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## ABSTRAKTY

### PLÁNOVANIE A RIADENIE VÝKONNOSTI V PODNIKU VEDENOM ZÁUJMOVÝMI SKUPINAMI

DAVID WALERS

**Abstrakt:** Meranie výsledkov výkonnosti začína naberať „virtuálny“ prístup. Je mimoriadne dôležité, aby sa dôsledky rozhodnutí prijatých v týchto významných štruktúrach presne identifikovali a vyhodnocovali, aby sa zabezpečilo, že sa tieto rozhodnutia napokon neukážu ako dysfunkčné. Kombinácia princípov na základe bodovacích kariet s výkonnostnými prizmami ponúka sľubný prístup, avšak vyžaduje si širší výskum a zhodnotenie.

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### MERANIE VÝKONNOSTI DODÁVATEĽOV V SIETI DODÁVATEĽSKÝCH REŤAZCOV VO VÝROBE ELEKTRICKÝCH ZARIADENÍ

KYÖSTI HUHTALA, JOSU TAKALA

**Kľúčové slová:** technologický manažment, manažment operácií, manažment/riadenie výkonnosti, dodávateľský manažment, analytický hierarchický proces (AHP)

**Abstrakt:** Táto empirická prípadová štúdia si kladie za cieľ pomocou jednoduchej indukcie vytvoriť ucelenú a systematickú metódu na merania výkonnosti dodávateľov v zložitom a dynamickom podnikateľskom prostredí. Článok prezentuje a porovnáva tri odlišné metódy merania a riadenia výkonnosti dodávateľov v dodávateľskom reťazci výroby elektrických zariadení. Výskum využíva AHP (analytický hierarchický proces) na zistenie priorít pre dimenzie riadenia výkonnosti dodávateľov.

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## HODNOTENIE VÝKONNOSTI / VÝSLEDKOV POTRAVINÁRSKÝCH MALOOBCHODNÝCH PREDAJNÍ – NEMANAŽÉRSKE FAKTORY PODMIEŇUJÚCE VÝKONNOSŤ PREDAJNÍ: EMPIRICKÁ ŠTÚDIA

MIKAEL HERNANT

**Kľúčové slová:** výkonnosť maloobchodných predajní, hodnotenie výkonnosti, hodnotenie manažovania, konkurečnosť a výkonnosť, trhový potenciál a výkonnosť

**Abstrakt:** Otázka, ktorou sa táto štúdia zaoberá sa dotýka nemanadžérskych determinantov – faktorov podmieňujúcich výkonnosť maloobchodných predajní. Rozdiely vo výkonnosti medzi jednotlivými predajňami je možné vysvetliť na základe rozdielov v obchodných atribútoch, vonkajšom prostredí a v rozdielnej výkonnosti vedúcich predajní. Aby sa uľahčilo spravodlivé hodnotenie riadenia na úrovni predajní, je žiaduce, aby mal manažment na úrovni reťazca poznatky o tom, či a do akej miery je výkonnosť na úrovni predajní ovplyvňovaná faktormi, ktoré presahujú rámec riadenia vedúcich predajní. Empirické výsledky tejto štúdie ukazujú, že charakteristiky prostredia obchodu a jeho nezvratné atribúty súvisia s jeho výsledkami. Zisťuje sa, že trhové ukazovatele výkonnosti súvisia s finančnými výsledkami, hoci značná časť rozdielnosti vo finančných výkonoch sa týmito ukazovateľmi nedá vysvetliť. Štúdia naznačuje, že manažment reťazca musí prehodnotiť charakteristiky týkajúce sa lokálnych trhov a fyzických možností predajní pri stanovovaní výkonnostných cieľov. Okrem toho výsledky poukazujú na potrebu odlišovať hodnotenie predajní od hodnotenia vedúcich predajní.

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## NOVÉ SMERY PRI ÚSPEŠNOM NÁVRHU DODÁVATEĽSKÝCH REŤAZCOV

GERALD REINER, REINHOLD SCHODL

**Abstrakt:** V článku sa riešia požiadavky úspešného návrhu dodávateľských reťazcov. Začína diskusiou o procesoch v dodávateľskom reťazci. Potom vysvetľuje požiadavky merania výkonnosti dodávateľského reťazca a poukazuje na nutnosť uceleného a zrozumiteľného procesne orientovaného systému merania výkonnosti. Napokon objasňuje úlohu návrhu dodávateľského reťazca. V tomto kontexte predstavuje proces pre návrh dodávateľského reťazca, vysvetľuje ako je možné podporiť návrh dodávateľského reťazca softvérovými nástrojmi a rozvíja koncepciu integrovaného návrhu dodávateľských reťazcov.

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## MARKETING AKO INOVATÍVNA STRATÉGIA ROZVOJA VYSOKÉHO ŠKOLSTVA

OTO HUDEC, NATAŠA URBANČÍKOVÁ

**Kľúčové slová:** marketing, vzťahy s verejnosťou, vzdelávacie inštitúcie

**Abstrakt:** Príspevok je venovaný otázkam marketingu vzdelávacích inštitúcií, ktoré sú spojené s budovaním ich pozitívneho imidžu pomocou aplikácie nástrojov marketingového mixu. Pozornosť je sústredená na aktivity vytvárania vzťahov s verejnosťou. Súčasťou príspevku je aj praktický návod na vytvorenie marketingového mixu a vzťahov s verejnosťou pre fakulty.

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## AUKCIE V HOLONICKÝCH VÝROBNÝCH SYSTÉMOCH A ICH MODELOVANIE V PROSTREDÍ ZEUS

MICHAL GIRMAN, PETER KMEC

**Kľúčové slová:** holóny, agenti, aukcia, Zeus

**Abstrakt:** Jedným z riešení pre decentralizované rozhodovanie v holonických resp. agentových systémoch je aukcia, kde jej účastníci predávajú a kupujú definované zdroje. Pri aukciách môže nastať niekoľko elementárnych prípadov obchodovania: aukcia s odložením objednávky, aukcia s jedinou voľbou, aukcia s konfliktom kooperácie a akceptovania, aukcia konkurenčných ponúk a aukcia s kooperujúcimi pracoviskami. Prostredie Zeus poskytuje pre modelovanie aukcií niekoľko výhod: 1. Pre jednoduchšie aplikácie nevyžaduje znalosť programovania; 2. Pre zložitejšie aplikácie je prostredie rozšíriteľné s možnosťou využitia Java knižníc a integrovateľné s existujúcim softvérom; 3. Vnútorňý koordinačný mechanizmus plne zabezpečuje interakciu holónov; 4. Možnosti ktoré pri aukciách nastávajú, vyplývajú priamo individuálnych stratégií holónov.

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## ABSTRACTS

### PERFORMANCE PLANNING AND MANAGEMENT IN A STAKEHOLDER LED ECONOMY

DAVID WALERS

**Abstract:** Performance measurement is beginning to take on a ‘virtual’ approach. It is essential that the ramifications of decisions taken in these important structures are identified and evaluated to ensure that the decisions do not eventually prove to be dysfunctional. The combination of the scorecard principles with those of the performance prism offers an approach that shows promise but requires more research and evaluation.

