

Differences in adaptations between service and manufacturing firms*

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Abstract

This paper studies the differences in adaptation to the environment of service, mixed, and manufacturing companies. Adaptations are contingent on the characteristics of the environment and technology. By them, companies try to manage environmental uncertainties. The latter are subjectively perceived amplifications of small scale multi-level, lagged, nested, and nonlinear changes. Companies intend to manage perceived environmental uncertainties. They facilitate adaptations that either reduce environmental uncertainties or make an efficient reaction to unexpected external developments possible. First type of adaptations is explained by resource dependence theory transaction-cost economics: the second one is explained by contingency theory. Strategic choice theory incorporates both types of adaptations. On the grounds of those four theoretical perspectives, we constructed a research model of organizational adaptations to environmental change. The focus is on exploration of differences in adaptations among service, mixed, and manufacturing companies. Organizational adaptations are studied from internal as well as external perspective. Research is based on a survey conducted on the sample of 236 medium and large companies in the period 2000–2005 in Slovenia. Findings confirmed that companies with different technology adapt differently. Mixed companies adapt mainly through external relationships, manufacturing companies adapt mainly internally, while service companies use both types of adaptations in congruent proportions. Adaptations of mixed companies are best explained by resource dependence theory, adaptations of manufacturing companies by environmental contingency theory, and adaptations of service companies are best explained by strategic choice theory.

Key words: environment, technology, organization, networks, change.

JEL classification: L14, L22, L23, P30

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1. Introduction

Every open system needs to sustain minimal fit with its environment (system in which it is embedded) in order to survive (exist). Companies are social entities and as such they represent the most complex form of open systems. In order to survive in the long run, each company needs to adapt to its business environment changes (Huber, Glick, 1995). Company's survival chances are defined by fitness landscape and where adaptations move the company in this space (Levinthal, Warglien, 1999).

Intended and unintended entities make organizations self-organizing entities (Morgan, 2006). Outcome of adaptations is difficult to predict, which makes the adaptation processes a complex phenomenon. Companies don't adapt only internally through changes and elaborations of their organizational structures, strategy, and technology (Donaldson, 1999); they also restructure their business niches and relationships with business partners (Pfeffer, Salancik, 1978).

Both internal and external adaptations represent two basic responses to environmental change and two complementary ways of managing environmental uncertainties. Environmental uncertainties are subjective perceptions of actual environmental change (Daft, Weick, 1984). The same environment might be perceived as certain by one set of managers and uncertain by another. Differences in management perception of environmental change are important because they largely define the range of possible organizational responses.

In addition, perception of environmental change and resulting organizational adaptations are contingent on the nature of business operations (Burton, Obel, 2004). Service, manufacturing and mixed companies in many aspects adapt differently to the same environmental changes.

Through revision of main contributions of contingency theory (Donaldson, 1999), strategic choice theory (Child, 1972, 1997), transaction cost economics (Williamson, 1975, 1979, 1991, 1996), and resource dependence theory (Pfeffer, Salancik, 1978), we construct a conceptual model of adaptations – incorporating both internal and external adaptations – to environment change. Its empirical verification is based on a special measurement construct. In the second part, we present the research methodology and main empirical findings. We discuss their validity as well as their theoretical and empirical implications with the main conclusions at the end.

2. Theoretical background

Good fit between company's offer and its environmental demands leads to higher performance (Doty et al., 1993). Basic fit expresses harmony between strategy, structure, technology, and environment (Donaldson, 1999). It incorporates efficiency

and effectiveness at the same time and as such it represents a necessary condition for viability (Burton, Obel, 2004: 20).

Managers (Burton, Obel, 2004: 395) try to deliberately change the company's strategy and size. Changes in technology, organization, and knowledge of employees are more triggering, incorporating greater risk. The most demanding and the least successful are intended changes of company's environment. Regardless of the amount of pre-decision information gathering and evaluations of alternatives, the outcome of each chosen alternative is always unknown (Levinthal, March, 1993).

Competition, technological developments, shifts in supplier and customer markets, political and economic integration, demographic trends, and social expectations are forces (Jones, 1998, 2004), mutually intertwined, that constantly change a company's business landscape in unpredictable ways where small changes are amplified through mutual, lagged, and nested effects (McKelvey, 1997). Uncertainty is a function of unpredictability of chains of changes over time. Still, companies need to successfully manage their environmental uncertainties in order to survive. Different theoretical perspectives give us different recommendations on that.

Environmental contingency theory argues that in an environment of frequent, extensive change and high uncertainty, the company should behave flexibly and respond to emerging environmental change. Burns and Stalker (1961) develop a concept of organic organization characterized by low formalization, low organizational complexity, low centralization, a lot of integration through group meetings and special integrators, high media richness, and incentive-based reward system (Burton, Obel, 2004: 206-224). Doty and Glick (1993: 1196-1251) discovered that there can be many equally appropriate organic solutions for given environmental context.

The statement that environmental changes cause internal organizational adaptations postulates environmental determinism, which is the main point in the criticism of contingency theory. Child (1972) argues that there is a substantial degree of choice over the response to environmental change. Managers (and other organizational controllers) vary in their response to the environmental change according to their perceptions, implicit theories, preferences, values, interests, and power. A company in a dominant market position has sufficient excess profit to retain a misfitting position for a longer period of time. When misfit is no longer tolerable and fit must be restored, the management can decide for adaptations to the environment or for restructuring of organizational domain and its environment.

