.

TABLE 1 Comparative survey of average significance grades that should be given to the principles of business excellence when defining policy, objectives and tasks in the organization

Principles of business excellence	(1)	(2)
Results orientation	4.17	4.39
Customer focus	4.42	4.61
Leadership	3.82	4.18
Management by processes and facts	3.80	4.06
People development and involvement	3.76	3.88
Continuous learning, innovation and improvement	3.68	3.79
Partnership development	3.94	3.94
Corporate social responsibility	3.58	3.39

NOTES Column headings are as follows: (1) average grade of the interviewed in companies, (2) average grade of the experts. ANOVA significance test – group: companies, $F = 2.066$, Sig.= 0.152.

TABLE 2 Comparative survey of average significance grades which should be given to the criteria of business excellence when defining policy, objectives and tasks in the organization

Criteria of business excellence	(1)	(2)
Leadership	3.73	4.00
Policy and strategy	3.87	4.24
People	3.68	4.21
Partnership and resources	3.65	3.97
Processes	3.90	4.15
Customer results	4.47	4.48
People results	3.58	4.15
Society results	3.52	3.70
Key performance results	4.23	4.27

NOTES Column headings are as follows: (1) average grade of the interviewed in companies, (2) average grade of the experts. ANOVA significance test – group: companies, $F = 3.350$; Sig.= 0.052.

It is interesting that particular significance is given to the principles and criteria which are directly oriented towards customers (the lowest average grade is 4.23); this shows the readiness of the organizations to devote themselves to their customers, as well as the importance which the experts give to this question.

Both companies and experts consider significant or satisfying (in the research (survey) the Likert 5-point scale was used) input elements of

TABLE 3 Comparative survey of the average significance given to the grade, and which should be paid to the criteria of business excellence at management review by the leading management

Criteria of business excellence	(1a)	(1b)	(1c)	(2)
Leadership	3.67	3.54	3.73	4.00
Policy and strategy	4.08	4.04	3.88	4.24
People	4.33	3.69	3.50	4.21
Partnership and resources	4.17	3.69	3.62	3.97
Processes	4.17	3.73	4.04	4.15
Customer results	4.67	4.42	4.23	4.48
People results	3.92	3.81	3.50	4.15
Society results	3.92	3.46	3.62	3.70
Key performance results	4.67	4.35	4.12	4.27

NOTES Column headings are as follows: (1a–1c) average grade of the interviewed in companies, (2) average grade of the experts. ANOVA significance test – group: companies, $F = 3.584$. Sig.= 0,043.

TABLE 4 Comparative survey of the average significance grade of input elements in the relationship marketing concept

Input elements of relationship marketing concept	(1)	(2)
Understanding customers' expectations	4.31	3.88
Building service partnerships	3.92	3.42
Empowering employees	3.66	3.71
Total quality management	3.76	3.26

NOTES Column headings are as follows: (1) average grade of the interviewed in companies, (2) average grade of the experts. ANOVA significance test – group: companies, $F = 2.892$; Sig.= 0.107.

the relationship marketing concept, especially in the sphere of planning (table 4).

A comparative survey of the average grades which the interviewed used to evaluate the significance of output elements of relationship marketing, especially in the sphere of planning is given in table 5. It should be emphasized that all the elements were evaluated as significant both by companies, 81 (96.4% answered the question, and by experts 35 (94.6%) of the interviewed.

Resource management

Resource management includes:

1. Human resources: HRM should include requirements which de-

TABLE 5 Comparative survey of average the significance grade of output elements in the relationship marketing concept

Output elements in the relationship marketing concept	(1)	(2)
Quality product	4.64	4.06
Customer satisfaction (complaints, recommendations, re-buying)	4.44	4.26
Customer loyalty	4.04	4.09
Increased profitability	4.19	3.91

NOTES Column headings are as follows: (1) average grade of the interviewed in companies, (2) average grade of the experts. ANOVA significance test – group: companies, $F = 1.431$, Sig.= 0.289.

mand taking care about the requirements of important elements of the relationship marketing concept and a business excellence model during the process of selecting, involving, training and motivating employees, especially those in direct contact with customers.

2. Infrastructure.
3. Work environment.

Training and motivation of employees, as input elements of relationship marketing, take for a starting base an appropriate selection of staff, especially those who need to be in direct contact with customers. The offered criteria are presented in figure 1, according to the degree of significance. Totally 82 (97.6%) of the interviewed in companies and 36 (97.3%) experts answered the question. The most significant criteria are: communicative abilities and experience and the least significant is appearance.

Appropriate training, encouraging and rewarding of employees, together with free initiative and imagination, from the standpoint of relationship marketing means that the employees, properly guided, can fulfil expectations and answer the requirements of customers better than any procedure and, in that way, reduce frustration and dissatisfaction of customers. In order to apply such an approach it is important to fulfill four conditions. Figure 2 shows that 79 (94.1%) companies and 35 (94.6%) experts gave their statements on this.

Product realization

Customer-related processes. Effective relationship with customers demands from organizations to:

1. Perform acceptable evaluation of customer satisfaction, when pos-

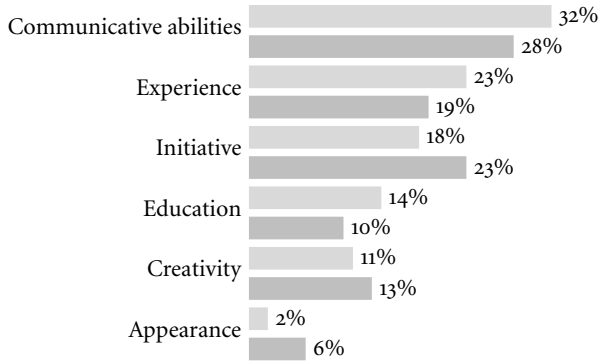

FIGURE 1 Key criteria for selecting staff that should be in direct contact with customers (light gray – firms, dark gray – experts)

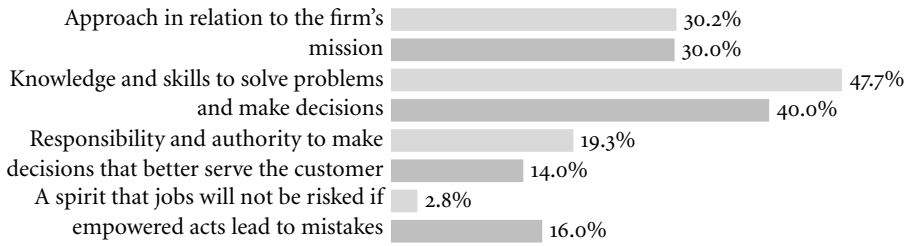

FIGURE 2 Conditions for active involvement of employees in the relation marketing concept (light gray – firms, dark gray – experts)

sible, and to refer to the results of the sub-process, related to data analysis and improvement.

2. Establish requirements that are not specified or expected, but which a customer can evaluate positively after use (if possible). Identification of customers' requirements and expectations is a separate sub-process which can be part of another process, and because of that its definition and providing evidence (document) can be performed in the following ways:
   - included in the procedure for identification of customer requirements and expectations,
   - given in more detail in the Reference book of quality,
   - forming part of another procedure, for example: making contracts, selling, communication with customers etc.
   - methodology, presented as a separate document, that is being referred to in the evidence.

The appropriate methods and techniques for establishing customer requirements and expectations are (Hanic 1997):

a) observation;
b) interviewing customers:
    - personal interview,
    - postal interview,
    - e-mail interview,
    - anonymous interview on a larger sample with the presence of interviewers,
    - interview by telephone.

3. Reconsidering of requirements should include (when it is possible for the organization and customers) some kind of needs and expectation research, or evaluation of customer satisfaction, or it should refer to the sub-process results of data analysis and improvement.
4. Establishing and implementing effective solutions in communication with customers in relation to feedback information from customers, including their complaints. If it is harmonized with the organization's commitment and possibilities or external requirements, the process of making complaints should be defined and documented.

Design and development. Validation of results within a phase or the project should include acceptable research of needs and expectations or it should refer to the results of processes related to customers, as well as evaluation of customer requirements (when possible) or sub-processes of data analysis and improvement.

Purchasing. The relationship towards suppliers should be in harmony with the principles and criteria of business excellence, as well as with relevant input elements of the relationship marketing concept. In general, this partnership with suppliers means necessary cooperation, harmonized with mutual interests.

Production and service provision. It is necessary to provide:

- during performing activities (products and services realization),
- after realization or products delivery, and
- through post-delivery and servicing activities,

an acceptable research of needs and expectations, both for the organization and customers. If this is not possible then it should be referred to

the results related to customers. When possible, evaluation of customer satisfaction should be performed and, when not possible, it should be referred to the sub-process results of data analysis and improvement.

Comparable additional explanations and accompanying statistical indicators for the parts of the paper related to researching needs, product realization and measuring analyses and improvement data are given at the end of the next paragraph.

Measurement, analysis and improvement

Monitoring and measurement includes methods, techniques and activities which an organization should introduce in order to monitor and measure:

1. Customer satisfaction – information on customers' opinion about the degree to which their requirements have been fulfilled. Methods, techniques and activities appropriate for getting this information are (Hanic 1997):
   a) observing;
   b) interviewing customers by:
      - personal interview,
      - postal interview,
      - e-mail interview,
      - anonymous interview on a larger sample when the interviewer is present,
      - telephone interview,
   c) solving complaints;
   d) monitoring of proposals for improvement (products/services) suggested by customers;
   e) solving complaints on products;
   f) monitoring of products 'behavior' during usage (defects).