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### SUPPLIER PERFORMANCE MEASUREMENT IN THE SUPPLY CHAIN NETWORK OF ELECTRICAL EQUIPMENT MANUFACTURING

KYÖSTI HUHTALA, JOSU TAKALA

**Keywords:** Technology Management, Operations Management, Performance Measurement, Supplier Management, Analytic Hierarchy Process (AHP)

**Abstract:** This empirical case study is aiming at developing by a simple induction a holistic and systematic method for supplier performance measurements in a complex and dynamic business environment. The paper presents and compares three different methods for measuring and managing supplier performance in the supply chain of electrical equipment manufacturing. The research utilises Analytic Hierarchy Process (AHP) to find out the priorities for the dimensions of supplier performance management.

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## **PERFORMANCE EVALUATION OF GROCERY RETAIL STORES NON-MANAGERIAL DETERMINANTS OF STORE PERFORMANCE – AN EMPIRICAL STUDY**

MIKAEL HERNANT

**Keywords:** Retail store performance, Performance evaluation, Management evaluation, Competition and performance, Market potential and performance

**Abstract:** The question addressed in this study is concerned with non-managerial determinants of retail store performance. Differences in performance between stores may be explained by differences in store attributes, external environment, and by differences in the performance of store managers. To facilitate fair evaluation of management at store level, it is required for management at chain level to possess knowledge about if and to what extent performance at store level is influenced by factors beyond the control of store managers. The empirical results of this study show that characteristics of a store's environment and irreversible attributes are related to its performance. Market-based performance measures are found to be related to financial performance, although a large part of the variance in the latter is not explained by such measures. The study implies that chain management need to consider characteristics of local markets and stores' physical facilities when setting target levels for performance. Further, the results suggest a distinction to be made between evaluation of stores vs. an evaluation of store managers.

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## CHALLENGES OF SUCCESSFUL SUPPLY CHAIN DESIGN

GERALD REINER, REINHOLD SCHODL

**Abstract:** In this paper we discuss the requirements of successful supply chain design. We start with a discussion about supply chain processes. We then explain the requirements of supply chain performance measurement and show the necessity of a comprehensive process oriented performance measurement system. Finally we explain the task of supply chain design. In this context we introduce a process for supply chain design, explain how supply chain design can be supported by software tools, and develop a concept of an integrated supply chain design.

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## MARKETING AKO INOVATÍVNA STRATÉGIA ROZVOJA VYSOKÉHO ŠKOLSTVA

OTO HUDEC, NATAŠA URBANČÍKOVÁ

**Keywords:** marketing, public relations, educational institutions,

**Abstract:** The article is devoted to those questions of the educational institution marketing that are connected with building of their positive image through applications of the marketing mix tools. Special attention is focused on the public relations activities. The practical guides regarding creation of the marketing mix and public relations for faculties are included as well.

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## AUCTIONS IN HOLONIC MANUFACTURING SYSTEMS AND THEIR MODELING IN ZEUS

MICHAL GIRMAN, PETER KMEC

**Keywords:** holons, agents, auction, Zeus.

**Abstract:** One of the solutions for decentralized decision-making in holonic or multi-agent systems is an auction, where the participants sell and buy the defined resources. There are several elementary possibilities that can emerge during an auction: postponement of an order, single choice auction, conflict of cooperation and acceptance, competing bids, and auction with cooperating holons. Modelling of an auction in the Zeus environment has several advantages: 1. Simple applications do not require a knowledge of programming; 2. For advanced applications, the environment is extensible utilizing Java libraries and integrating with existing software; 3. internal coordination mechanism facilitates the interaction of holons; and 4. the possibilities that can take place during an auction emerge as a consequence of individual strategies of holons.

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## PERFORMANCE PLANNING AND MANAGEMENT IN A STAKEHOLDER LED ECONOMY

### PLÁNOVANIE A RIADENIE VÝKONNOSTI V PODNIKU VEDENOM ZÁUJMOVÝMI SKUPINAMI

DAVID WALTERS

#### 1 INTRODUCTION

“Knowing the cost of your operations, however, is not enough. To succeed in the increasingly competitive global market, a company has to know the costs of its entire economic chain and has to work with other members of the chain to manage costs and maximize yield. Companies are therefore beginning to shift from costing only what goes on inside their own organizations to costing the entire economic process, which even in the biggest company is just one link.” Drucker (1995) was discussing the changes in business organization structures and the “need to know” information portfolio of management. As ever with Drucker his views are expansive. In this particular article he was focusing on the role of the costs the economic chain as a tool for creating corporate wealth (or value). Drucker suggests that the shift from cost-led pricing to price-led costing is a powerful force driving companies toward economic-chain costing: he emphasises that it is only in the mid to late 1990s that companies have, in any number, switched to price-led costing, in which the price the customer is willing to pay determines allowable costs, beginning at the design stage and from that point exerting an essential influence on subsequent processes. While Drucker does not discuss the virtual organization/value chain as such his comments certainly are pertinent:

“Companies can practice price-led costing... ..only if they know and manage the *entire* cost of the economic chain.

and

“The same ideas apply to outsourcing, alliances, and joint ventures – indeed, to any business structure that is built on partnership rather than control. And such entities, rather than the traditional model of a parent company with wholly owned subsidiaries, are increasingly becoming the models for growth, especially in the global economy.”

Drucker comments that the transformation to economic chain costing is far from easy suggesting success is built upon compatible accounting systems and

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a willingness to share information on an inter-organisational basis. The example of the close cooperation between Proctor & Gamble and Wal-Mart is used to demonstrate how information sharing and economic chain management can lead to a cost-effective planning and control system.

The role of the enterprise is to create wealth (or shareholder value); Drucker argues that this is not obvious from traditional accounting information where the emphasis is on the liquidation value of an enterprise. Wealth creating enterprises are going concerns, and to fulfill their roles management requires information that facilitates informed decision-making.

## 2 INFORMATION FOR WEALTH CREATION

Drucker's executive tool kit for managing the business is the economic chain comprising:

- **Foundation information:** the most widely used set of data are cash flow, liquidity projections and relevant ratios that indicate the efficient use of working capital and the effectiveness of investment in assets.
- **Productivity information:** these data extend the information provided to measure the productivity of assets. Typically we were concerned with plant and labour productivities. Increasingly the focus is upon the productivity of tangible and intangible assets that are knowledge based, but more significantly the measures are becoming interorganisational. Data generated for performance monitoring is concerned with total factor productivity – regardless of who actually owns the “assets.”
- **Competences/capabilities information:** Drucker suggests that the Prahalad and Hamel work on “core competences” identified the notion that: “leadership rests upon being able to do something others cannot do at all or find difficult to do even poorly.” It is essential for management to know the strength (or indeed the weakness) of capabilities. It answers the questions: do the capabilities remain relevant and if so for how long? Kay (1993) discussed capabilities as comprising architecture, reputation, innovation and strategic assets. While they all have significance architecture( the network of relational contracts within, or around, the firm) is particularly interesting. He suggests:

“the value of architecture rests in the capacity of organizations which establish it to create organizational knowledge and routines, to respond flexibly to changing circumstances, and to achieve easy and open exchanges of information. Each of these is capable of creating an asset for the firm – organizational knowledge which is more valuable than the sum of individual knowledge, flexibility, and responsiveness which extends to the institution as well as to its members”

This is particularly relevant to the virtual structure to which Drucker referred in 1995 and which are now becoming significant as organisational structures. Kay

describes three types of architecture; internal, between the firm and its employees and among employees. External architecture structures exist between the firm and its suppliers and customers; networks comprise groups of collaborating firms. Clearly “organisational knowledge and routines” are the basis for building interorganisational or stakeholder performance planning and monitoring networks.