A company establishes its domain by deciding which customers it is going to serve, which suppliers it will deal with, and how it will manage its relationships with them. An organizational domain therefore represents a set of functionally interconnected organizations (Tushman, O'Reilly, 1996; Knoke, 2000: 39). Enduring relationships are usually developed with key suppliers, clients and distributors, regulatory agen-

cies, and other organizations (DiMaggio, Powell, 1983: 148). They form a network of companies (Kovač, 2002).

Major changes of organizational domain completely restructure network relationships, while minor changes usually restructure only mechanisms by which transactions are coordinated among existing business partners. Recommendations for selection of coordination mechanism amidst given environmental uncertainty are given by resource dependence theory (Pfeffer, Salancik, 1978) and transaction cost economics (Williamson, 1975, 1979).

Resource dependence perspective argues that the goal of this type of restructuring should be reduction of uncertainties in resource flows. If resources such as capital, information, material, energy, and others become more scarce, uncertainty is increasing. It is recommended that companies should connect with companies possessing scarce resources. They should try to (Green, Welsh, 1988) (1) abandon those relationships in which they feel too weak and at the same time (2) develop long term relationships with business partners with strategic resources in the way that preserves as much autonomy as possible (Jones, 1998). In general, the more uncertain the environment, the more they try to fix the relationships with their business partners.

Similar recommendations are made by Williamson's (1975, 1979) transaction cost economics, although theoretical argumentation is based on transactions costs. In general, when transaction costs increase relative to the administration costs, the relationship among business partners should be intentionally stabilized by formation of joint ventures and strategic alliances, ownership swaps, and other cooperation mechanisms (Lewin et al., 2005).

Networks with stabilized, fixed, enduring relationships among business partners are less flexible and – borrowing from the terminology of Burns and Stalker (1961) – operate mechanistically. In a very unstable environment they should close in enclaves (close systems), keeping scarce resources inside (Meyer et al., 1995: 91). For any given situation many equally suitable solutions of network relationships may exist (equifinality).

The nature of business operations (technology) is also an important determinant of internal and external adaptations to the environment and its change (Perrow, 1967; Thomson, 1967). There are many different classifications of technology. On the highest level, technology can be classified into manufacturing, service, and mixed technology (Hickson et al., 1979). Manufacturing firms convert raw materials, parts, and subassemblies into finished products, while service companies deliver service directly to the customer (Burton, Obel, 2004: 251).

In many cases, the distinction between a manufactured product and a service is not obvious, since many companies sell products and services at the same time. Such companies have mixed technology. Though contingency theory argues that organiza-

tional adaptations are contingent on service, manufacturing, and mixed technology, it does not offer any idiosyncratic recommendations on this aspect of adaptations. In the next section, we will try to elaborate also these recommendations.

3. Conceptual framework

Study of the relationship between environmental change and organizational internal and external adaptations requires certain amount of complexity in the research framework like (Lewin, Volberda, 1999: 527-528; McKelvey, 1994: 314-326; 1997: 352-376) studying rates of change, considering multidirectional causalities, taking mutual, simultaneous, lagged, and nested effects into account, selecting a right time frame, and combining different methodological tools and statistical methods (Koza, Lewin, 1999: 640-641).

Word Resource Institute (http://pdf.wri.org/tm_tomorrows_markets.pdf) described business environment at the beginning of 21st century in terms of increasing competition, shorter product, technology, and organizational life cycles, intense price and quality wars, development of substitutes, concentration of power within MNC, unfavorable demographic trends and major disequilibria in local labor markets, significant technological developments, unpredictability in financial markets, national legislation changes, enlargement of international political and economic associations, increasing social demand for social responsibility etc.

These trends created major instabilities in business environments in almost all industries all over the world, but even more so in countries in transition, moving from planned to market economy (Lewin, Volberda, 1999). When following the recommendations of Lewin, Volberda (1999) and McKelvey (1997) for empirical research of environment-organization co-evolution, we decided to select the case of Slovenia in period 2000-2005, focusing on medium and large companies. This selection fits the proposition of substantial environment change.

Slovenian economy in that period was characterized by intensified competition and observable restructurings of industries and their strategic importance for national economy, significant technological developments, unfavorable demographic trends, labor market instabilities, uncertainties in financial market and major institutional transformation as a consequence of admission to EU. Research frame implanted in unstable, turbulent time and space offers promising reference for identification of emerging properties of economic transformations (Lewin, Volberda, 1999).

In unstable, equivocal, and uncertain environment, organizational theorists recommend technologically superior, team-based, customer focused, organic organization (Ashkenas et al., 1995; Cameron et al., 1995; Hammer, Champy, 1995; Burton, Obel,

2004) implemented through a set of internal adaptations like automation, information technology improvements, decision-making decentralization, professionalization of employees, downsizing and delayering, job enlargement, empowerment and greater job rotation, more project work, more team work and cooperation among business units, customization of products and services, outsourcing of non-core activities, introduction of more flexible rewards and planning systems, a bigger focus on high value-added activities and the introduction of more process-focused organizational structures and work place descriptions introduced to different business fields and functions.

Successful implementation of recommended adaptations improves flexibility and responsiveness of the company (Volberda, 1999) to unpredictable environmental change and as such creates company's dynamic capability (Teece et al., 2000).

Hypothesis 1: When perceiving environment as changing, companies facilitate organic organizational structure adaptations which allow them greater flexibility and responsiveness.