Improvement. The analysis of customer satisfaction should have the following consequences:

- corrective and/or preventive actions;
- planning the quality for the future;
- (re)definition of quality policy, objectives and tasks;
- training personnel;

TABLE 6 Comparative survey of acceptable ways of making documentation of processes: identification of expectations and monitoring, measuring and analyses

Offered answers	(1)	(2)	(3)	(4)
Given in more detail in the reference book (handbook) of quality	27 (29.7%)	16 (27.1%)	22 (23.2%)	13 (22%)
The procedure	46 (50.5%)	27 (45.8%)	54 (56.8%)	33 (55.9%)
The part of another procedure	12 (13.2%)	5 (8.5%)	12 (12.6%)	4 (6.8%)
Methodology as a separate document that is being referred to in the evidence	4 (4.4%)	11 (18.6%)	7 (7.7%)	9 (15.3%)

NOTES Process of identification of expectations: (1) firms, (2) experts; process of monitoring, measuring and analyses: (3) firms, (4) experts. Process of identification of expectations; Kruskal Wallis test – grouping variable: firms (companies), Chi-Square = 2.258, Asymp. Sig.= 0.323. Process of monitoring, measuring and analyses; Kruskal Wallis test – grouping variable: firms (companies), Chi-Square = 1.714, Asymp. Sig. = 0,424.

- 'good practice' – collective experience (it is equally related to all modules of the model).

The procedure of evaluating customer satisfaction is a separate process, but it can be part of another process too, so its definition and making evidence can be performed in the following ways by:

- introducing the procedure for monitoring, measurement and analysis of customer satisfaction,
- processing in more details in the Reference book (Handbook) of quality,
- forming part of another procedure, for example corrective or preventive actions, selling, solving complaints etc.,
- providing methodology, as a separate document that is being referred to in the document.

Having been asked to say if they had particularly defined the process for identification of the expectations and requirements of customers, the majority of the interviewed, 66 (79.5%) out of 83 (98.8%) from the companies gave positive answers. One part 14 (16.9%) of them connected this process to some process in the organization and only in 3 (3.6%) companies was this process not defined at all. A similar structure of answers given by the experts: 31 (83.8%) thought it was important to define this process, and 6 (16.2%) thought that this process could be joined to some

TABLE 7 Survey of phases in which research on needs and customers' satisfaction is/should be performed

Offered answers	(1)	(2)	(3)	(4)
Defining quality policy, objectives and tasks	5 (20.8%)	23 (18.7%)	18 (16.5%)	13 (11.7%)
Research on requirements and expectations	6 (25%)	17 (13.8%)	17 (15.6%)	30 (27%)
Defining resources for realisation of a product or service	1 (4.2%)	9 (7.3%)	15 (13.8%)	7 (6.3%)
During review of requirements related to the product	5 (20.8%)	18 (14.6%)	15 (13.8%)	12 (10.8%)
Through validation of results (within a phase or the project)	6 (25%)	14 (11.4%)	13 (11.9%)	11 (9.9%)
During performing activities (products and services realization)	—	20 (16.3%)	10 (9.2%)	10 (9%)
After realization or products delivery	—	17 (13.8%)	8 (7.3%)	6 (5.4%)
Through post-delivery and servicing activities	1 (4.2%)	5 (4.1%)	13 (11.9%)	18 (16.2%)

NOTES Research on needs and expectations: (1–3) firms, (4) experts. Kruskal Wallis test; grouping variable: firms (companies), Chi-Square = 14.645; Asymp. Sig. = 0.001.

other process, with a note that they insisted on the existence of this process.

The process of monitoring, measuring and analysis of customers' satisfaction is similar to the previous one: 69 (82.1%) of the interviewed in companies stated that this process already existed as specifically defined, 14 (16.7%) said that it was a part of some other process, and only 1 (1.2%) said that it didn't exist. The experts were, this time, specifically unique in thinking that this process had to be particularly defined, only 3 (8.1%) of the interviewed stated that it could be a part of some other process.

When the problem of making documentation of both processes is in question, we can see that the opinion of companies and experts was almost the same (table 6). For making documentation of the process – identification of expectations – we got answers from 81 (96.4%), and for making documentation of the process – monitoring, measuring and analysis – we got answers from 83 (98.8%) of the companies.

It is obvious that, in both processes, the experts gave advantage to methodology over integration – which is opposite to that of companies. This does not diminish the significance of the part (which is the biggest) in

TABLE 8 Survey of phases in which measuring of customers' satisfaction is/should be performed

Offered answers	(1)	(2)	(3)	(4)
Defining quality policy, objectives and tasks	2 (6.5%)	10 (10.8%)	11 (11.6%)	14 (11.9%)
Research on requirements and expectations	6 (19.4%)	9 (9.7%)	18 (18.9%)	20 (16.9%)
Defining resources for realisation of a product or service	—	8 (8.6%)	5 (5.3%)	7 (5.9%)
During review of requirements related to the product	5 (16.1%)	11 (11.8%)	10 (10.5%)	10 (8.5%)
Through validation of results (within a phase or the project)	9 (29%)	10 (10.8%)	6 (6.3%)	14 (11.9%)
During performing activities (products and services realization)	—	8 (8.6%)	14 (14.8%)	9 (7.6%)
After realization or product delivery	6 (19.4%)	27 (29%)	18 (18.9%)	21 (17.8%)
Through post-delivery and servicing activities	3 (9.7%)	10 (10.8%)	13 (13.7%)	23 (19.5%)

NOTES Measuring of satisfaction: (1–3) firms, (4) experts. Kruskal Wallis test; grouping variable: firms (companies), Chi-Square = 12.205, Asymp. Sig. = 0.002.

which there is an agreement in statements. The survey of the answers related to phases in which research of needs, expectations and measuring of customers' satisfaction is performed, or should be performed, is given in tables 7 and 8 respectively. A statistically significant difference in answers of different-type companies was noticed concerning the questions about the phases in which research on needs and expectations ($p = 0.001 < 0.05$) and measuring of satisfaction ($p = 0.002 < 0.05$) is performed, therefore the answers are given separately. The question concerning the process – identification of expectations – was answered by 83 (98.8%) of the interviewed, and the question concerning the process – monitoring, measuring and analysis – was answered by 80 (95.2%) of the companies.

Generally, it is the best to implement both the research of needs and expectations and measuring of satisfaction in all the mentioned phases, having in mind that the focus of the activities is moved from research on the needs and expectations towards measuring of satisfaction during the process, which goes from defining policy and objectives of quality to post-selling and service activities.

Methods and activities for research on attitudes are acceptable, in the opinion of companies and experts, and they should be applied in research on the needs and expectations and in measuring of satisfaction, as shown in the comparative survey (table 9).

Methods and activities that are of particular importance are those used in surveying customers, especially the personal interview and postal interview. The least attention is paid to monitoring of a product's life in usage.

The analysis of customers' satisfaction should influence the improvement of QMS and making business of a whole organization in general. This is a requirement of the standard, but also the practice of Serbian companies, as shown by is the research. The ways through which this is performed, or should be performed, were shown by 81 (96.4%) companies and 36 (97.3%) of the experts in their answers to the questions presented. It is encouraging that the 'system of award and punishment' has almost completely excluded in companies 5 (2.5%), while the experts have not considered this problem at all. Table 10 shows a comparative survey of companies and experts' opinions on this question.

With a certain difference, the companies and experts give advantage to corrective and/or preventive measures in planning quality in the future period, while they give the least attention to shared values. The purpose of the research (survey) was not so much to establish the reason for its application but to identify the ways – how 'the circle closes,' in other words, to establish the elements of feedback in the model, so we did not go into details.

Discussion

The basic function, as well as the elements and sub-processes of the cybernetic model, define the processes of needs and requirements identification and measuring customers' satisfaction in implementation of the model for providing satisfaction of customers' requirements and through realization of the sub-processes.

The structure of a theoretic model follows the bases of the ISO 9001: 2000 standard, as well as recommendations concerning managing quality, costs and the process of solving customers' complaints. The elements, including criteria of business excellence (the EFQM as a reference model) and marketing requirements (the base for defining this was the effective relationship marketing concept) which are also integrated in the model, broaden and fulfil the model thus performing its basic function.

TABLE 9 Comparative survey of methods and activities for research on needs and expectations and measuring of customers' satisfaction

Offered methods and activities	(1)	(2)	(3)	(4)	(5)	(6)
Observing	25 (9.7%)	12 (13.2%)	13	2	13	5
Interviewing customers	75 (29.1%)	32 (35.2%)				
Personal interview	33 (24.8%)	18 (30%)	15	11	17	11
Postal interview	33 (24.8%)	8 (13.3%)	13	6	16	3
E-mail interview	31 (23.3%)	12 (20%)	11	8	16	6
Anonymous interview on a larger sample when interviewer is present	10 (7.5%)	11 (18.3%)	4	9	7	6
Telephone interview	16 (12%)	4 (6.7%)	7	2	7	2
Solving complaints					45 (17.4%)	10 (11%)
Monitoring of proposals for improvement (products/services) suggested by customers					32 (12.4%)	11 (12.1%)
Solving complaints on products					47 (18.2%)	11 (12.1%)
Monitoring of products' 'behavior' during usage (defects)					25 (9.7%)	8 (8.8%)

NOTES (1) firms, (2) experts; research on needs: (3) firms, (4) experts; measuring of satisfaction: (5) firms, (6) experts.

TABLE 10 Comparative survey of the ways in which the results of analysis should influence the improvement of QMS

Offered answers	Firms	Experts
Corrective and/or preventive actions	64 (31.8%)	20 (21.3%)
(Re)definition of quality policy, objectives and tasks	35 (17.4%)	19 (20.2%)
Planning quality for the future	48 (23.9%)	24 (25.5%)
Training personnel	33 (16.4%)	20 (21.3%)
'Good practice' – collective experience	16 (8%)	11 (11.7%)

NOTES Kruskal Wallis test; grouping variable: firms (companies), Chi-Square = 3.253, Asymp. Sig. = 0.197.

The theoretic model served as a base for further research on companies (productivity and services), which work and have their seats on the territory of Republic of Serbia – first of all their leaders, owners or employees who are in charge for the implementation of QMS, as a primary group, and experts from this sphere, as a control group in the research.

Generally, this research did not show directly that the model should be fulfilled by the integration of new elements and/or activities, but it noted that it should be reduced.

There is not a statistically significant difference in the answers obtained from the companies and the experts concerning the relevant modules, elements, sub-processes and functions of the model, although the opinions are to a great deal different when some indirect questions are analysed. There are, according to some questions, statistically significant differences in opinion of the different types of companies (concerning the size: micro, small, medium and big), but this was expected, taking into account the size of the research.

The research in companies, and among the experts directly showed the justifiability of the model, which is confirmed by the model's structure.