- **Resource allocation:** this last item is more significant now than when Drucker raised it in 1995. Resource allocation is becoming an interorganisational activity. The influence of resource decisions on wealth or value creation has not changed; but the process has. Increasingly the decision is becoming one of allocation and coordination as the concept of distributed assets (or asset leverage) becomes more common within corporate structures. Kenevan and Xi Pei (2003) discuss the need for an equity approach to resource allocation suggesting that rewards and comparative financial commitments should be a guiding metric in the development of alliances and partnerships.

## 2.1 Some basic requirements

In an environment that is constantly changing and in which competition can often come from the unexpected it is essential that organizations have systematic processes in place with which to modify performance measuring systems and performance measures. Kennerley and Neely (2003) present evidence to show that few organizations have such responses in place that will ensure their performance measurement systems continue to reflect their environment and strategies. The authors present case study evidence to show that:

“ ... a well designed measurement system will be accompanied by an explicitly designed evolutionary cycle with clear triggers and:

- **Process** – existence of a process for reviewing, modifying and deploying measures.
- **People** – the availability of the required skills to use, reflect on, modify and deploy measures.
- **Systems** – the availability of flexible systems that enable the collection, analysis and reporting of appropriate data.
- **Culture** – the existence of a measurement culture within the organisation ensuring that the value of measurement, and importance of maintaining relevant and appropriate measures, are appreciated.

Through the case study the authors demonstrate the factors facilitate the development of measurement systems that are relevant to the changing environment in which this particular company found itself. They contend:

“ The data collected... .. shows that the managers ... .. now recognize the process, people, culture and systems capabilities necessary to manage a measurement system over time. They recognize that these capabilities did not exist within the organization during the first phase of their management systems

evolution, and action has been taken to ensure that the capabilities are in place to ensure that the evolution is effective in the future.”

Perhaps it is the conclusions the authors reach that are the most significant directions for the “visionaries” or “integrators” responsible for developing virtual organizations: without a structured and relevant approach to performance measurement the organization not be aware of the extent of the success of the innovative organizational structure but nor will it be aware of the need to make changes if the performance is to be maintained. An “SAS White Paper” proposes a broad approach. While this is an attempt at selling software the seven topics introduce a framework that, regardless of whether or not a particular ‘brand’ of hardware is used, has some validity.

**Enterprise Performance Management: is a key factor comprising:**

- A company (organization) wide strategy that is identified, accepted and managed by all ‘partners’.
- An organization wide “vision” is used to align processes and capabilities. Where these are not available ‘in-house’ they are identified and incorporated.
- This implies that functional units are aligned to meet the strategic direction of the organisation

**Proactive rather than reactive structures:**

- Business cycle compression creates the need for organisations to identify opportunities and threats ahead of potential competitors
- Virtual organizations that are flexible and lean are able to respond more effectively and more quickly than vertically integrated organisations.

**Abandoning the “Silo” mindset:**

- By extending corporate transactions and interactions beyond the organisation’s existing boundaries.
- Embrace value chain and value net concepts to their full extent.

**Understand and leverage relationships:**

- Worthwhile relationships are long-term, they are not managed on a transaction by transaction basis.
- Processes should be managed on a relationship basis extending across functional, organizational and even international boundaries.
- “Value” is a stakeholder issue; value criteria should be determined and monitored for long-term success.

**Automate “Best Practices”:**

- Ideally processes should be “self-learning” and “self-tuning” and be able to capture and share best practices, performance metrics and experience. In this way knowledge is created and it follows that;
- Decision making becomes more effective

**Communicate “Customised” information**

- Stakeholders must understand the vision, direction and structure they have agreed to be part of.

**Create knowledge rather than just capturing data:**

- Understand the messages from ‘day-to-day’ transactional data.
- Creating knowledge systems that relate to the business model is essential.

SAS suggest there to be common problem areas. For example, **financial management** typically lacks vision in creating structures and is more secure with well-established performance measures. For many organisations **customer relationship management**, while recent as a “collective concept”, has a quantity rather than quality perspective preferring to measure its success on market share rather than share of market value. Combining ‘knowledge’ with structured data processing analysis can result in a powerful method or tool for exploring long-term customer relationship scenarios, identifying how value propositions might be met by valued customers. **Supplier Relationship Management**, not typically practiced in most companies is another process for which clear performance metrics are necessary. And again these should be qualitative as well as quantitative. For example, organizational spending patterns should be identified, suppliers’ performance should be “ranked and rated” against meaningful criteria such as organizational objectives. A knowledge base should be established that enables potential areas for cost rationalisation, consolidation and buying power indices to be identified and used. Such a knowledge base would also permit the exploration of procurement strategies on both intra and inter organizational bases. **Human Resource (HR) development and management** can also benefit. Combining strategic information with workforce performance analytics will facilitate the evaluation of HR alternative strategies against qualitative and quantitative organisational expectations. Not only can the HR strategy be considered but more importantly so too can the future organization structure.

Bryan and Hulme (2003) identify the comprehensive nature of corporate performance management with:

“By definition, corporate-performance management involves corporate- and not just business-level managers. Unlike operating performance, which can be driven by "vertical" line-management processes, corporate performance requires "horizontal" processes involving company-wide collaboration to generate and share ideas, establish accountability, and help allocate resources effectively.<sup>2</sup> Scarce resources now include not only capital but also discretionary spending as well as the talent and management focus needed to find, nurture, and manage new projects that could boost future performance. Major corporate-wide initiatives, such as programs to improve the management of client relationships and to create new product-development and corporate-purchasing processes, would all be part of the effort.”

and:

“A particularly important part of the portfolio mix should be initiatives to communicate with and influence the expectations of major stakeholders—customers, regulators, the media, employees, and, above all, shareholders and directors. The involvement of all parts of the company in this area is essential, since strong corporate performance means results that meet or exceed the stakeholders’ expectations.”

## 2.2 Some basic issues

Neely et al (2002) comment:

“Performance measurement is a topic that is often discussed but rarely defined. Literally it is the process of quantifying past action, where measurement is the process of quantification and past action determines current performance.”