Through relationships among business partners, companies reconfigure their organizational domain (Knoke, 2000) and their business environment (Oliver, 1991) in a way that reduces environmental uncertainty in the supply of scarce resources like information, money, raw materials, people etc. (Pfeffer, Salancik, 1978) and reduce costs of transactions (Williamson, 1975, 1979). Stability in relationship with business partners is established through informal agreements, contracts, formation of strategic partnerships, strategic alliances and clusters, joint ventures, or by purchases of ownership shares which, under the extreme uncertainty, should extend to mergers and acquisitions (Knoke, 00: 128-140).

Hypothesis 2: When perceiving environment as changing, companies respond via mechanistic network structure adaptations which allow them greater control over their environment.

Contingency theorists (Perrow, 1967) assume that technology is an important mediator that affects the adaptations, too. The most important dimension of technology is its routines. Routine technology contains easy-to-analyze problems and few exceptions, while non-routine technology contains difficult to solve problems and many exceptions (Robbins, 1990).

Non-routine technology is an important determinant of internal uncertainty. It contributes to this uncertainty either through variations in the quality or availability of inputs for the transformation process, or through the variable nature of the transformation process itself. Manufacturing companies mainly face the first type of technological uncertainty, while service companies more frequently try to fight the second. Aston group showed (Hickson et al., 1990) that service companies have on average more organic organization and less network relationships as manufacturing firms.

This is consistent with the contingency argument that uncertainty fits with organic structure. Based on that next hypothesis can be developed.

Hypothesis 3: Manufacturing companies – having permanent relationship with business partners already established – adapt to environmental change with organic organizational adaptation, while service companies – having organic organization already established – adapt by developing more permanent relationships with business partners mechanistic.

In the next sections, we construct a research design which offered us enough validity and reliability to assign relevance to our hypotheses.

4. Methodology

4.1. Data and measurement construct

Data about environmental developments along with organizational and network structure adaptations were gathered through a specially constructed questionnaire composed of four parts.

In the first part, we studied the characteristics of each company's technology, i.e. whether a studied company is mainly a service, manufacturing, or mixed company. In order to do this, companies needed to assess the percentage of the income they create through their sales of products/services. If they created more than 95% of their income through services, then they were regarded as pure service companies. If they created more than 95% of their income through products, then they were classified as pure manufacturing companies. And companies with equal distribution of their income among services and products (50% products and 50% services) were regarded as pure mixed companies. In the comparative study of organizational adaptations, all companies with other distribution of income among products and services were excluded.

In the second part of the questionnaire, we studied 21 developments expected according to the literature and research on organizational change unfolding in the business environment at the end of the 20th and beginning of the 21st century. The management of the companies needed to assess their intensities on a 1 to 7 Likert scale.

In the third part of questionnaire, we studied 17 different organizational structure adaptations which the contemporary literature on organizational structure change (Volberda, 1999; Daft, 1998; Daft, Marcic, 2001; Hammer, Champy, 1993; Ashkenas et al., 1995) listed as the right organizational responses for the beginning of the new millennium and as the proper response to an uncertain environment (increased competitiveness and globalization pressures). Most proper organizational responses

were the following: investments in the automation of work processes and information technology improvements; decentralization of decision-making, especially the decentralization of planning activities; investments in the tacit and explicit knowledge of employees (professionalization); intensive downsizing (a side product of this are dismissals) and layering of the hierarchy; more widely defined work place descriptions based on job enlargement, empowerment and rotation and more project and team work; enhanced cooperation among different business fields; customization of products and services, as well as business process; focus on the value-added process and outsourcing of non-core activities; the introduction of a more process-based organizational structure.

The extent of each organizational structure adaptation was assessed indirectly. The basis for its assessment was the number of business fields it was introduced into in the studied period (in our case: January 2000-January 2005). In the questionnaire, we listed six different business fields/functions: sales, manufacturing, purchasing, finance, staffing (human resource management), and support function (information processing, planning and control etc). If a specific adaptation was not implemented in any of these fields in the studied period, it was assessed with a one. If it was implemented in only one field, it was assessed with a two etc. If it was introduced in the whole company (in all business fields), it was assessed with a seven. So, the assessment scale for each particular organizational adaptation was between 1 and 7.

In the fourth part of the questionnaire we studied six different types of coordination mechanisms among business partners. Their introduction in the network structure was treated as an adaptation. The external coordination mechanisms most frequently stated in the contemporary literature on network structure change (Knoke, 2000; Jones, 1998) are: informal and formal agreements with business partners, clustering, joint venturing, minor or major ownerships swaps, and mergers and acquisitions.

The extent of each network structure adaptation was assessed indirectly. The basis was an assessment of how many different groups of business partners a specific coordination mechanism (treated as a network structure adaptation) in the studied period (in our case January 2000-January 2005) was introduced. In the questionnaire, we listed six of the most important groups of business partners: clients, distributors, competitors, research and finance institutions, and others. If a specific coordination mechanism was not introduced to any of these groups of business partners in the studied period, then the extent of a particular network structure's adaptation (extent of the use of a particular external coordination mechanism) was assessed with a one. If it was introduced to only one group of business partners, it was assessed with a two etc. If it was introduced to all business partners it was assessed with a seven. So, the assessment scale for each particular network structure adaptation was between 1 and 7.