The work on the model showed certain imperfections:

- relatively weak response of experts and companies which could jeopardize the model and its significance concerning representative quality,
- limitation in the geographic sense – only the Republic of Serbia was included in the survey,
- apart from the statistical check, there was an absence of mathematic modeling, as had been previously anticipated.

Conclusions

The bases of successful management aimed at building a relationship with customers mean:

- involvement of executives and their commitment to the objectives of such organization management,
- successful measurement which is, in short term, based on quality management of services and, in long term, at obtaining a high degree of customers' satisfaction,
- guidelines for individual initiative which provide realization coordinated with the general objective and strategy aimed at building a relationship with customers.

The company's objective should be achieving and understanding the optimum level of customer satisfaction. The important step in achieving customer satisfaction is to conduct research on customers' requirements in order to make good business decisions.

The model for providing customer satisfaction, presented in this work, is harmonized according to its basic function and primary structure, with the requirements of the ISO 9001:2000 series of standards, as well as with relevant proposals and criteria of business excellence, marketing requirements and specific characteristics and requirements of Republic of Serbia economy.

Further work on the model would go in, at least, two directions:

- towards spreading the research to the countries in the region,
- towards factor analysis and creation of a mathematical model in order to check the elements and ties within the model.

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Market Orientation and Degree of Novelty

Mateja Bodlaj

This study aims to examine the relationship between a responsive and a proactive market orientation and the degree of novelty. Data obtained via an Internet survey were analysed using structural equation modelling. An analysis of 325 Slovenian firms reveals that only a proactive market orientation is positively related to the degree of novelty. While there is no evidence of statistically significant differences in the examined relationships given the firm size and environmental characteristics, separate analyses in each group indicate that a proactive market orientation may be more important for small firms and firms operating amidst a higher level of technological turbulence. This study suggests that a distinction between a responsive and a proactive market orientation is important for a better understanding of the effect of a market orientation on the degree of novelty.

Key Words: responsive and proactive market orientation, incremental and radical innovation

JEL *Classification:* M30, M31

Introduction

Market orientation is one of the core concepts of marketing thought which stresses the importance of a firm's focus on customer needs (Kotler 2003) and it has been the subject of numerous empirical studies since the 1990s. Most of these empirical studies have examined the effects of a market orientation on business performance (Cano, Carrillat and Jaramillo 2004; Kirca, Jayachandran and Bearden 2005; Ellis 2006), whereas its effects on innovation have received substantially less research attention (Han, Kim and Siravastava 1998; Lukas and Ferrell 2000; Grinstein 2008).

Despite the acknowledged importance of innovation for business performance (e. g. Hult and Ketchen 2001; Deshpande and Farley 2004; Fagerberg 2005; Antončič et al. 2007), innovation has only attracted greater attention in market orientation research during the past decade. A meta-analysis of 114 empirical studies revealed that among the consequences of a market orientation, 60% of the effects relate to organisational performance (i. e. overall business performance, profit, sales, market share),

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whereas only 17% relate to innovation consequences (Kirca, Jayachandran and Bearden 2005). Our understanding of the relationship between a market orientation and innovation is limited (Lukas and Ferrell 2000; Grinstein 2008).

This paper addresses the effect of a market orientation on the degree of novelty. Past research indicates that the degree of novelty is positively correlated to new product performance (e. g. Gatignon and Xuereb 1997; Song and Montoya-Weiss 1998) and business performance (e. g. Vazquez, Santos and Alvarez 2001; Sandvik and Sandvik 2003; Sorescu and Spanjol 2008). Yet, some authors believe that a market orientation only facilitates incremental innovation (Baker and Sinkula 2007). Empirical findings on this topic are discordant and warrant further examination.

The recent market orientation literature stresses the importance of distinguishing between two complementary forms of market orientation, i. e. responsive and proactive. To date, only a few empirical studies have adopted both forms of market orientation (Narver, Slater and MacLachlan 2004; Atuahene-Gima, Slater and Olson 2005; Tsai, Chou and Kuo 2008; Milferner 2009; Voola and O'Cass 2010). None of these studies has explicitly examined the relationship between the two market orientations and the degree of novelty.

The purpose of this study is to fill this gap in the literature and to offer a new insight into the relationship between a market orientation and the degree of novelty by considering both market orientation forms. Specifically, the main objective of this research was to empirically examine the relationship between a responsive and a proactive market orientation and the degree of novelty among Slovenian firms. In contrast to previous empirical studies which have focused on product innovation, this study aims to embrace other types of innovations as well (i. e. process, marketing and organisational innovation). In addition, comparisons will be made in terms of firm size and technological and market turbulence in the business environment.

The paper first provides a literature review of present knowledge about the relationship between a market orientation and the degree of novelty along with the distinction between a responsive and a proactive market orientation. Next, the research methodology and empirical findings of an Internet survey of a sample of 325 Slovenian firms are provided. The paper concludes with a discussion of the empirical findings and practical implications of the study, including the limitations of our study and suggestions for future research.

Literature Review

A market orientation can be viewed as a form of innovative behaviour because it involves doing something new or different in response to market conditions (Jaworski and Kohli 1993). A market-oriented company constantly strives to create and deliver a superior value for its target markets (Narver, Slater and Tietje 1998; Kotler 2003). In other words, a firm should be innovative in order to be market-oriented. According to the literature, optimal new product development programmes require a balance between incremental and radical innovation (Baker and Sinkula 2007). In the existing literature, almost all definitions and measures of radical and incremental innovations are limited to new products and changes in technology (e. g. Gatignon and Xuereb 1997; Chandy and Tellis 1998, 2000; Sivadas and Dwyer 2000). Chandy and Tellis (1998) believe that radical innovations involve fundamental changes in technology for the firm and provide substantially greater customer benefits, relative to existing products, whereas incremental innovations are product improvements and line extensions which involve relatively minor changes in technology and provide relatively few customer benefits. Incremental innovation is the most common form of innovation (e. g. Davila, Epstein and Shelton 2006; Baker and Sinkula 2007). While some authors claim that the cumulative impact of incremental innovations is just as great as the impact of a radical innovation or even greater (Fagerberg 2005), empirical studies suggest that radical innovations are more directly and positively related to new product success (e. g. Gatignon and Xuereb 1997; Song and Montoya-Weiss 1998; Henard and Szymanski 2001; Baker and Sinkula 2007) and to business performance (Vazquez, Santos and Alvarez 2001; Sandvik and Sandvik 2003; Sorescu and Spanjol 2008). Therefore, in general radical innovations have greater value for firms than incremental innovations (Baker and Sinkula 2007).

The question is whether a market orientation facilitates radical innovations. Some believe that a strong market orientation causes firms to overemphasise customer-led incremental innovation (Baker and Sinkula 2007). For Hamel and Prahalad (1991), simply being customer-led is not enough for the development of truly innovative products and leads to the 'tyranny of the served market.' Firms that simply ask customers what they want end up as perpetual followers. In contrast, market leaders know what customers want before customers know it themselves. Similarly, Bower and Christensen (1995) claim that leading firms often

fail to hold their leading positions in their industries when technologies or markets change, because they stay close to their customers. Focusing on current customers can therefore significantly reduce the innovative capacity of the firm (Christensen and Bower 1996). For Slater and Narver (1995), market orientation without an entrepreneurial drive might focus the firm's efforts too narrowly and, at best, lead to adaptive learning, which is necessary for continuous improvements and incremental innovations, but insufficient for radical innovations (Slater and Narver 1999). Similarly, Baker and Sinkula (1999, 2002) suggest that a market orientation in the absence of a strong learning orientation leads to a higher degree of imitation of new products. Only a combination of a strong market orientation and learning orientation leads to generative learning and consequently to radical innovations. In contrast, Santos-Vijande et al. (2005) counter this argument and suggest that a market-oriented firm is capable of both types of organisational learning. For Berthon, Hulbert and Pitt (2004) highly market-oriented firms without a strong innovation orientation are only followers: these firms rely heavily on market research when developing new products and generally 'give customers what they want.' To summarise, a prevalent view in theoretical discussions is that a market orientation alone is insufficient for the development of radical innovations.

Empirical findings on the relationship between market orientation and degree of novelty are discordant. Some empirical findings support the criticism mentioned above, suggesting that a market orientation is negatively correlated to the degree a product is new to the customer (Atuahene-Gima 1996), negatively related to radical market-based innovation, i. e. innovations that are often based on simpler new technologies but which create benefits for new markets (Zhou, Yim and Tse 2005), negatively related to radical innovation (Gatignon and Xuereb 1997) or insignificantly related to the degree of novelty for the customers (Salavou 2005).

On the contrary, some empirical findings indicate that a market orientation is positively related to the degree of novelty (e. g. Vazquez, Santos and Alvarez 2001; Sandvik and Sandvik 2003) and positively related to radical technology-based innovation, i. e. innovation which is based on state-of-the-art technology and which creates new benefits for existing markets (Zhou, Yim and Tse 2005). Further, Lukas and Ferrell (2000) found that the market orientation components proposed by Narver and Slater (1990) differ in their impact on the degree of novelty: while cu-

stomer orientation is positively related to the introduction of new-to-the-world products, a competitor orientation is positively correlated to the number of me-too products. A more recent empirical study conducted by Baker and Sinkula (2007) suggests that a market orientation shifts a firm's innovation priority more toward radical innovation activities, while it has no influence on the firm's incremental innovation priority.

To summarise, the existing literature does not provide a clear answer as to the relationship between market orientation and degree of novelty. It should be noted that the abovementioned empirical studies on the relationship between market orientation and degree of novelty are based on the 'traditional' measures of market orientation, i. e. the scale developed by Ruekert (1992), the MKTOR scale (Narver and Slater 1990), the MARKOR scale (Kohli, Jaworski and Kumar 1993) or some modified form of them, thereby focusing on the responsive form.