The authors continue by making an essential point:

“Organisations achieve their defined objectives – that is, they perform – by satisfying their stakeholders’ and their own wants and needs with greater efficiency and effectiveness than their competitors”

This is a valuable contribution. Neely et al are suggesting, as does Porter (1996) that performance planning and measurement occurs at two levels; a strategic level and at an operational level. **Strategic** success requires **effective** planning and control while **operational** success is achieved with **efficient** planning and control systems. They suggest this perspective is helpful in identifying qualitative aspects of strategic decisions that are qualitative in their nature and influence such as product/service reliability – an effectiveness metric. Efficiency measures are typically related to cost performance. And further, the authors identify the role of stakeholders, and the need to consider their roles and expectations, if both strategic and operational objectives are to be realised. They offer the basis for a working definition of a performance measurement system:

“A performance measurement system enables informed decisions to be made and actions to be taken because it quantifies the effectiveness and the efficiency of past actions throughout the “organization” through the acquisition, collation, sorting, analysis and interpretation of appropriate data (Based upon Neely et al (2002)).

In their work in this area the authors suggest five criteria that any performance measurement approach should address:

- A clear understanding of who the stakeholders are and what they require.
- For the “organization to establish and articulate what it requires from its stakeholders ” clearly.
- Strategies that reflect the interests of all participants.
- Processes that are in place to ensure the “organization” can implement its strategies.
- Capabilities that facilitate the operations of the processes.



Neely et al discusses performance from a traditional corporate perspective and this requires to be modified to meet the needs of the organisation structures of the “new economy”. Stakeholders become partners and their requirements and their contributions become as central to the success of the “organization” as are those of the coordinator and visionary who may initiate the structure.

The notion of interrelated systems is not new. Koch (1994) refers to the role of information technology and its ability to span corporate boundaries necessitating a review of interorganisational structures and relationships. Well before the ‘IT’ revolution, thought was being given to the functional aspects of distribution versus the view that considers distribution as an activity performed by a number of institutions. Intermediaries are seen as system functionaries, their designations are incidental: “.....what is critical is the system design through which functions can best be performed”. (Dommermuth and Andersen: 1969). The impact of information systems extends beyond distribution channels (as suggested by Short and Venkatraman (1992) and now has an impact across entire operational processes. Thus their comment concerning the impact of information systems: “.....(they can) redefine market boundaries, alter the fundamental rules and basis of competition, redefine business scope, and provide a new set of competitive weapons”, is particularly relevant. Add to this: “Just as importantly, they change the emphasis in interorganisational relations from separation to unification (Stern L W et al 1996) and the contention that interorganisational functions and processes are becoming increasingly integrated leads to a significant role for strategic operations management.

The growth of “virtual organisations” has added emphasis to the need for a strategic perspective. Oates (1998) discusses outsourcing in the context of virtual organisations. He refers to a contribution by Moran (in a Daily Telegraph supplement on outsourcing, 28 May 1997) to the effect that outsourcing was no longer seen as: “.....a way to reduce costs, it is now perceived as a route to improve business performance and competitive strength”. Oates also refers to a survey by Andersen Consulting, aimed at finding out what 350 executives expected their companies to look like in 2010. Comments regarding outsourcing suggest cost reduction remaining as a prime motivating force, but six other reasons were offered:

- To improve overall business performance.
- To sharpen business focus.
- For accessing external skills.
- For improving quality and efficiency of the outsourced process.
- To achieve competitive advantage, and:
- To create new revenue sources.

These benefits are realisable through virtual organization structures which: “Rather than owning assets, companies look to outsource functions to achieve

a high level of flexibility in providing services. There is a shift in focus to communication and linkages between the various outsourced functions and distributed assets”. (Beech: 1998) It extends its interest and influence into developing and managing networks of logically related assets (the virtual organisation). The owners of the processes clearly have their own objectives.

Clearly planning strategic operations management performance is an activity requiring perception, innovation and persuasive coordination. Any performance management model must be capable of identifying alternative solutions to meeting market based objectives, evaluating alternative structures and influences on ‘corporate performance’ and then managing (through coordination) an integrated value chain. Not easy, nor is it impossible.

This topic is pursued by Kalmbach and Roussel (1999) of Andersen Consulting who use the practice’s data to show that only 51 percent of alliances use formal performance measures and: ...of those that do, just 20 percent.....believe the measures to be sufficient. All told ,barely 10 percent of alliances have meaningful measures of performance”.

### 3 THE BALANCED SCORECARD

The **balanced scoreboard** is ideal for alliances. The nature of alliances - multifaceted and fluid - makes it important to monitor performance from a variety of perspectives. Kalmbach and Roussel cite the example of an energy company that established 10 to 15 performance measures for each alliance. The number was large enough to incorporate the alliances’ interests and limited enough to ensure that management would allocate time to monitor (and act upon) the measures. The measures provided a balanced combination of perspectives encompassing financial and strategic measures over the short and longer terms and measures that monitor processes and end results. One measure in common was **customer satisfaction**.

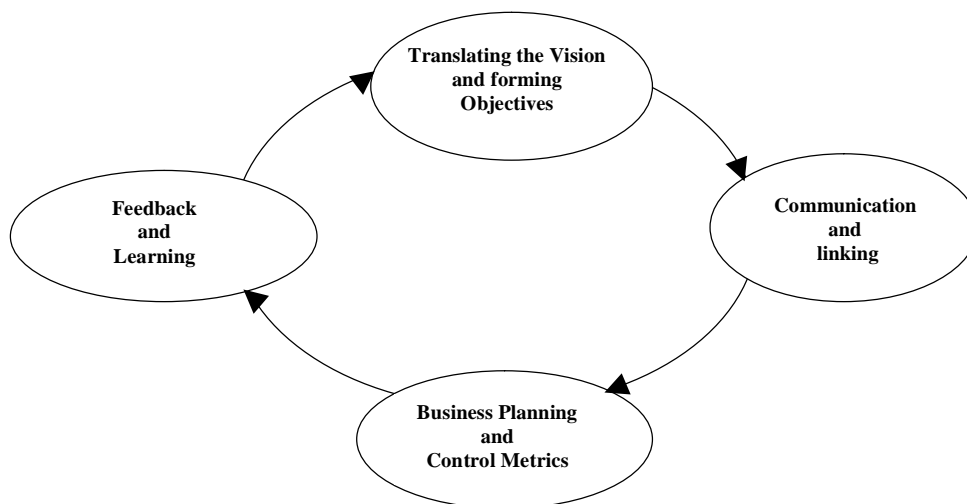
Kaplan and Norton (1993) contend: “Executives also understand that traditional financial accounting measures like return-on-investment and earnings per share can give misleading signals for continuous improvement and innovation - activities today’s competitive environment demands”. They suggest that traditional financial performance measures worked well for the industrial era, but are “out of step” with the skills and competencies companies are trying to master today. They also draw attention to the fact that: “.....no single measure can provide a clear performance target or focus attention on critical areas of the business. Managers want a balanced presentation of both financial and operational measures.

The balanced scorecard allows managers to look at the business from four important perspectives; a customer perspective (based upon customer perceptions); an internal perspective (detailing what the organisation should excel at); an innovation and learning perspective (which identifies how an organisation can continue to improve and create value); and a financial perspective (which

considers stakeholders' value expectations). They report on experiences of user companies and suggest two major benefits: a composite report which brings together hitherto, "disparate elements of a company's competitive agenda". Performance information on customer orientation, corporate response times, quality team work and management, product launch activities, and long term directions are examples of the aggregate of knowledge management provided by the Balanced Scorecard. Subsequent experiences suggest additional advantages:

"The real benefit comes from making the scorecard the cornerstone of the way you run the business. It should be the core of the management system, not the measurement system". (A review of the scorecard working in FMC corporation: Kaplan and Norton (1993)).