The questionnaires were sent to the management of all Slovenian companies that have more than 50 employees. At the end of 2004, there were 1,370 companies with

more than 50 employees. 262 questionnaires were sent back, 237 of which had no missing data. So the sample presented 17.3% of the whole population. The analysis of the companies' distribution according to their assets, product/service sales, foreign/domestic sales and state ownership shows that the sample used here is a good representative of the population.

4.2. Analysis

The statistical analysis involved several statistical methods. First, we estimated the extent of each particular organizational and network adaptation according to the described calculation procedure; next, we calculated averages for each adaptation. Because we wanted to see whether there are some groups of adaptations that are usually implemented together, we used principal component analysis (PCL). The group of adaptations indicated by the PCL can be treated as a major, more complex adaptation.

Then we distributed companies into three groups according to the percentage of income earned by sales of services/products: service, manufacturing, and mixed companies. We calculated the average extents of organizational and network adaptations as well as the perception of the environmental developments for each group. We employed an ANOVA analysis to test the significance of differences among those three groups. We also calculated the averages of changes for major groups of changes (constructed through PCA). In the next step, we developed networks of individual changes for each group. The basis for the development of these networks were partial correlation coefficients higher than 0.3 or 0.4. Finally, we developed networks of groups of changes for pure service, pure mixed, and pure manufacturing companies. Because these groups of changes/adaptations can be seen as one or more complex adaptations, the latter network gives us insights into the main constructs of change and their relationships. We then identified the key characteristics of those networks and examined differences among service, mixed, and manufacturing networks of change.

5. Empirical findings

5.1. General characteristics of environmental change and companies' adaptations

Empirical analysis showed that industry dynamics is different from general macro environment dynamics. Industry (organizational field) dynamics was created by developments in the competitor segment, distributor segment, and client segment, while macro dynamics was constituted from technological developments and changes in institutional environment.

On the other hand, companies made extensive adaptations in their organizational structures. Principal component analysis grouped them into four groups. Each group represents a complex adaptation per se. The first group of changes deals with people – it improves their capabilities and enables them to cover a larger working domain more professionally. We named it ‘Professionalization’. The second group of changes facilitates flexibility and responsiveness to specific customer needs and desires. We named it ‘Mass customization strategy’. The third group incorporates changes that reduce costs and increase internal efficiency. We named it ‘Cost reduction strategy’. The fourth group of changes reflects adaptations in production and information technology; therefore, we named it ‘Technology adaptations’.

In general, companies most intensively adapted their technology, especially information technology, mainly across all business fields (Table 1). Besides, professionalization of employees played an important role, too. Percentage of team and project work increased significantly. Most extensive organizational transformations (organic direction) were made in the field of manufacturing and sales.

Companies also introduced many observable network restructurings. In general, those adaptations were either competence-strategic based or power-ownership based. Competence-based networking was based on contracting and strategic partnering through joint consortia and joint venturing, while power-based network was mainly based on ownership swaps and share purchases.

In general, Slovenian companies mainly related strategically with distributors, customers, and in some cases, competitors.

Table 1: Environmental development, organizational and network adaptations of medium and large Slovenian companies in the 2000-2005 period; average assessments

Environmental developments (1-7 scale)		Organizational adaptations (1-7 scale)		Network adaptations (1-7 scale)	
<i>Institutional environment</i>	4.61	<i>Professionalization</i>	4.07	<i>Power development (ownership approach)</i>	1.58
Automation of manufacturing activities	4.29	Decentralization	3.51	Purchasing of minority owner. rights	1.70
Fast development of infor. techn.	5.08	Professionalization	4.92	Purchasing majority owner. rights	1.41
Shortening of technology life cycles	4.53	Rewards system adaptations (linked to outcomes)	4.10	Mergers and acquisitions	1.64
Higher social responsibility	4.57	Planning system decentralization	3.74	<i>Competency development (strategic approach)</i>	2.41
Transparency of a company's market value	4.26	<i>Mass customization</i>	4.46	Making (in)formal agreements	3.25
Globalization	4.84	Team work	4.55	Clustering. joint research consortia.	2.46
Legislation changes	4.67	Cooperation	4.86	Joint venturing	1.63
<i>Industry</i>	3.42	Customization of P/S	4.32		
Product life cycle narrowing	3.67	Project work	4.29		
Price-cutting wars	5.56	Focusing on value-added processes	4.29		
Greater market power of competitors	4.12	<i>Cost reductions</i>	3.59		
Development of substitutes	3.36	Dismissals	3.44		
Takeover threats by clients	2.10	Delaying	2.79		
Negotiating power of suppliers	3.25	Job rotation and enlargement	3.18		
Takeover threats by suppliers	1.86	Outsourcing	3.30		
		Adaptations of work places	4.82		
		Adaptations of departments	3.99		
		Adaptations of technol. to tech. dev.	4.37		
		Automation	3.41		
		Informatization of work processes	5.32		
		<i>Area of organiz. adaptations (0-1 scale)</i>		<i>Area of network adaptations (0-1 scale)</i>	
		Sales	0.56	Distributors/suppliers	0.21
		Manufacturing	0.58	Customers	0.21
		Purchasing	0.49	Competitors	0.19
		Finance & account.	0.49	Finance institute.	0.12
		Staff	0.46	Research institute.	0.14
		Support	0.48	Other partners	0.13

Source: Research on adaptation processes of medium and large Slovenian companies, 2005.

5.2. Differences in adaptation processes

Analysis of variance confirmed that differences in perception in environmental changes exist. In general, manufacturing companies perceived the greatest environmental change. Mixed companies experienced the least changes in the environment (Tables 2-4).