Hypotheses Development

An increasing number of authors (e. g. Jaworski, Kohli and Sahay 2000; Kumar, Scheer and Kotler 2000; Narver, Slater and MacLachlan 2004, Atuahene-Gima, Slater and Olson 2005; Tsai, Chou and Kuo 2008; Grinstein 2008; Voola and O'Cass 2010) call for a distinction between two complementary forms, namely, responsive (market-driven, customer-led) and proactive (market driving). According to Narver, Slater and Maclachlan (2004), a *responsive* market orientation refers to discovering, understanding and satisfying expressed customer needs, whereas a *proactive* market orientation refers to discovering, understanding, and satisfying latent customer needs. Past measures of market orientation predominantly focused on the responsive market orientation (Narver, Slater and MacLachlan 2004). Similarly, Jaworski, Kohli and Sahay (2000) claim that a market orientation is often interpreted too narrowly as the adaptation of product offerings to the current customer preferences and/or market structure (i. e., *market-driven*) compared to proactively shaping customers and/or the market to enhance a firm's competitive position (i. e., *market-driving*). Both forms should be the foundation of a business's innovation efforts (Narver, Slater and MacLachlan 2004) and are needed for a long-run business performance (Sheth and Sisodia 1999). A responsive market orientation can be successful in relatively predictable and stable environments. Yet in dynamic environments this form of market orientation rarely leads to a competitive advantage because it does not provide sufficient incentive for important innovations (Sla-

ter and Narver 1998; Kumar, Scheer and Kotler 2000) and a foundation for customer loyalty (Narver, Slater and MacLachlan 2004). A responsive market-oriented firm focuses largely on its current knowledge and experience to satisfy expressed customer needs, thereby reflecting exploitative (Atuahene-Gima et al. 2005; Tsai et al. 2008) or adaptive learning (Slater and Narver 1998). In contrast, a proactive market-oriented firm explores new knowledge and markets significantly distant from existing experience (Tsai et al. 2008), thereby reflecting exploratory (Atuahene-Gima, Slater and Olson 2005; Tsai, Chou and Kuo 2008) or generative learning (Slater and Narver 1998). To summarise, a proactive market orientation with its focus on latent customer needs may be more associated with radical innovation in comparison to a responsive form which focuses on expressed customer needs. To date, no empirical study has explicitly addressed the relationship between both forms of market orientation, and degree of novelty. However, in their empirical study Narver, Slater and MacLachlan (2004) found that both forms of market orientation are positively related to an innovation orientation with a proactive market orientation being more strongly related. Based on the latter finding along with empirical findings which suggest that a (responsive) market orientation is not only limited to incremental innovation (e. g. Vazquez, Santos and Alvarez 2001; Sandvik and Sandvik 2003, Baker and Sinkula 2007), the main hypotheses in this study postulate that both forms of market orientation are related positively to the degree of novelty, with a proactive market orientation being more strongly related:

H1a *A responsive market orientation is positively related to the degree of novelty.*

H1b *A proactive market orientation is positively related to the degree of novelty.*

Methodology

The sample consisted of Slovenian firms in manufacturing and selected services (wholesale and retail trade, transport, storage and communications, and financial intermediation) with at least 10 employees. A list of 3,732 email addresses of general managers and marketing managers was used as a sampling frame compiled by a call centre at Slovenian's Chamber of Commerce and Industry from the records of the Agency of the Republic of Slovenia for Public Legal Records and Related Services. Each manager was sent an email explaining the general purpose of the study

and the link to the Internet survey. Two follow-up emails were sent to non-respondents. The survey was conducted in the period from January to March 2008. After accounting for undeliverable emails, usable questionnaires from 441 companies were received, constituting a 16 percent response rate which is comparable to some other studies (e. g. Baker and Sinkula 2007 – 15.1%).

A subsample of 325 companies (73.7% of all companies participating in the survey) which had introduced a product, process, marketing and organisational innovation during the 2005–2007 period was retained for this study. The study sample consisted of 54% manufacturing and 46% service organisations. 51% of the companies in the sample were classified as small (10–49 employees), 32% of them were medium (50–249 employees), while 17% were large (more than 250 employees). Of all respondents, 54% were general managers, 30% were marketing managers and the rest mainly held other leading positions in the company. An early versus late respondent analysis provided no evidence of non-response bias.

In order to measure the responsive and proactive market orientation, 20 items on a seven-point Likert scale (1-strongly disagree, 7-strongly agree) were developed based on the existing market orientation measures (Narver, Slater and MacLachlan 2004; Kohli, Jaworski and Kumar 1993; Narver and Slater 1990) along with findings from eight in-depth interviews with managers. Technological and market turbulence were measured based on the widely used scales developed by Jaworski and Kohli (1993) on a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). Technological turbulence refers to the considered rate of technological change, whereas market turbulence refers to changes in the composition of customers and their preferences (Jaworski and Kohli 1993).

Following the innovation literature and the Oslo Manual (2005) which provides guidelines for measuring innovation in the European Union, four types of innovation were included in the survey: product, process, marketing and organisational. The respondents were asked to assess the predominant level of each type of innovation introduced by the company during the 2005–2007 period ('Please indicate the predominant level of product/process/marketing method/organisational method innovation your company introduced during the 2005–2007 period') on a seven-point scale (1 – minor change, 7 – new-to-the-world; x – no introduction). A similar approach can be found in marketing academic research (e. g. Weerawardena 2003; Weerawardena, O'Cass and Julian 2006, Leskovar-Špacapan and Bastič 2007).

The questionnaire was pretested with nine academics and twelve managers. In addition, the face validity of the market orientation scale was tested with two academics and four managers.

Results

The analysis was conducted in two steps. First, a confirmatory factor analysis using the AMOS 18.0 software was conducted in order to assess the measurement model with four latent variables (i. e. Responsive market orientation, Proactive market orientation, Technological turbulence, Market turbulence). Second, the structural model was evaluated in order to assess the relationships between both market orientations and the degree of novelty.

Table 1 shows the measurement items retained for the analysis. All four latent variables exhibit indices superior to the reference values of the composite reliability index (ρ_c) and the variance extracted (ρ_v) (see table 1), indicating convergent validity. The literature recommends values of 0.6 or higher for composite reliability (ρ_c) and values of 0.5 or higher for the variance extracted (ρ_v) (Hair et al. 2005). For each pair of constructs, the chi-square difference between the constrained (i. e. the correlation between two constructs was set to 1) and unconstrained model was statistically significant ($\Delta\chi^2 > 3.84$), confirming the discriminant validity of our constructs. In addition, the usual fit indices are better than the commonly accepted thresholds (CFI = 0.983; the literature recommends values of 0.95 or higher; RMSEA = 0.036; the literature recommends values below 0.08; Hair et al. 2005).

Table 2 provides descriptive statistics for the variables under review. The mean scores of RESP and PRO are above the scale midpoint with a significantly higher mean score of RESP (mean = 5.36; SD = 1.00) in comparison to PRO (mean = 5.06; SD = 1.09). No significant differences were found in the mean score of market orientation components given the firm size (small vs. medium and large firms). In order to test the differences, given the environmental characteristics, the firms were split into two groups based on the median value of technological and market turbulence (4.0 and 4.5, respectively). The analysis revealed that the mean scores of RESP and PRO are significantly higher in a business environment characterised by higher technological and market turbulence ($p < 0.001$).

Taking all four types of innovation into account, the average degree of novelty is very close to the scale midpoint (mean = 3.98; SD = 1.17).

TABLE 1 Measurement items retained for the analysis

Items	SFL*
Responsive market orientation – RESP ($\rho_c = 0.84$; $\rho_v = 0.52$)	
We respond quickly to changed customer needs, wants and/or buying behaviour.	0.82
Business functions work in a co-ordinated way so as to satisfy the needs of our target markets.	0.77
We adapt the marketing mix (products, prices, distribution, communication) to the selected target markets.	0.71
We respond quickly to competitors' activities.	0.69
In the case of customer dissatisfaction or complaints we take corrective steps as fast as possible.	0.61
Proactive market orientation – PRO ($\rho_c = 0.85$; $\rho_v = 0.54$)	
We examine problems customers may have with existing products in the market in order to offer a new or better solution to satisfy a need.	0.81
We examine which needs and wants customers may have in the future.	0.75
We try to recognise needs and wants which existing and potential customers are unaware of or which they don't want to disclose.	0.77
We work closely with lead customers who recognise their needs months or years before the majority of potential customers recognise them.	0.68
We develop new products that will satisfy still unexpressed customer needs.	0.66
Technological turbulence ($\rho_c = 0.85$; $\rho_v = 0.66$)	
Technological changes provide big opportunities in our industry.	0.85
The technology in our industry is changing rapidly.	0.84
A large number of new product ideas have been made possible through technological breakthroughs in our industry.	0.75
Market turbulence ($\rho_c = 0.86$; $\rho_v = 0.61$)	
Customer needs and wants are changing fast.	0.89
Customers tend to look for new products all the time.	0.86
Customer buying behaviour is changing fast.	0.79
The structure of our customers is changing fast.	0.55

NOTES * SFL – standardised factor loadings. Model fit: $\chi^2 = 155.1$, df = 109, GFI = 0.947, NFI = 0.947, TLI = 0.979, CFI = 0.983, RMSEA = 0.036.

The mean score of the degree of novelty is significantly higher in larger companies (i. e. medium and large) ($p = 0.008$) and in a business environment with higher technological and market turbulence ($p < 0.001$). The mean scores of technological and market turbulence are around the

TABLE 2 Means and standard deviations (SD)

Variables	Mean	SD	95% CIM
RESP	5.36	1.00	5.25–5.47
PRO	5.06	1.09	4.94–5.18
Degree of novelty	3.98	1.17	3.86–4.11
Technological turbulence	4.12	1.45	3.96–4.28
Market turbulence	4.29	1.29	4.15–4.43

NOTES CIM – confidence interval for mean.

TABLE 3 Baseline model results

	Antecedent	Dependent variable	Std. path coeff.	t^*	Result
H1a	RESP	Degree of novelty	–0.22	–1.02	Not supported
H1b	PRO	Degree of novelty	0.57	2.66	Supported

NOTES Significant at $p < 0.05$ if $|t| > 1.96$.

scale midpoint (mean = 4.12; SD = 1.45 and mean = 4.29; SD = 1.29, respectively) with no significant differences given the firm size.