Kaplan and Norton (1998) also pursue the strategic management capacity of the Balanced Scorecard (see **Figure 1**). They claim its success as a strategic management system, offering management the advantage of a broader planning perspective by introducing four processes: "...that, separately and in combination, contribute to linking long-term strategic objectives with short-term actions". These processes are **translating the vision** (which helps managers build a consensus around the organisation's vision and strategy); **Communicating and linking** (facilitates managers communication of their strategy throughout the organisation, linking it to departmental objectives); **business planning** (which enables integration of business and financial plans), and; **feedback and learning** (gives organisations the capacity for strategic learning).



**Figure 1:** Balanced Scorecard porcesses

The authors have identified a number of advantages from successful applications since the introduction of the Balanced Scorecard. These include:

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- Clarify and update strategy.
- Communicate strategy throughout the company.
- Align unit and individual goals with the strategy.
- Link strategic objectives to long-term targets and annual budgets.
- Validate cause-and-effect relationships.
- Identify and align strategic initiatives.
- Conduct performance reviews to learn about and improve strategy.

The 'scorecard' is easily modified for use in strategic operations management. Kaplan and Norton have reported its successful application within a number of organisations. However, strategic operations management considers performance planning and measurement across **a number** of organisations. This requirement suggests the need for modifications to accommodate a stakeholder approach.

### **Modifying the scorecard for the virtual organisation**

Clearly the first modification is to make stakeholder objectives and linking performance a major feature (**Figure 2**) illustrates this change and also expands the **perspectives** of the scorecard model by adding an **external** perspective. The purpose of the additional perspective is to ensure that competitive responses are identified, monitored and met with due consideration and actions.

A number of questions are posed in figure two for each perspective. Each question is significant in that the answer prescribes the direction of the value creation processes and the coordination and control functions the scorecard will be expected to monitor. The **financial perspective** considers the financial objectives of the value chain participants. Essentially the performance considerations are focussed on measures of "return on investment" and the risk of exposure of the investment. It follows that VARs (Value Added Resellers) would prefer a structure that minimises inventory holding and, at the same time, maximises their use of suppliers' working capital. The amount of added value created, and where, within the value chain is important as the 'distribution' may not match the 'investment' by individual value chain partners. Consequently there may be concern over the 'equity' of its distribution. The **internal perspective** has as its primary concern the relevance of the value chain structure (i.e., partnerships and processes) to meeting customer satisfaction. The linkage with the financial perspective will ensure cost-effectiveness. The **customer perspective** is clearly focussed on achieving customer satisfaction. Its linkages with the internal and innovation and learning perspectives ensure a relevant structure of response processes and that these are monitored and acted upon. **Innovation and learning** is concerned with monitoring customer satisfaction, competitive responses and the efficacy of internal structures in meeting participant and customer value expectations and, further, that any changes that occur can be met. The **external perspective** completes the linkage. In almost any industry or market structure

there are a number of ways in which customer value can be (and is) delivered. An external perspective monitors these alternatives with regard to the extent that customer value delivery differs (as do the responses from customers) and the structures and delivery costs of competitive alternatives. The central role of **strategic stakeholder objectives** is to ensure optimal performance is achieved: that the customer receives the value expected and that value chain participants' objectives continue to be met.

Stakeholder value expectations should reflect the components identified in **Figure 3**. This is particularly important in business-to-business markets where typically value expectations are financially oriented and have clear implications for customer value expectations. It is safe to assume that if, for example, VAR expectations are satisfied VARs will choose to maintain this state by ensuring that end-user satisfaction is maintained. Assuming the value chain integrator is aware that tangible, premium and latent growth components are critical for the success of the value chain organisation and that consequently these must be reflected in the business plan for value chain, the 'value' of the value chain as an enterprise can only increase. This concern is reflected in **Figure 4** where the process moves further by raising questions concerning activities and relationships within the value chain and in eliciting the answers begins to formulate a series of potential metrics. For example the internal perspective asks whether partners are meeting their objectives, and the **customer perspective** is seeking to establish customer perceptions of the value offer and 'checking' these against their (the customers) loyalty and transaction responses. The relationship link is concerned to ensure that both customer and partnership satisfaction occur.

#### 4 PERFORMANCE MEASUREMENT IN VIRTUAL ORGANISATIONS: THE PERFORMANCE PRISM

Neely et al (op cit) have developed an approach to performance planning and measurement that addresses the expanding spectrum of stakeholders. A review of recent business trends identifies by the authors leads them to conclude:

“The point is that the only way sustainable way of delivering shareholder value in the 21<sup>st</sup> century is to deliver stakeholder value and this means enhancing, maintaining and defending the company's reputation on a broad range of fronts”.

Neely et al suggest that the 'demands' made on organizations are in fact two-way. While the stakeholders seek to improve their "lot" through more 'profitable' relationships (looking for closer and longer relationships, not simply increased profitability and productivity) organizations are beginning to programme and structure their expectations of stakeholders. The authors identify typical contributions expected of stakeholders:

- **Investors:** capital for growth, assume more risk and long-term support.
- **Customers:** profitable and long-term loyalty, feedback.

- **Intermediaries:** planning and forecasting, inventory management.
- **Employees:** flexibility, multi-skilling, anti-social hours, loyalty.
- **Suppliers:** increased customization, total solutions, integration.
- **Regulators:** cross-border consistency, advice, involvement, grants & aid.
- **Communities:** skilled employment pools,
- **Pressure groups:** closer cooperation, shared research
- **Alliance partners:** co-development, co-productivity, shared information and shared costs

Clearly the interrelationships between stakeholder and organisation are becoming structured as corporate boundaries reach beyond their legal entities and become inter-organisational. Neely and his colleagues conclude that:

“Indeed the very concept of stakeholder value itself should perhaps be quantified in terms of the strength of the interrelationship.”

#### 4.1 Value Led Management

The argument developing here is that corporate structures (as well as decision making processes) and corporate behaviour are changing dramatically and rapidly. The point may be made a little stronger: it is becoming very clear that "value" is migrating in many industries and is being captured by an increasing number of "participants". For example the automotive industry is experiencing a shift in value profile. Hitherto, value *was* maximised in the production process, current indications and expectations for the **future** are that this will migrate towards the marketing and service processes.

Three major changes are suggested. The first concerns the emphasis on performance. Currently many organisations emphasise cost-led efficiency as a primary objective. Not only is this constraining it has been shown not to be in the shareholders' interests: cost reductions typically have a negative impact on customer service and this, in turn, has the same impact on revenues. The second change involves a switch from an internal focus in which assets and resources **must be owned** to one of cooperation and collaboration in which assets and resources are **managed**. The third shift is one in which the organisation becomes *proactive* in its operations and this obtains for both customer and supply markets. **Market responsive** organisations tend to be inflexible and typically have very slow "time-to-market" responses. In other words they are imitators rather than innovators!!