Though in general all three groups perceived significant changes in the environment, their perception varied across groups. In case of industry competitiveness and institutional change, analysis of variance was insignificant because of a great variability of perception of environmental change within groups. Each company perceived specific environmental change, regardless of their manufacturing or production focus. This indicates that perception of environmental change and uncertainty is largely a subjective category (Weick, 1995; Scott, 1987: 117).

Regardless of subjectivity of perceptions of environmental change, internal and external adaptations are in many aspects significantly different among service, manufacturing, and mixed companies. As expected in hypothesis 3, manufacturing companies conducted more intensive organizational adaptations, while mixed companies conducted more of network adaptations.

In the next three subsections, we present results of in-depth exploratory study of adaptations of each group of companies.

5.2.1. Service companies

Organizational adaptations:

Service companies responded to environmental changes by investing in employees and information technology, and by focusing on mass customization strategy (Table 2). Most extensive changes were implemented in sales.

Network adaptations:

On the external side, service companies networked more or less only on the contractual base. The key networking mechanisms were informal agreements and contracts, clustering, and other forms of strategic partnering. Most networking was done with competitors and suppliers. They facilitated modest cooperation with the research institutions.

Table 2: Environmental developments and adaptations of service companies (average assessments)

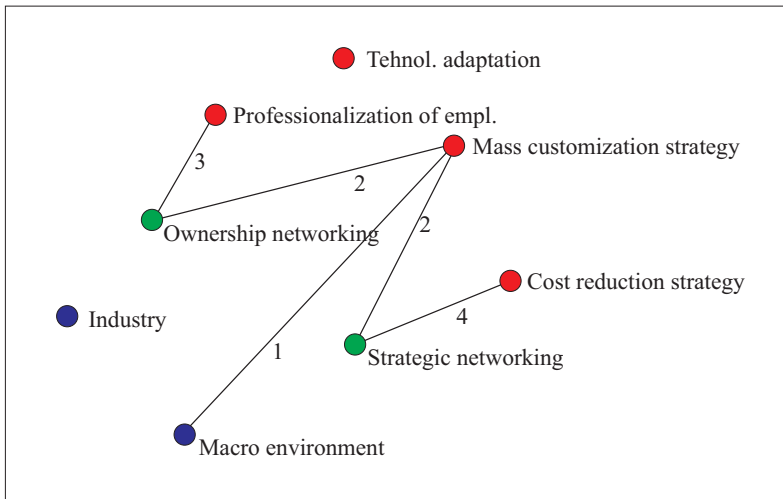
Number of pure service companies:	57	<i>Organizational adaptations (1-7 scale):</i>	3.98
		TECHNOLOGY ADAPTATIONS	4.30
<i>Environmental developments (1-7 scale):</i>	3.75	Automation	3.33
INDUSTRY ENVIRONMENT	3.25	Informatization	5.26
Competitors' segment	4.06	PROFESSIONALIZATION OF EMPLOYEES	4.09
Customers' segment	3.18	Decentralization of decision-making	3.35
Distributors' segments	2.50	Professionalization	5.16
MACRO ENVIRONMENT	3.88	Flexible rewards system	4.09
Workforce segment	2.65	Decentralization of planning	3.77
Technology segment	4.24	MASS CUSTOMIZATION STRATEGY	4.10
Institutional environ. segment	4.75	Job rotation and enlargement	3.19
		Team work	4.42
		Cooperation among functions	4.72
<i>Network adaptations (1-7 scale):</i>	1.70	Customization of products & services	4.09
STRATEGIC NETWORKING	2.26	Project work	3.86
(In)formal agreements	2.84	Focus on value-added activities	4.32
Clusters and strategic partnering	2.35	COST REDUCTION STRATEGY	3.62
Joint ventures	1.58	Dismissals and downsizing	3.53
OWNERSHIP NETWORKING	1.58	Delaying of hierarchy	2.60
Minority ownerships purchases	1.72	Outsourcing of non core activities	3.19
Majority ownerships purchases	1.47	Redefining work place description	4.61
Mergers and acquisitions	1.56	Restructuring of departments	4.16
<i>Area of network adapt. (0-1 scale):</i>		<i>Area of organiz. adapt. (0-1 scale):</i>	
Distributors/suppliers	0.18	Sales	0.55
Customers	0.17	Manufacturing	0.50
Competitors	0.22	Purchasing	0.47
Finance institutions	0.13	Finance and accounting	0.49
Research institutions	0.10	Staff	0.47
Other business partners	0.11	Support functions (stabs)	0.49

Source: Research on adaptation processes of medium and large Slovenian companies, 2005.

Structure of adaptations:

Relationships between groups of changes were relatively weak. At correlation of 0.4, the central role here is taken by 'Mass customization' which was closely related with both types of networking (Figure 1). The numbers on lines express the power of relation.

Figure 1: Structure of groups of environmental developments and adaptations of service companies (correlation coefficients 0.4 or more)



Source: Research on adaptation processes of medium and large Slovenian companies, 2005.

Although service companies conducted extensive adaptations (Table 2), they didn't respond to environmental changes homogeneously, partly because of differences in their perceptions. Correlations among individual changes were consequently weak. There is no unified response to environment. For instance, some companies react to increasing competition by more strategic networking, while others with further professionalization of employees. These mixed responses argue for Child's (1972) strategic choice theory. Company response to the environment is subject to its strategic choice.