Hypotheses about the relationship between both market orientations and the degree of novelty (entered as a mean score of all four types of innovation) were tested via the SEM method. The analysis resulted in a good model fit with the data ($\chi^2 = 42.7$; df = 38; $p = 0.277$; GFI = 0.977; NFI = 0.975; CFI = 0.997; RMSEA = 0.019). Table 3 summarises the results of hypotheses testing for the baseline model (hypotheses H1a and H1b). The analysis reveals that PRO is positively related to the degree of novelty ($b = 0.57$, $p = 0.008$). Hence, hypothesis H1b is supported. On the other hand, the relationship between RESP and the degree of novelty is insignificant. Hence, no support was found for hypothesis H1a. The model explains 15% of the variance in the dependent variable.

Comparisons between groups of firms were examined using a two-group analysis following Byrne (2001) and Hair et al. (2005). The path coefficient was constrained to be equal between the two groups (i. e. small vs. medium and large firms). Then the χ^2 of this model was compared with an unconstrained model. The non-significant difference in χ^2 ($\Delta\chi^2 < 3.84$, $\Delta df = 1$) indicates no evidence of statistically significant differences in the relationship between RESP and PRO and the degree of novelty, given the firm size and the environmental turbulence.

However, despite statistically insignificant differences between the groups of firms, separate results of the analysis in each group offer an

TABLE 4 Effect of RESP and PRO on the degree of novelty

Groups of companies	Antecedent	Std. path coeff.	t^*	Result
Small	RESP	−0.58	−2.08	Significant effect
	PRO	0.90	3.22	Significant
Medium and large	RESP	0.40	1.05	Non-significant
	PRO	0.01	0.02	Non-significant
Low technological turbulence	RESP	−0.31	−0.99	Non-significant
	PRO	0.58	1.84	Non-significant
High technological turbulence	RESP	−0.35	−1.12	Non-significant
	PRO	0.68	2.17	Significant
Low market turbulence	RESP	−0.27	−0.74	Non-significant
	PRO	0.66	1.81	Non-significant
High market turbulence	RESP	−0.10	−0.40	Non-significant
	PRO	0.33	1.25	Non-significant

NOTES Significant at $p < 0.05$ if $|t| > 1.96$.

additional insight into the examined relationships (see table 4). In small firms (10–49 employees), RESP is negatively related to the degree of novelty ($b = -0.58$, $p = 0.038$), whereas PRO is positively related ($b = 0.90$; $p = 0.001$). Given the level of environmental turbulence, the only significant effect was found for PRO in a business environment with higher levels of technological turbulence ($b = 0.68$, $p = 0.03$).

Discussion

In general, the findings of this empirical study confirm that PRO (Proactive market orientation) is positively related to the degree of novelty, whereas no support was found for the effect of RESP (Responsive market orientation). Since PRO focuses on latent customer needs, a positive effect of PRO on the degree of novelty was expected. Our findings have important managerial implications. In order to enhance the degree of novelty, it is suggested that firms invest resources in raising their PRO. This is particularly important since our study reveals that in Slovenian firms PRO is, on average, significantly less developed than RESP. This clearly suggests that Slovenian companies allocate relatively more resources to responding quickly to changed customers needs and to competitors' activities, the co-ordination of all business functions, adapting the marketing mix to the selected target markets and taking corrective

steps in the case of customer dissatisfaction. On the other hand, Slovenian firms pay relatively less attention to activities related to an examination of customers' problems with existing offerings in order to find a new or better solution to satisfy a need; the examination of unexpressed and future customer needs; working closely with lead customers and developing new products that will satisfy still unexpressed customer needs. By increasing the level of these activities, Slovenian firms can become more proactively market-oriented.

The two-group analyses found no evidence of statistically significant differences in the effect of RESP and PRO on the degree of novelty between the groups of firms given their size and environmental turbulence. However, separate analyses in each group provide valuable additional findings. In small companies, both market orientations significantly, yet differently, impact the degree of novelty: while RESP has a negative impact, PRO has a positive impact. If small firms focus on expressed customer needs their innovation efforts will be limited to incremental innovations, while focusing on latent customer needs will lead to a higher degree of novelty. By contrast, in larger firms neither of the market orientations significantly impacts the degree of novelty. This suggests that in larger firms other antecedents of the degree of novelty are more important than market orientation. With regard to environmental turbulence, all that is significant and positive is the impact of PRO in firms amidst higher technological turbulence. A technologically more turbulent environment offers more opportunities for the development of new products which can satisfy unexpressed or future customer needs. At the same time, such an environment encourages firms to develop a significantly higher PRO. Therefore, a significant positive effect of PRO amidst higher technological turbulence was expected. On the other hand, neither of the market orientations has an effect on the degree of novelty given the market turbulence, although firms operating in the context of higher market turbulence on average develop a higher degree of novelty and a higher level of both market orientations. This finding of an insignificant effect is unexpected and warrants further examination. To summarise, while the two-group analyses failed to reveal statistically significant differences in the examined relationships across groups of firms, our study suggests that PRO might be more important for small firms and firms operating amidst a higher level of technological turbulence. Statistically significant differences across the groups of firms might be revealed in the case of larger subsamples.

This study makes an important contribution to the existing market orientation literature by distinguishing between a responsive and a proactive market orientation, by embracing not only product innovations but other types as well (i. e. process, marketing and organisational), and by examining the relationship between both market orientations and the degree of novelty across groups of firms given their size and environmental turbulence.

This study also has a number of limitations. First, measures involving a distinction between a responsive and a proactive market orientation are still developing. In future research, improvements and testing of the psychometric features of the two scales are highly recommended.

Second, following the Oslo Manual (2005) this study distinguishes between four types of innovation. Although this distinction is a step towards a more holistic view of innovation, it does not use an adequate set of criteria for the classification. For example, a distinction is made between innovation related to a production and a marketing business function, but not between innovations related to other business functions. Further, a clear distinction between the four types is difficult to establish since an innovation can encompass more than one type. In addition, questions on novelty are likely to be the easiest to answer as regards product and marketing innovations, yet more difficult for process and organisational innovations which may be more specific to an individual firm, and firms may lack information on whether certain innovations have been applied by other firms. In future research, it is recommended to use more items to measure the degree of novelty of each type of innovation.

Third, the findings are based on the subjective assessment of managers who might perceive their firm's activities related to a market orientation and innovation better than their customers. In subsequent research, therefore, it is recommended to also include the views of customers. Fourth, our model explains only 15% of the variance in the degree of novelty, suggesting that other antecedents of innovation should be included in the model (e. g. an innovative culture, a learning orientation, an entrepreneurial orientation etc.).

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Developing Measures of Intellectual Capital for the Venture Capital Industry in Taiwan

Chung-Chu Liu

The Taiwanese venture capital industry has played a critical role in the development of the Taiwan IT industry. The purpose of this study is to construct and prioritize the intellectual capital measures of venture capital in Taiwan and to formulate a strategy map based on these measures. A thorough interview was used to collect the data, while the content analysis method and the analytic hierarchy process were used to analyze the data. Intellectual capital can be categorized into three dimensions: Human Capital, Relational Capital and Structural Capital. The research also developed twelve indicators to assess business intellectual capital, as well as a strategy map for the venture capital industry. Measuring intellectual capital can help to formulate business strategies and allocate business resources.

Key Words: venture capital, content analysis method, analytical hierarchy process, strategy map, intellectual capital, human capital, relational capital, structure capital, sustainability

JEL *Classification:* M13, L15

Introduction

Globalization provides opportunities for international entrepreneurial expansion. Government, corporations and the venture capitalist industry help entrepreneurial ventures. (Sameer and Liu 2005). Venture capital's (VC) success is due to global economic growth and innovation (Gompers and Lerner 2001). Venture capitalists are value- added investors, typically geographically close to their investors and are among the most sophisticated financial intermediaries (Neus and Walz 2005).

Venture capital in Taiwan was introduced by the government in 1984 to improve the technology of products and attain global competitiveness. The government gave support through tax incentives and financial assistance, as well as the help of foreign technology and skills (Chotigeat, Pandey and Kim 1997). Successful high-tech companies apply management models used by venture capitalists to find and fund new ideas (Chen, Chen and Liu 2003). According to Knott and McCarthy (2007)

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most foundations have targeted investment and partnered with government, while Wonglimpiyarat (2007) suggests that the Thai government should play a vital role in the venture capital market. Studies show that 'knowledge-intensive' companies have a higher market value than their book value of equity. The value of a company is created by producing new and desirable products, by lowering input costs or realizing production efficiencies (Hansson 1997). Value, however, is not always related to financial performance, as market conditions and regulations may result in increased competition (Porter 1985; Adner and Zemsky 2006). The market value of a company consists of both financial capital and intellectual capital, which are the resources created from internal learning and the development of valuable relationships (Bontis 2002; Pablos 2002). One should consider that there has been little research done on intellectual capital in Taiwan, although it is necessary, and that the performance of the venture capital industry is difficult to measure. Also, a strategy map is constructed using principles of cognitive mapping and shows a series of linked ideas. It has been a useful tool in this study.

Literature Review

EMPIRICAL RESEARCH OF VENTURE CAPITAL

The concept of venture capital is that investors come together to create a venture capital fund. The management and investments of the fund are monitored and the fund invests in portfolio companies and provides investors with a return on their investments. Fund managers are subsequently compensated (Gulinello 2005). The venture capital industry has aided the surge in entrepreneurial activity where capital is provided by investors who contribute to a fund, and venture capitalists participate together to finance companies. Venture capitalists prefer to work with other venture capital companies, as co-investment means more capital. This results in the creation of venture capital company 'cliques' and important social networks (Mintz and Schwartz 1985). Tan, Zhang and Xia (2008) identify five factors (contracting costs, monitoring costs, lost time, resources for the venture capitalists and resources for entrepreneurs) associated with two mechanisms (control and incentive) as determinants for venture capitalists and entrepreneurship in China. In Silicon Valley venture capitalists are influential in shaping clients' organizations and act as management companies who invest in companies at different stages of development.