This notion can be expanded upon. The role of the entrepreneur is to balance the allocation of resources between **transformation inputs** and **interaction inputs**. Central to the decision is not who owns the inputs but rather how they may be incorporated into the business organisation and how this then is structured to ensure that customer and stakeholder expectations may be met. There are

a number of important decision areas. The first concerns decisions that influence physical products; quality and production costs are important and the resource allocation decision can be influenced by production alternatives that offer an organisation the opportunity to utilise the production facilities of partner organisations that have production expertise or cost advantages. The management of 'intangible assets' can add differentiation to the physical product and improve the customer appeal by a "brand promise" that in some way increases customer perceptions of the benefits received. Innovative product and/or service design is another factor. Designs that increase, or extend, "value-in-use" for customers also differentiate both the organisation and its products. The third decision concerns where, how much, and who should invest in both tangible and intangible assets and how these should be integrated and coordinated. The "virtual community" approach that value nets and chains propose offers to increase an organisations' abilities for focussed response, flexibility of response and an ability to organise a 'timely' response.

Tapscott and Caston (1993) proposed a "generic" model of the value chain/virtual organisation. By modifying their model and using it to contrast the traditional and emerging organisation (1993) the structural and resource inputs requirements of the new model become apparent. The significant, and perhaps fundamental, difference is its inter-relationship focus. The emphasis shifts from ownership and intra-functional capabilities towards one based upon cooperation and collaboration and towards managing inputs without necessarily owning them. This in turn suggests that profitability becomes less significant. Rather the value delivered to the shareholders is oriented towards free cash flow discounted to give a net present value.

Earlier Davidow and Malone (1992) suggested:

"The complex product-markets of the twenty first century will demand the ability to deliver, quickly and globally a high variety of customised products. These products will be differentiated not only by form and function, but also by the services provided with the product, including the ability for the customer to be involved in the design of the product a manufacturing company will not be an isolated facility in production, but rather a node in the complex network of suppliers, customers, engineering and other 'service' functions".

".....profound changes are expected for the company's distribution system and its internal organisation as they evolve to become more customer driven and customer managed. On the upstream side of the firm, supplier networks will have to be integrated with those of customers often to the point where the customer will share its equipment, designs, trade secrets and confidences with those suppliers. Obviously, suppliers will become very dependent upon their downstream customers; but by the same token customers will be equally trapped by their suppliers. In the end, unlike its contemporary predecessors, the virtual corporation will appear less a discrete enterprise and more an ever-varying cluster of common activities in the midst of a vast fabric of relationships".

"The challenge posed by this business revolution argues that corporations that expect to remain competitive must achieve mastery of both information and relationships".

and Pebler (2000):

“ The virtual enterprise of the future will be much more dynamic and sensitive to the need for tuning operational parameters of the enterprise as a whole, including capital spending for both producers and service companies, optimising the whole chain of value creation. The future world will be characterised by knowledge management and collaborative decision-making by way of virtual teams. Virtual enterprises will be empowered by a willingness to do business in more productive ways and by information technologies that eliminate barriers between stakeholders and radically improve work processes.”

Clearly the way in which we measure performance needs to be reviewed in light of these changes.

## 4.2 The Performance Prism

Neely et al argue that the balanced scorecard focuses on financials, customers, internal processes, plus innovation and learning. In doing so it downplays the importance of many of the stakeholders. As discussed earlier it can be modified to do so. They also consider the strengths and weaknesses of other models. The business excellence model takes a broader view of performance and considers a wider set of stakeholders: “but also contains a host of dimensions that are effectively unmeasurable.” Similar comments are made concerning the Baldrige Award and others yet to be implemented. Neely et al argue that: “they are all partial or point solutions, offering insights into some of the dimensions of performance that should be measured and managed, but by no means all of them.” They suggest the Performance Prism rectifies this shortcoming by integrating the strengths and weaknesses of them all thereby: “offering a more comprehensive and comprehensible framework.” They argue:

“In order to satisfy their own work and needs, organizations have to access contributions from their stakeholders – usually capital and credit from investors, loyalty and profit from customers, ideas and skills from employees, materials and services from suppliers and so on. They also need to have defined what strategies they will pursue to ensure that value is delivered to their stakeholders. In order to implement these strategies they have to understand what processes the enterprise requires and must operate both effectively and efficiently. Processes... .. can only be executed if the organization has the right capabilities in place – the right combination of people skill-sets, best practices, leading technologies and physical infrastructure.”

This is the structure provided by the Performance Prism. It provides a comprehensive framework that may be used for communication model as well as



for performance measurement (see **Figure 5**). In the Performance Prism model, strategies are applied at relevant levels of the organization. They reflect overall corporate strategic direction and the strategies at other levels that contribute to these. Supporting processes and capabilities are developed and performance measures developed for both.

### 4.3 Modifying the Performance Prism for the Virtual Organisation

The Performance Prism makes a significant contribution in an academic and pragmatic context. By identifying the role of the stakeholders in the strategic decisions of the organisation a more effective as well as efficient model results. However for many industries the predominant structure is one in which corporate structures (as well as decision making processes) and corporate behaviour are changing. Furthermore, it is becoming very clear that "value" is migrating in many industries. This raises two issues not met by the model; the characteristics of the value strategy to be delivered and, a means by which the appropriate strategy can be developed and subsequently monitored for effectiveness. The principle set by Neely et al is that is that partner (stakeholder) expectations or value drivers that are of primary importance. Futhermore, Neely et al are discussing the more traditional business model. The needs of the virtual organization differ.

It is safe to assume that an inter-organisational approach to strategy will differ from that of a single company working with (and recognizing the needs and contributions of) its stakeholders. And here another assumption: given the dynamic nature of value in many industries the most likely 'common denominator' will be cash flow. Margins are changing as both value and profit migrate (See Gadiesh and Gilbert: 1998) it follows that the success of the virtual organisation and of its component partners is more readily measured in the overall free cash flow generated.

It should be pointed out that even the conventional (accounting based) approach to cash flow management is limiting, being developed for statutory reporting purposes. An alternative model is offered. This model identifies the operational and strategic decision areas that impact on cash flow planning and management and breaks these down into three broad categories the sum of which gives the firms **Free Cash Flow**.

The first category is quite familiar - **Operating Cash Flow**. Cash flow analysis at this level in the context of a "new economy" business structure allows the identification of options based around delivering both customer and corporate value either by enhancing product features or by reducing costs. These options may be internal to the organization or may be external. Basic options such outsourcing production to lower component costs or to obtain a more reliable component can be evaluated, as can the impact on both customer service (and cash flow) that may result from a shift in the companies policy towards intermediaries.

At the second level the model enables the impact on assets of alternative production and distribution strategies to be evaluated. **Cash Flow From Assets** describes the cash flow profiles that may result from alternative decisions. The

options available each have significant implications for inventory, receivables and payables together with cash flow impacts from changes in the “structure and ownership” of production and logistics in the organization.