5.2.2. Mixed companies

Organizational adaptations:

While the company-wide organizational adaptations were on average less intensive in mixed companies (Tables 3), they facilitated extensive technological improvements in manufacturing, sales, and purchasing.

Network adaptations:

On the other hand, mixed companies facilitated extensive network adaptation. They largely reconstructed their relationships with distributors, clients and competitors through contracting, purchases of ownership shares, and joint venturing. They also facilitated more collaboration with the research institutions.

Table 3: Environmental developments and structural adaptations of mixed companies (average assessments)

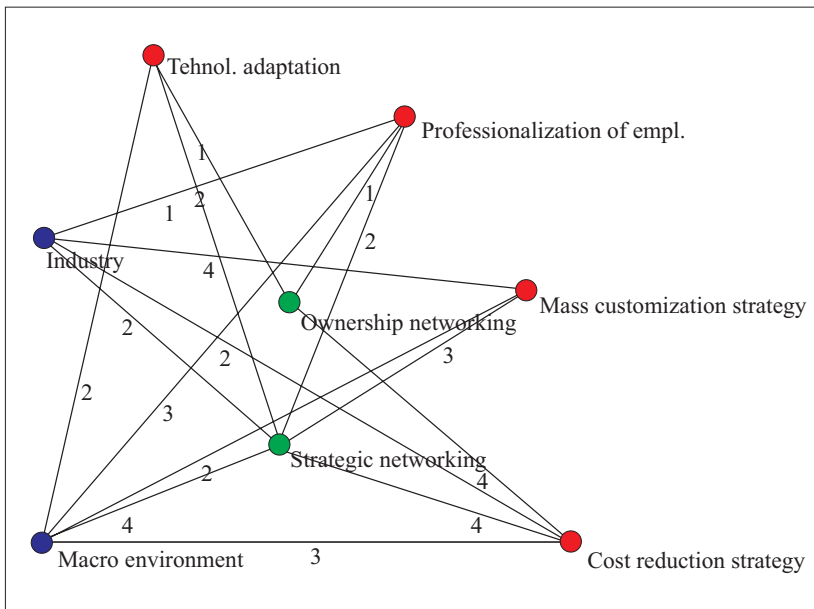
Number of pure mixed companies:	23	<i>Organizational adaptations (1-7 scale):</i>	3.65
<i>Environmental developments (1-7 scale):</i>	3.69	TECHNOLOGY ADAPTATIONS	4.15
INDUSTRY ENVIRONMENT	3.27	Automation	2.91
Competitors' segment	3.90	Informatization	5.39
Customers' segment	3.23	PROFESSIONALIZATION OF EMPLOYEES	3.69
Distributors' segments	2.67	Decentralization of decision-making	2.96
MACRO ENVIRONMENT	3.93	Professionalization	4.91
Workforce segment	3.22	Flexible rewards system	4.04
Technology segment	4.52	Decentralization of planning	2.83
Institutional environ. segment	4.04	MASS CUSTOMIZATION STRATEGY	3.82
		Job rotation and enlargement	2.70
		Team work	3.83
		Cooperation among functions	4.13
<i>Network adaptations (1-7 scale):</i>	2.47	Customization of products & services	3.87
STRATEGIC NETWORKING	2.69	Project work	3.78
(In)formal agreements	3.43	Focus on value added activities	4.61
Clusters and strategic partnering	2.65	COST REDUCTION STRATEGY	3.22
Joint ventures	2.00	Dismissals and downsizing	2.48
OWNERSHIP NETWORKING	2.52	Delaying of hierarchy	2.43
Minority ownerships purchases	2.70	Outsourcing of non core activities	3.09
Majority ownerships purchases	2.17	Redefining work place description	4.65
Mergers and acquisitions	2.70	Restructuring of departments	3.43
<i>Area of network adapt. (0-1 scale):</i>		<i>Area of organiz. adapt. (0-1 scale):</i>	
Distributors/suppliers	0.31	Sales	0.51
Customers	0.33	Manufacturing	0.52
Competitors	0.28	Purchasing	0.41
Finance institutions	0.23	Finance and accounting	0.41
Research institutions	0.24	Staff	0.39
Other business partners	0.23	Support functions (stabs)	0.42

Source: Research on adaptation processes of medium and large Slovenian companies, 2005.

Structure of adaptations:

The relative density of the network of groups of adaptations at a correlation of 0.4 (Figure 2) shows that (1) adaptations to specific environmental changes were relatively similar and (2) that the central position is taken by changes in macro environment. Macro environment changes facilitated more strategic networking and led to more investments in professionalization of employees. The mass customization strategy was strongly related to changes in the industry (degree 4). By raising the correlation to 0.5, the network becomes less dense and illuminates strong relationship between (1) the mass customization strategy, strategic-based networking, and developments in the industry environment and (2) the cost reduction strategy, ownership-based networking, and developments in the macro environment.

Figure 2: Structure of groups of environmental developments and structural adaptations of mixed companies (correlation coefficients 0.4 or more)



Source: Research on adaptation processes of medium and large Slovenian companies, 2005.

Mixed companies are largely diversified and as such they are usually organized either as M-form or as holding companies. Because of diversification, they perceive their environment as less uncertain. When environmental uncertainty increases, they usually restructure their portfolio and organizational domain. This involves changing the business partners and mechanisms of their coordination. Adaptations of this group of firms are best explained by Pfeffer and Salancik's (1978) resource dependence theory.