Harmon's Zero Gravity idea uses personal insight to discuss how to navigate through the venture capital process (Harmon 1999). Venture capitalists use management, recruiting, accounting and legal advice as well as financial resources and have access to a network of professionals in the high technology industry. This network provides support and legitimacy to the investee company and is an example of the Granovetter embeddedness concept (Granovetter 1995; 1985; 1974; Castilla 2003). Diochon, Menzies, and Gasse (2005) use a longitudinal study of Canadian entrepreneurs to explore the relationship between start-up activities and new venture emergence. Their results indicate the significance of the role start-up activities play in the sustainability of a company.

Wen and Huang (2005) investigate the key investment decision-making factors used by Taiwanese venture capitalists in the biotech industry. Their results showed the main concern to be the ability of the management team when evaluating an investment project. Yu and Roger (2006) develop the determinants of entrepreneurial development in China and provide a framework to benchmark with other nations. Cumming (2006) notes that the nature of value added active VC investing requires the use of pecuniary measures of investment costs, proxies for the non-pecuniary costs associated with the changes in portfolio size. There are four main factors which affect portfolio size: characteristics of the VC fund, characteristics of the entrepreneurial companies, characteristics of financing arrangements, and market conditions. Klonowski (2007) proposes a nine-stage model as follows: deal origination, initial screening, feedback from the investment committee, feedback from the supervisory board, pre-approval completions, and formal approvals and due diligence phase II, deal completion, monitoring and exit.

In summary, the domestic market is relatively small and has a range of natural resources. Over the last decade Taiwan's production has moved to mainland China and Southeast Asia, resulting in an effort to enhance the development of the high-tech industry locally. VC companies have facilitated this development and support companies with high growth potential (Lin and Chou 2005).

DEFINITION AND CONTENT OF INTELLECTUAL CAPITAL

The drivers behind sustainable competitive advantage are a focal point of debate in strategy literature. The competitive strategy school (Porter 1980; Ghemawat 1991) is concerned with industry structure and strategy, while the resource-based school is concerned with the value and

uniqueness of resources. The former focuses on companies' external environment, while the latter focuses on the internal environment of companies (Wernerfelt 1984; Barney 1991). Resources are the key focus of the resource-based view, which assesses an organization's resources according to important, rare, unique, and structured categories (Barney 1991). The two are often presented as contrasts. In an environment where intangible resources allow companies to add value, intellectual capital will be key in determining performance. There is a growing consensus that value should be created by and distributed to stakeholders as well as shareholders (Bowman and Ambrosini 2000; Porter 1985; Adner and Zemsky 2006; Hitt, Bierman, Shimizu and Kochhar 2001; Nahapiet and Ghoshal 1998; Donaldson, and Preston 1995; Meek, and Gray 1998). A stakeholder view demands the use of value added (gross or net) for measuring total wealth created (Riahi-Belkaoui 2003).

The concept of core competency was first suggested by Selznick (1957) who used distinctive competency to depict corporate advantage through various value activities (Yang et al. 2006). One of the most known strategic management concepts is certainly that of core competence. The concept was introduced in the early 1990s and is defined as collective learning in the organization with special regard as to how to coordinate diverse production skills and integrate multiple streams of technology (Prahalad and Hamel 1990). Yang, Wu, Shu and Yang (2006) developed the core competency identifying model with the use of value-activity and process oriented approaches. The notion of core competence, as extremely important to organizational renewal and as a significant force behind strategic change, interests both managers and practitioners. It is very difficult to indicate theoretically, to recognize empirically as a phenomenon, and to put into practice (Ljungquist 2007). Therefore, this study adopts the more systematic, measurable concept 'intellectual capital' to conduct empirical investigation.

Nahapiet and Ghoshal (1998) define intellectual capital as an organization's knowledge and knowing capability. Roos et al. (1998) propose that intellectual capital is about both measuring and managing intangibles, while Mouritsen, Larsen and Bukh (2001) suggest that intellectual capital indicators are an integral part of managing knowledge resources. An observation of eleven Swedish companies with long experience in measuring and managing intangibles demonstrates that managerial processes have gradually evolved to ensure the transformation of measurement results into necessary action. While knowledge based resources contribute

to sustained competitive advantage through intellectual capital, they do not register in a company's tangible financial accounts(Guthrie, Petty and Johanson 2001; Pablos 2003).

There are three sub-phenomena which constitute intellectual capital: human, relationship and organizational capital. Human capital is the knowledge stock of an organization as represented by employees (Bontis 2002; Bontis, Crossan and Hulland 2002). Relational capital is the relationships with internal and external stakeholders, and organizational capital is the knowledge which stays with a company at the end of the work day and includes databases and strategies (Roos et al. 1998; Bontis, Chong and Richardson 2000). Organizational capital can be further broken down into innovation capital and structure capital. While innovation capital refers to the explicit result of innovation, such as protected commercial rights and intellectual capital, structure capital is the combined value of value-creating and non-value-creating processes (Stewart 1994). Stovel and Bontis (2002) suggest that intellectual capital can be divided into three categories: human capital, structure capital and customer capital. Human capital includes the tacit knowledge of employees, while structural capital is the support mechanism by which employees may achieve optimum job performance. Relational capital is the interpersonal rapport which exists within an organization (Choo and Bontis 2002; Hudson 1993; Bontis 1998; Stovel and Bontis 2002).

The components of intellectual capital are indications of a company's future value (Stewart 1994). Roos et al. (1998) state that intellectual capital is new research development, and the theory comes from two streams of research: strategy and measurement. Strategy focuses on knowledge creation, acquisition, diffusion, capitalization, conversion, transfer and storage, while measurement focuses on measuring intellectual capital. The second stream has advanced towards building on international standards of measuring and reporting (Pablos 2003). The second stream, measuring and reporting on intellectual capital, is the focus of this research. This study uses a systematic approach to formulate and prioritize the measures of intellectual capital of venture capital industry from practitioners' perspectives.

STRATEGY MAP

A strategy map is constructed using the principles of cognitive mapping and represents an individual's thoughts regarding a problem. Strategy mapping is useful, but ironically, can be a difficult tool to implement and

there is no step-by-step process for delivering a strategy map initiative. The following is a useful framework for developing and understanding a strategy map:

1. Choose the overriding objective.
2. Select the appropriate value proposition.
3. Determine general financial strategies.
4. Determine customer-focused strategies.
5. Decide how internal processes will support the execution of strategies chosen.
6. Implement the skills and employee programs required (Scholey 2005)

Methods

For this research I gathered data from thirteen senior managers from ten venture capital companies. In-depth interview, content analysis, and analytical hierarchy processes were used to collect and analyze data.

Sample

This research uses the purposive sampling method, and those interviewed were qualified by three conditions:

1. Has ten years or more related work experience.
2. Must be in top management or hold a senior position.
3. Must have been to China or abroad a few times.

An open-ended questionnaire was delivered which asked about the determinants of competitive advantage of companies in the long and short term. The participants ranged in age from 40 to 62, with a mean of 49. Thirty-one percent of participants were female, while sixty-nine percent were male. All participants held master's degrees.

CONTENT ANALYSIS METHOD

Content analysis is a research method that facilitates the examination of written and oral communication. It is a valid way to measure underlying decision processes (Berelson 1952; Insch, Moore and Murphy 1997; Winogard 1983). Holsti (1969) defines it as any technique for making inference by objectively and systematically identifying specified characteristics of messages. April, Bosma and Deglon (2003) use content analysis with a

TABLE 1 Research samples of this study

Code	Job Title	Sex	Age	Tenure	Education	Principal/Agent
A	Chief Secretary	Female	45	16	Master degree	Third-party
B	President	Male	52	25	Master degree	Agent
C	Executive Vice President	Male	46	15	Master degree	Agent
D	Vice President	Male	48	17	Master degree	Agent
E	President	Male	52	16	Master degree	Principal/Agent
F	Executive Vice President	Male	54	26	Master degree	Agent
G	Vice President	Female	46	14	Master degree	Agent
H	President	Male	48	16	Master degree	Principal/Agent
I	Board Director, President	Female	52	22	Master degree	Principal
J	Vice President	Male	40	12	Master degree	Agent
K	Chairwoman	Female	62	30	Doctorate candidate	Principal
L	President	Male	45	15	Master degree	Agent
M	Vice President	Male	48	22	Master degree	Agent

framework consisting of 24 indicators across the categories of internal, external and human capital.

For this study, content analysis was used to identify the heuristics used by venture capital companies and to determine how cognitive biases affect decision processes. I have followed the four-step process to ensure reliability and valid coding of determinants, and then repeated the coding process to determine each participant's level of certainty (Manimala 1992; Haley and Stumpf 1989; Winograd 1983). Plant (2007) takes a grounded theoretical approach in examining the relationship between venture capitalist clusters and company migration, and this study follows this process to formulate concepts. With code pioneering, I considered product documentation and the managers' interview statements.

First, we decided on the size of the text units to analyze and found that the smaller the units, the more reliable is the coding, but the greater the potential to miss the point of interest. Individual sentences or groups of sentences contained discrete ideas. Second, we developed a preliminary list of determinants based on new production literature. We then matched interview text units to the preliminary list of determi-

nants of long and short term competitive advantages to clarify classification decisions, which became the basis for coding rules. Third, we used these coding rules to practice coding independently with a different 'hold-out' sample and obtained nearly identical results. We discussed each coding unit to eliminate ambiguity in the coding rules, and found the coding taxonomy to be reliable. Finally, we coded each interview independently and recoded the transcripts in a different order, to eliminate text unit order or time frame based biases. The study then followed the four-step procedure and coding discrepancies were resolved through discussion.

CATEGORIES OF ANALYSIS

This study used both concepts from literature and interview records from thirteen participants. There are three factors developed as a conceptual framework (see figure 1). Human capital represents a combination of four factors: genetic inheritance, education, experience, and attitudes regarding life and business; and in this study it includes the group's tacit and professional understanding, leadership, and work teams (Wu, and Hung 2008; Hsu 2007; Choo, and Bontis 2002; Rourke, and Anderson 2004). Structural capital is the area in which value added by nonlinearities of the knowledge creation process is assumed to reside. Structural capital also encompasses all knowledge which is not supported by humans, such as organizational routine and databases. It includes the law and regulatory and risk management processes, the internal decision making quality and the external control system. Relational capital is knowledge linked to external relationships, such as government (Cardwell 2008; Hung, Chung and Lien 2007; Pablos 2004; Smith 2008; Wong, Leung, Hung and Ngai 2007; Liu and Chen 2006; Chaminade and Johanson 2003). The elements of structural capital used in this study include internal standard operational procedures and the external operational process.