**Strategic Cash Flow** decisions include investment in long term fixed tangible and intangible assts. They also concern working capital to the extent these are essentially long term, considering not simply work in progress and finished goods inventories but strategic sourcing issues that are involved with the design of products to benefit from the advantages of product platforms and buying exchanges established on an industry wide basis. In addition we are also concerned with the difficult, but nonetheless important, entry and exit costs that are associated with strategic cost decisions.

The eventual success of the business is the **Free Cash Flow** that is generated. To calculate this we need to consider the additional funding required by the business if it is to achieve its objectives. These will be equity and/or debt combinations. This introduces not only the cost considerations but also the perceptions of risk that the “market” may assume and issues of corporate control. The “value of the business” then becomes the discounted value of the free cash flow at a discount rate that is judged to be appropriate reflecting this risk. These levels of cash flow form an important feature of figure six.

**Figure 6** links strategies to objectives. Given the assumption that free cash flow is the **primary objective** of the virtual organization, figure six first identifies the components of this primary objective. The model uses the principle of the Dupont model, that there are links between profitability management, productivity management and financial management and further, these links can be used to explore the options available to the organization to maximize free cash flow. The **primary strategies** that will drive the organization towards meeting its free cash flow objective are; product-market development, customer retention and customer attraction. Again the virtual structure approach facilitates the evaluation of strategy alternatives.

### Structural Issues

However it is important that the performance implications of structural alternatives are considered. Campbell (1996) provides a useful typology of virtual organization, bringing out some important differences that impact on performance outcomes:

- **Internal Virtual Organisations:** relatively autonomous SBUs are formed within a large conventional business to provide operational synergies and “customised” customer responses.
- **Stable Virtual Organisations:** conventional business organisations out source non-core activities to a small network of key suppliers whose activities become integrated and interdependency with the large organisation.

- **Dynamic Virtual Organisations:** organisations concentrate on core capabilities but introduce external partners in cooperative ventures.
- **Agile Virtual Organisations:** temporary networks rapidly formed ‘to exploit new market opportunities through the mutual exchange of skills and resources.’

It follows that any performance model should now be capable of evaluating the alternative combinations of assets and asset ownership that are emerging with the recent business models and structures. These have been suggested by Boulton et al (2000) who contend:

“The encompassing challenge that companies face in this new environment is how to identify and leverage all sources of value, not just the assets that appear on the traditional balance sheet. These important assets including customers, brands, suppliers, employees, patents, and ideas – are at the core of creating a successful business now and in the future ... .. But what assets are most important in the New Economy? How do we leverage these assets to create value for our own organisations in a changing business environment? What new strategies are required for us to create value?”

The authors continue by making the point that the new business models comprise asset portfolios whose success is influenced by the interaction of the assets. Furthermore, in the new economy business model, asset portfolios are far more diversified than those of traditional organisations and include intangible assets such as relationships, intellectual property and leadership. They suggest that new business models are becoming commonplace in “every industry” in the new economy.

### Processes and Process Management

In addition performance planning and measurement models will be required to consider the implications of more recent views on process management. Following the attention given process re-engineering, business processes run horizontally *across* organizations, organizational boundaries and often across international boundaries. Neely et al (op cit) remind us that processes typically consider four separate categories these being to; **develop products and services, generate demand, fulfill demand** and **to plan and manage the enterprise**. They add:

“Processes are what make the organization work... .. They are the blue prints for what work is to be done where, when, and how it will be executed.”

To make this effective for the emerging virtual structures we must add “who” to their qualification. They add that for process management to be effective five characteristics should be measured because they quantify the measurement criteria for success these being, how good, how many, how quickly, how easily and how expensive:

- **Quality:** consistency, reliability, conformance, durability, accuracy, dependability.
- **Quantity:** volume, throughput, completeness.
- **Time:** speed, delivery, availability, promptness, timeliness, schedule.
- **Ease of use:** flexibility, convenience, accessibility, clarity, support.
- **Money:** cost, price, value

In virtual structures such an approach is essential if the strategic goal of an **effective** response is to be developed. However for the model to be successfully applied to the virtual organization the structural options should be a major consideration.

### Capabilities

Similarly for capabilities. Hamel and Prahalad (1994) have defined a core capability as: “... a bundle of skills and technologies that enables a company to provide a particular benefit to customers”. An interesting perspective that may be derived from this definition is that it is an aggregate of “skills and technologies” and as Hamel and Prahalad contend:

“it represents the sum of learning across individual skill sets and individual organisational units”. And they suggest “... it is unlikely to reside in a single individual or within a small team”. A primary reason for an organisation to consider partnerships with other organisations is simply for that reason, together with the fact that the dynamics of competition, technology and consumer value expectations make investment in core competencies unattractive. and this view is reinforced with:

“In the concept of core competence there is no suggestion that a company must make everything it sells ... although Cannon has a very clear sense of its core competencies, it buys more than 75% of components that go into its copiers. What a company should seek to control are those core competencies that make the biggest contribution to customer value”. This view also identifies the clear need for core capabilities to be linked with customer value generation. It also identifies the trend towards **virtual integration** in which the core capabilities required to complete are identified and, rather than being developed or acquired, they are leased and aggregated to create an entity which answers the question “What can we do that other organisations could not easily do as well?” Competitive advantage is determined by capabilities, and these vary. Kay identifies two categories: **distinctive capabilities** such as institutional sanctioned items; patents, copyrights, statutory monopolies, etc, but also feature: “... powerful idiosyncratic characteristics ... built by companies in competitive markets.” These are; strong brands’ patterns of supplier and/or customer relationships, specialist skills, knowledge and processes. **Reproducible capabilities** can be created (or purchased or leased) by any

company with reasonable management skills, skills of observation and financial resources. Both process and product technology are reproducible, the automotive industry is but one example.

#### 4.4 Planning And Performance: A Virtual Organisation Perspective

Given the changes in strategy and structure perspective it follows that neither the balance scorecard or the performance prism offer precisely the approach needed to plan and measure performance in the virtual communities that are beginning to become a feature of many sectors. The “interrelated approach” of Kaplan and Norton and the “stakeholder approach of (Neely, Adams, Kennerley, 2002) can be combined into a performance planning and measurement mode. Figure 7 presents a framework for the model. It extends the Neely et al. model by adding structure and asset base decisions. Both are justified by the composition of the virtual organization model that works on the premise that it is **managing** assets rather than **owning** assets that has impact on performance, (Normann; 2001).