5.2.3. Manufacturing companies

Organizational adaptations:

Manufacturing companies conducted intensive organizational structure transformations, especially in manufacturing, sales, and purchasing (Table 4). They perceived significant technological developments which forced them to undertake a huge internal technological transformation towards greater automation of work activities. Furthermore, they were enforcing more project and team work, as well as collaboration across business units and functions.

Network adaptation:

On the other hand, manufacturing companies conducted very little network restructurings. They mostly tried to restructure their relationships with distributors and suppliers by integrating forwards and/or backwards on their industry value-chain.

Table 4: Environmental developments and structural adaptations of manufacturing companies (average assessments)

Number of pure manufacturing companies:	99	<i>Organizational adaptations (1-7 scale):</i>	4.13
<i>Environmental developments (1-7 scale):</i>	4.00	TECHNOLOGY ADAPTATIONS	4.42
INDUSTRY ENVIRONMENT	3.43	Automation	3.58
Competitors' segment	4.15	Informatization	5.25
Customers' segment	3.48	PROFESSIONALIZATION OF EMPLOYEES	4.14
Distributors' segments	2.65	Decentralization of decision-making	3.57
MACRO ENVIRONMENT	4.38	Professionalization	4.74
Workforce segment	3.65	Flexible rewards system	4.17
Technology segment	4.79	Decentralization of planning	4.07
Institutional environ. segment	4.71	MASS CUSTOMIZATION STRATEGY	4.41
		Job rotation and enlargement	3.43
		Team work	4.72
<i>Network adaptations (1-7 scale):</i>	1.61	Cooperation among functions	5.18
STRATEGIC NETWORKING	2.35	Customization of products & services	4.09
(In)formal agreements	3.27	Project work	4.72
Clusters and strategic partnering	2.35	Focus on value added activities	4.32
Joint ventures	1.42	COST REDUCTION STRATEGY	3.71
OWNERSHIP NETWORKING	1.43	Dismissals and downsizing	3.42
Minority ownerships purchases	1.45	Delaying of hierarchy	2.68
Majority ownerships purchases	1.30	Outsourcing of non core activities	3.62
Mergers and acquisitions	1.54	Redefining work place description	4.89
		Restructuring of departments	3.92

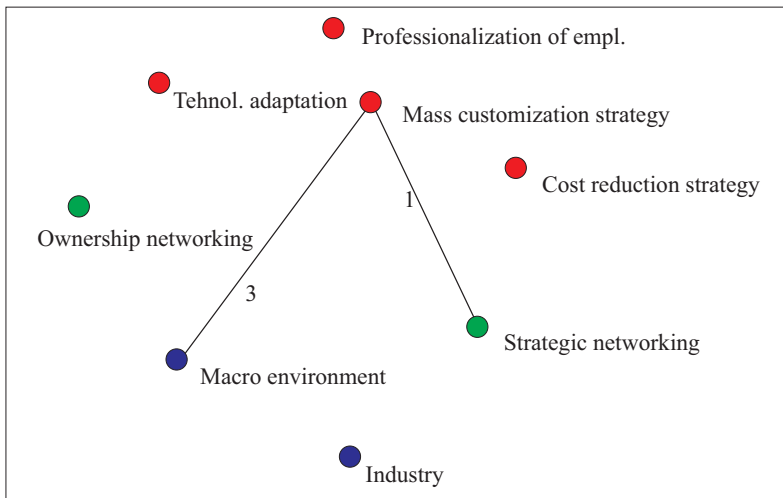
Area of network adapt. (0-1 scale):		Area of organiz. adapt. (0-1 scale):	
Distributors/suppliers	0.20	Sales	0.57
Customers	0.20	Manufacturing	0.61
Competitors	0.15	Purchasing	0.51
Finance institutions	0.10	Finance and accounting	0.49
Research institutions	0.13	Staff	0.47
Other business partners	0.12	Support functions (stabs)	0.49

Source: Research on adaptation processes of medium and large Slovenian companies, 2005.

Structure of individual adaptations:

In general, there aren't any strong correlations among groups of changes (Figure 3). A significant relationship exists between macro environment and mass customization strategy. Adaptation of manufacturing companies depends on technological development and legislative changes.

Figure 3: Structure of groups of environmental developments and structural adaptations of manufacturing companies (correlation coefficients 0.4 or more)



Source: Research on adaptation processes of medium and large Slovenian companies, 2005.

In case of Slovenia, manufacturing companies in the last phase of the transition to EU perceived significant changes in technological and institutional environment, which forced them to transform internally towards greater flexibility and responsiveness. Adaptations of manufacturing companies best fit to the explanations of contingency theory (Donaldson, 1999: 59-60), according to which companies adapt to environmental uncertainties though organic organizational adaptations.

We can conclude that adaptations to environmental developments slightly differ among service and production firms.

6. Discussion and conclusions

Before jumping to the implications for theory and practice, we should take into account some of the major drawbacks and limitations of the research design. The main source of all deficiencies lies in the questionnaire. The chief objective of formulating the questionnaire was “fast and easy fill in”. We had to give up some of the precision and details, which lowered data reliability. The questionnaire listed only the main, most important, and most likely organizational and network structure adaptations suitable for the uncertain environment in the time period we investigated. Even though the attributes of environmental developments and organizational and network structure adaptations were carefully selected, we did not list and study all important changes and adaptations.