RELIABILITY AND VALIDITY

The accuracy of the pretest coding requires a check of the sample test coding to ensure that classification rules are applied. The researcher should also assess the reliability of the pretest and the results (Insch, Moore and Murphy 1997). This study used theme as a unit of measurement, and according to the aforementioned categories, we have 60. A pretest was used to take a random sampling of 20 themes, and after interviews with

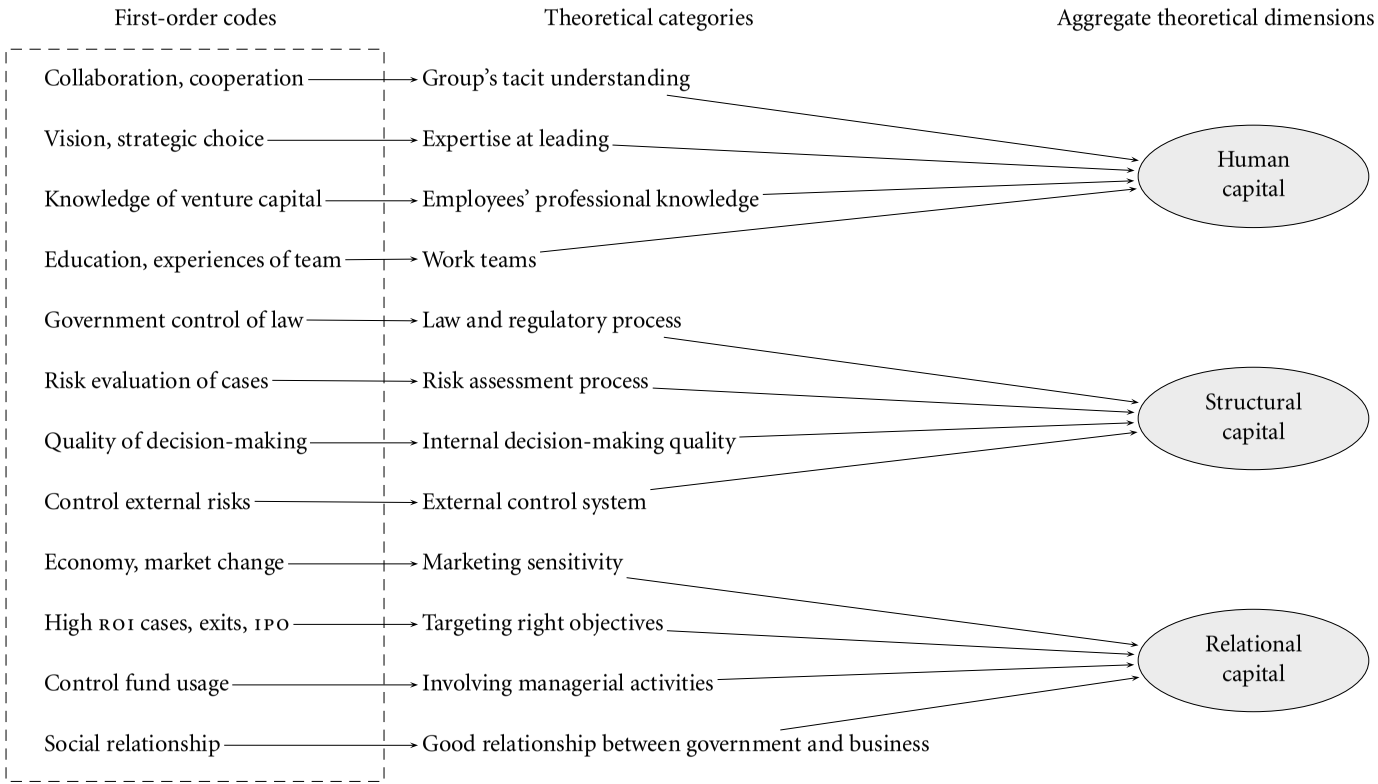

FIGURE 1 Data of structure

TABLE 2 Pretest the degree of mutual agreement in three dimensions

	Researcher	Coder 1	Coder 2
Coder 1	0.76		
Coder 2	0.78	0.74	

TABLE 3 Coding results of mutual agreement in three dimensions

	Researcher	Coder 1	Coder 2	Coder 3	Coder 4	Coder 5
Researcher	—					
Coder 1	0.80	—				
Coder 2	0.64	0.76	—			
Coder 3	0.80	0.76	0.64	—		
Coder 4	0.76	0.76	0.68	0.68	—	
Coder 5	0.64	0.64	0.64	0.80	0.76	—

two venture capitalists and a university professor, the results showed a consensus.

We sampled 20 out of 60 themes to analyze the degree of mutual agreement by three coders. We used the formula [2M/(N + O); M: all agree numbers, N: coder 1 agree, O: coder 2 agree] to get the degree of mutual agreement.

In 60 themes of three factors, the mutual degree of researcher and coder 1 was 0.76, coder 2 was 0.78; coder 1 and coder 2 was 0.74. I used a formula of reliability being $[n/1 + (n - 1)]$. The pretest reliability of this study was 0.90 $[(3 \times 0.76)/(1 + 2 \times 0.76)]$, which was acceptable. We coded all themes to get the mutual degree and reliability from a total of six coders (table 3).

The average mutual degree of this study by six coders was 0.7173. So, the acceptable reliability of this study was 0.938 $[(6 \times 0.7173)/(1 + (6 - 1) \times 0.7173)]$. The reliability of these 60 themes in this study was acceptable.

There are two kinds of validity relevant to this study: face and content. Face validity is the subjective assessment of the correspondence between individual items and the concept through rating by expert judges. A measure is considered to have face validity if items are related to the perceived purpose of the measures (Issac, Rajendran and Anantharaman 2004; Hair, Anderson, Tatham and Black 1998; Kaplan and Scauzzo 1993). Content validity is ensured if the items representing the various constructs of an instrument are substantiated by a comprehensive review of the rele-

vant literature (Issac, Rajendran and Anantharaman 2004). The face and content validity for this study were rendered acceptable by the aforementioned experts.

ANALYTIC HIERARCHY PROCESS

The analytical process (AHP) was used in this study to analyze data. Saaty (1994) claims that AHP combines logic and intuition and is a technique widely used in decision-making (Sarkins and Sundarraj 2003; Easley, Valacich and Venkatareman 2000; Liberatore and Miller 1995). Makipelto (2009), Liu (2005; (2006), Liu and Wang (2007) use the process to develop e-government, intellectual capital and digital capital measures in various industries, while Palliam (2005) uses the process to calculate predicted capital costs in financial markets. Forman and Selly (2001) mention that software implementation of AHP, such as Expert Choice, was adopted, while Saaty (1980) proposes ranking the options as given by the values of the maximum eigenvector of the paired comparison matrix as the best option. The accuracy of the obtainable hierarchical ranking is dependent on the congruence with which the judgments are formulated in the paired comparison matrix. The judgment inconsistency index is produced along with the weights and it should be under 0.1.

Results

DEVELOPING AND PRIORITIZING THE INTELLECTUAL CAPITAL

According to the results, the priority of sequencing in the first level is: relational capital, structural capital and human capital. Relational capital is an accumulation of social networks, and thus increases access to information about investment cases. Venture capital companies should take structural capital seriously and set up internal and external standard operation procedures to improve efficiency. The human element has grown in importance (Grant 1996) and company performance may be improved by the way in which human resources are used in the development and implementation of strategies (Wright, Smart and McMahan 1995).

STRATEGY MAP OF THIS STUDY

A well-understood and describable strategy is a framework which has proved useful for organizations. The objective for this process is to maximize organizational value, and complete customer-focused strategies and internal process. This study developed a strategy map of the venture capitalist industry in Taiwan (see figure 2).

TABLE 4 Priority and sequence for level 1 and level 2 of intellectual capital

Criterion	Items	Priority weight	Ranking
	Human Capital	0.292	3
	Structure capital	0.320	2
	Relational Capital	0.388	1
	Inconsistency index: 0.00		
Human capital	Group's tacit understanding	0.062	4
	Expertise at leading	0.160	3
	Employees' professional knowledge	0.208	2
	Work teams	0.570	1
	Inconsistency index: 0.04		
Structural capital	Law and regulatory process	0.077	4
	Risk assessment process	0.285	2
	Internal decision-making quality	0.384	1
	External control system	0.254	3
	Inconsistency index: 0.04		
Relational capital	Market sensitivity	0.211	2
	Targeting right objectivities	0.510	1
	Involving managerial activities	0.147	3
	Good relationship between gov. and business	0.132	4
	Inconsistency index: 0.07		

NOTES Inconsistency index in first level is 0.00.