Questionnaires were filled in by one member of the top management team. Consequently, we obtained only subjective perceptions of environmental change of one decision-maker; moreover, the probability that the person who filled in the questionnaire did not have all the relevant information about internal and external adaptations in the 2000-2005 period and/or maybe forgot some, is also high. This is the main source of reliability deficiencies of our data.

Data validity problems are related to the measurement construct. The way we measured the size of organizational and network structure adaptation is problematic, since we did not ask for actual extent of a particular change. We were only interested whether some particular adaptation had been introduced. The questionnaire did not spot the difference between automation as an introduction of a new machine and automation as complete automaton of manufacturing. In addition, the measurement construct did not take into account the varying importance of the adaptation conducted in one business function or another. The same deficiencies of the measurement construct apply to the network structure adaptations.

These drawbacks of the measurement construct are minimized by relatively large sample size, offering sufficient degree of freedom to make our conclusions significant. On the most general level, we can conclude that companies respond to environmental uncertainty both by organizational structure adaptations that facilitate greater flexibility, and by network structure adaptations that facilitate greater control over scarce resources. In general, hypothesis 1 and 2 are confirmed.

The research showed that under environmental uncertainty, organizational structure adaptations aim to enhance company's flexibility and responsiveness through major

restructurings of value-adding business activities like manufacturing, sales, and purchasing. These internal changes are accompanied by significant adaptations of narrow organizational domain though restructurings of cooperative relationships with suppliers, customers, and competitors.

Further analysis confirmed that significant differences among service, manufacturing, and mixed firms exist and that manufacturing companies adapt to environment relatively more intensively with organic organizational adaptation, while mixed companies adapt more by external relationships. Service firms don't adapt congruently to the same environmental change. Some apply more external adaptations – as expected in hypothesis 3 – and others more internal. Consequently, different theoretical grounds can be used to explain adaptations of each group of companies.

Adaptations of manufacturing companies to environment are best explained by environmental contingency theory. Environmental uncertainty is handled mainly by internal adaptations of their key business functions (manufacturing, sales, and purchasing). The adaptive behavior of mixed companies is best explained by resource dependence theory. They respond to environmental uncertainty mainly by restructuring external relationships – especially those with suppliers, customers and competitors - and through them altering their organizational domains. The adaptive behavior of service companies is best explained by strategic choice theory. Managers freely decide on how to respond to the environment, either through organizational adaptations, network adaptations, or both.

These findings have important implications for theoretical explanations of adaptation paths. Neither theoretical perspective was proven completely right or wrong. Each perspective is relevant under certain conditions. The step beyond is development of meta-theory able to incorporate all different perspectives congruently. A theory with meta-characteristics is complexity theory (Axelrod, Cohen, 2000; Styhre, 2002: 343-352). Its focus is on emergent properties of studied phenomena resulting from nonlinear feedback loops that construct complex adaptive system behavior. Nonlinearities and feedback loops are system specific and as such they cannot construct some general behavioral paths suitable for all companies. Instead, attention should be shifted to identification of nonlinearities and feedback loops that make a system behave in a specific way. Our network analysis managed to illuminate some of the feedback loops causing the behavioral specificities of service, mixed, and manufacturing companies.

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Razlike u prilagođavanju između uslužnih i proizvodnih poduzeća

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Sažetak

Članak proučava razlike u prilagođavanju na okolinu usporedbom uslužnih, miješanih i proizvodnih poduzeća. Prilagodbe se očituju u (ovise o) značajkama okoline i u tehnologiji. Pomoću njih poduzeća pokušavaju savladavati nepredvidivosti okoline, koje se očituju u subjektivno percipiranim povećanjima manjih, različitih razina, odloženih, umetnutih i nelinearnih promjena. Poduzeća namjeravaju ovladavati opaženim nepredvidivostima u okolini primjenom olakšavanja prilagodba, koje bilo da smanjuju nepredvidivosti okoliša, bilo da omogućuju učinkovito reagiranje na razvoj neočekivanih vanjskih promjena. Prvi tip prilagodbi objašnjavaju dvije teorije: teorija ovisnosti o izvorima i ekonomika transakcijskih troškova, dok drugi tip objašnjava teorija kontingencije (teorija ispunjenja pretpostavki). Teorija strateškog izbora objedinjuje obje vrste prilagođavanja. Na temelju tih četiriju teoretskih aspekata napravljen je model za istraživanje organizacijskih prilagođavanja na promjene u okolini. Žarište istraživanja su različitosti u prilagodba usporedbom uslužnih, miješanih i proizvodnih poduzeća. Proučavaju se organizacijske prilagodbe kako s unutrašnje, tako i s vanjske perspektive. Istraživanje je zasnovano na uzorku 236 srednjih i većih poduzeća u razdoblju 2000–2005 u Sloveniji. Rezultati su potvrdili da se poduzeća s različitim tehnologijama različito prilagođavaju. Miješana poduzeća prilagođavaju se većinom putem vanjskih odnosa, proizvodna poduzeća se u najvećoj mjeri prilagođavaju interno, dok uslužne djelatnosti koriste obje vrste prilagođavanja ravnomjerno. Prilagođavanja miješanih društava najbolje se mogu objasniti pomoću teorije ovisnosti o izvorima, prilagodbe proizvodnih poduzeća teorijom kontingencije, dok se prilagodbe poduzeća koje se bave uslužnim djelatnostima najlakše objašnjavaju teorijom strateškog izbora.

Glavne riječi: *okolina, tehnologija, organizacija, mreže, promjena.*

JEL klasifikacija: L14, L22, L23, P30

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