Conclusion and Suggestions

This study explores the value of the venture capital industry from a managerial perspective. Intellectual capital is a popular issue world-wide and while there are many discourses published abroad, the industry is just beginning in Taiwan. We have explored the construction of intellectual capital indicators and found that the intellectual capital of the venture capital industry is categorized into three concepts. We have also developed 12 indicators for the business intellectual capital assessment model through the venture capital industry in Taiwan, and the results are similar to Cumming's (2006), who suggests four points:

1. Fund-raising and the number of funds operated by the VC company have a positive impact on the company's portfolio size. VC funds sponsored by government have larger portfolios, and corporate and

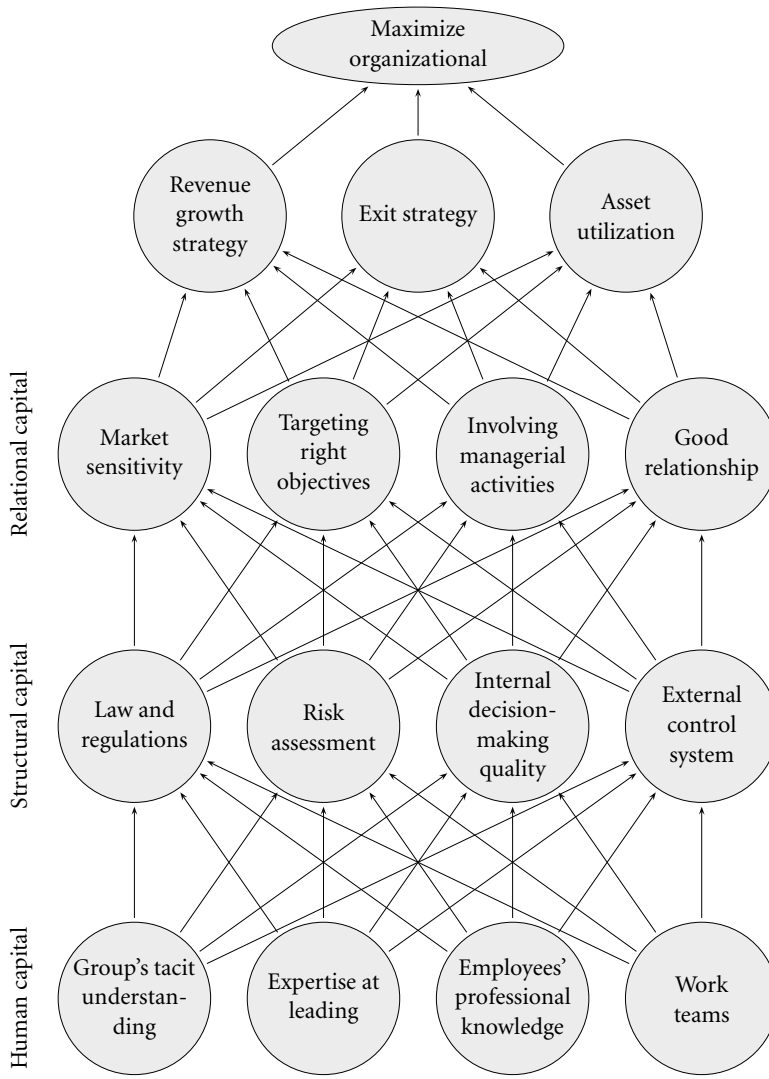

FIGURE 2 The sustainable strategy map of the venture capital industry in Taiwan

private independent limited partnerships have smaller portfolios. VC funds with more VC managers have larger portfolios (relational capital and human capital).

2. Portfolio size is affected by the composition of the portfolio in terms of high-tech and early-stage investments (structural capital).
3. Portfolio size is affected by the nature of financing arrangements,

including capital structure, staging, syndication, and the amount of VC capital invested in the entrepreneurial company relative to capital from other investors (structural capital).

4. Portfolio sizes are larger when formed during boom periods (Cumming 2006).

Intellectual capital is complex and intangible, and errors due to subjectivity are inevitable. This study is the first attempt to investigate the intellectual capital reporting practice of the venture capital industry in Taiwan and is exploratory. Further work should include using a larger sample to include the analytical hierarchy process model and to extend analysis longitudinally to monitor the progress of the practices. Measuring intellectual capital can help formulate business strategies, and these measures provide an evaluation for venture capitalists abroad and allocate resources for the sustainability of venture capitalist companies (Marr, Gray and Neely 2003).

The results have important implications for future research. The author has attempted to construct the intellectual capital of the venture capital industry, but future analysis should extend to other economic sectors and institutions. A network approach can help social scientists and policy makers to understand the nature of the relationship between social networks of investors and regional development (Castilla 2003).

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Abstracts in Slovene

Poslovni začetki: kulturno-ekonomska nasprotja
Nejat Erk

Namen tega članka je ugotoviti, če imajo razlike v nacionalnih poslovnih kulturah ter ekonomski in makroekonomski kazalniki bistven vpliv na poslovne začetke v nekaterih državah Evropske unije. Med nacionalnimi kulturnimi razlikami, kot jih definira Hofstede, smo izbrali indeks individualnosti-kolektivnosti, ki meri nagnjenost k uveljavljanju lastnega interesa, indeks razlik v moči, ki meri stopnjo tolerance državljanov do socialnih razlik in razslojenosti, indeks izogibanja negotovosti, ki meri stopnjo sprejemanja negotovosti, ter indeks moškosti, ki nam pove, v kolikšni meri so moški v določeni družbi dominantni. Zadnja spremenljivka v našem modelu, ki je povezana s poslovno kulturo, je indeks koruptivnosti, ki meri občutljivost družbe na pojav korupcije. Med makroekonomskimi kazalniki smo preverili, če na število novih podjetij v državi vplivajo povprečni osebni dohodek, splošna raven produktivnosti, stopnja donosnosti in realna rast BDP. Izsledki kažejo, da so za razlago poslovnih začetkov – razen pri nekaterih izjemah – kulturni dejavniki prav tako pomembni kot ekonomski kazalniki. V ta namen smo uporabili faktorsko analizo, z analizo glavnih komponent pa smo pojasnili vpliv posameznih spremenljivk in odnose med njimi.

Ključne besede: poslovni začetki, Hoftstedejev model
Klasifikacija JEL: M31, M13
Managing Global Transitions 9 (1): 3–13

Razširjen model upravljanja tveganj v projektih razvoja novih izdelkov
Dušan Gošnik

V prispevku so predstavljeni rezultati proučevanja tveganja v projektih razvoja novih izdelkov (RNI). Razvili smo specifičen razširjen model upravljanja s tveganji v projektih RNI, ki upošteva specifičnost teh projektov. Podatke v raziskavi smo zbrali s pomočjo vprašalnika, ki je bil oblikovan posebej za potrebe te raziskave, vanjo pa smo vključili izkušene vodje projektov na področju RNI. Rezultate raziskave in hipoteze smo testirali s pomočjo statističnih metod. Rezultati kažejo, da je pri

projektih RNI ključno, da tveganje planiramo že v zgodnjih fazah projektov, posebej v fazi določanja tehničnih zahtev za izdelek in pri zastavljanju ciljev projektov RNI. Nejasno določene tehnične zahteve predstavljajo najpomembnejši vir tveganj pri razvoju novega izdelka in so kasneje, v fazi izvedbe projekta, povezane z negotovostmi v fazi razvoja izdelka. Bolj kot so tehnične zahteve v fazi priprave projekta nejasno definirane, večja je negotovost in iz tega izhajajoča tveganja, do katerih pri razvoju izdelka. Nejasno določeni cilji projekta RNI imajo značilno pomemben vpliv na časovne zamude pri izvedbi projektov RNI. Bolj kot so pred začetkom izvedbe projekta RNI cilji nepopolno določeni, večje časovne zamude lahko nastanejo v projektu.

Ključne besede: management projektov, tveganje, dejavnik, razvoj izdelkov, planiranje, model
Klasifikacija JEL: M11
Managing Global Transitions 9 (1): 15–37

Nekateri vidiki zagotavljanja zadovoljstva uporabnikov: izsledki raziskav v Srbiji
Dejan Đorđević, Dragan Ćoćkalo, Zvonko Sajfert in Milan Nikolić

Prispevek predstavlja raziskovalne rezultate, do katerih smo prišli s procesom oblikovanja sistema zagotavljanja zadovoljstva odjemalcev določenega podjetja. Kibernetski model vključuje procesni pristop in ustrezne tržne raziskave na začetku ter temu primerno evalvacijo na koncu. Prilagojen je tudi pogojem, v katerih delujejo srbska proizvodna in storitvena podjetja. Sistem je bil oblikovan, da bi omogočili lažje upravljanje teh procesov z namenom doseganja poslovne odličnosti.

Ključne besede: QMS, TQM, trženjski odnosi, zadovoljstvo uporabnikov, kibernetski model
Klasifikacija JEL: M11, M31
Managing Global Transitions 9 (1): 39–62

Tržna naravnanost in stopnja novosti
Mateja Bodlaj

Namen te raziskave je proučiti povezanost med odzivno in proaktivno tržno naravnanostjo ter stopnjo novosti. Podatke, zbrane v spletni raziskavi, smo analizirali s strukturnimi modeli. Analiza 325 slovenskih podjetij kaže, da je samo proaktivna tržna naravnanost pozitivno povezana s stopnjo novosti. Čeprav razlike v proučevanih povezanosti

niso statistično značilne ob upoštevanju velikosti podjetja in značilnosti okolja, pa ločene analize skupin podjetij nakazujejo, da je proaktivna tržna naravnanost morda pomembnejša v majhnih podjetjih in podjetjih, ki poslujejo v okolju z večjimi tehnološkimi spremembami. Ta raziskava kaže, da je razlikovanje med odzivno in proaktivno tržno naravnanostjo pomembno za boljše razumevanje vpliva tržne naravnanosti na stopnjo novosti.

Ključne besede: odzivna in proaktivna tržna naravnanost, inkrementalne in radikalne inovacije
Klasifikacija JEL: M30, M31
Managing Global Transitions 9 (1): 63–79

Razvoj merjenja intelektualnega kapitala za potrebe tajvanskega tveganega kapitala

Chung-Chu Liu

Tajvanski tvegani kapital je imel odločilno vlogo v razvoju tajvanske informacijske tehnologije. Namen te raziskave je vzpostaviti merjenje intelektualnega kapitala pri tveganem kapitalu na Tajvanu in oblikovati strateški načrt, ki temelji na teh meritvah. Podatki za raziskavo so bili zbrani z intervjuji, pri analizi podatkov pa sta bili uporabljeni metoda analize vsebine in analitični hierarhični proces. Intelektualni kapital lahko razdelimo na tri skupine: človeški kapital, relacijski kapital in strukturni kapital. V raziskavi smo določili tudi dvanajst indikatorjev za presojo poslovnega intelektualnega kapitala, izdelali pa smo tudi strateški načrt za tvegani kapital. Merjenje intelektualnega kapitala je lahko v pomoč pri oblikovanju poslovnih strategij in pri vlaganjih.

Ključne besede: tvegani kapital, metoda analize vsebine, analitični hierarhični proces, strateški načrt, intelektualni kapital, človeški kapital, relacijski kapital strukturni kapital
Klasifikacija JEL: M13, L15
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