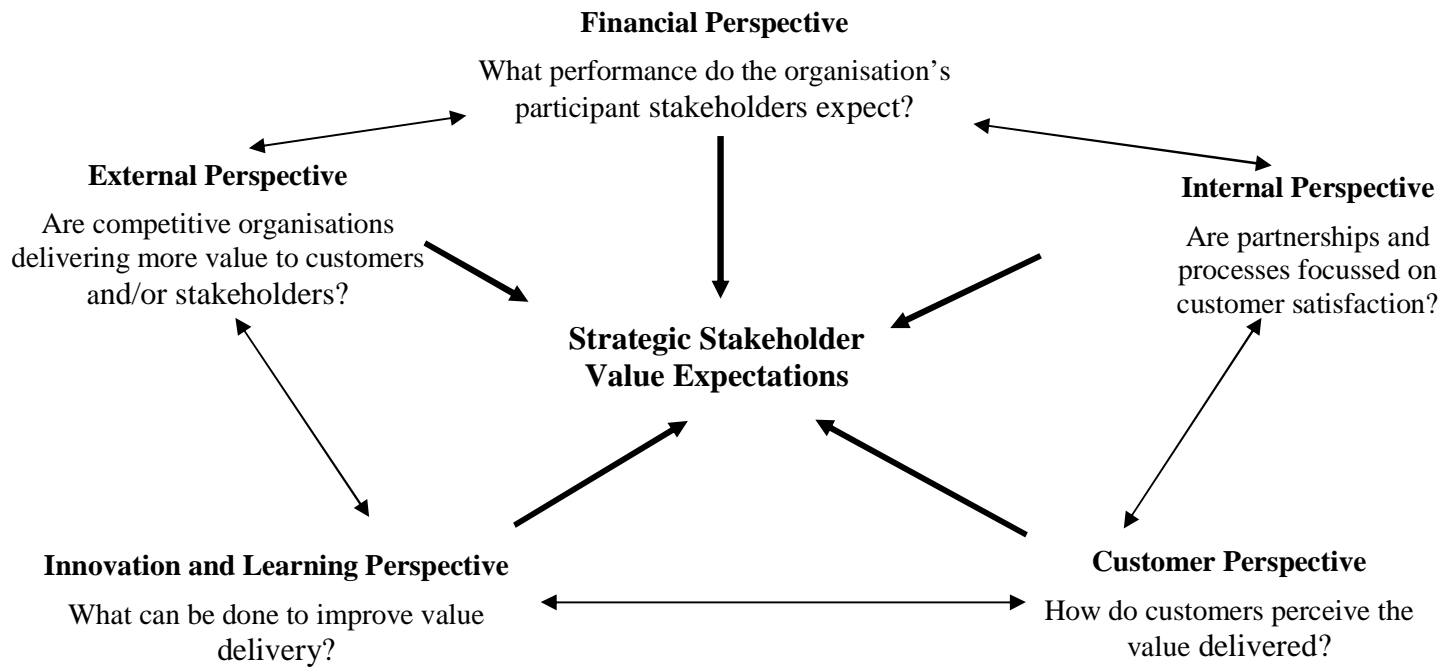
The model is explored in more detail in **Figure 8**, where the components are presented in detail. The overriding purpose of any business organization is for it to increase its “value” to its owners. The ownership may be diversified. This does not detract from this primary requirement: without ongoing financial success the survival of the organization is under threat. Accordingly the purpose of the organization is to increase the NPV of the free cash flow generated. This can only be achieved if the stakeholder expectations are met and if the stakeholders make the necessary contributions. These are suggested in figure eight and include capital for growth, long-term loyalty, feedback, ‘solutions’, together with a shared view of success and what is required to achieve success.

The selection of appropriate strategies is essential. Three basic strategies are essential: product-market development, customer retention and customer attraction. These strategies ensure the growth of the ‘organisation’ by maintaining growth from the existing business but at the same time exploring and exploiting new opportunities.

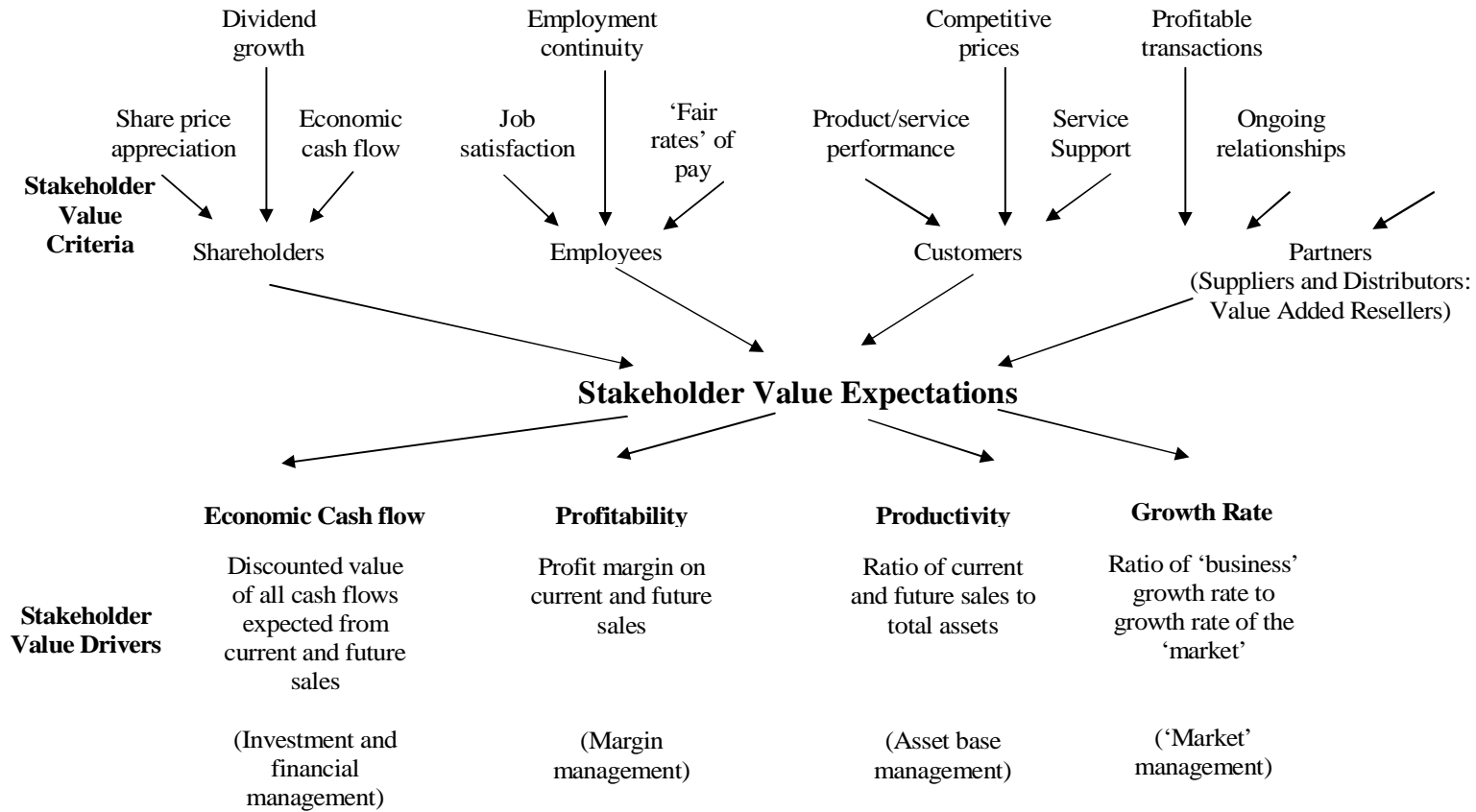
The appropriate structure is essential. The concern here is not simply about performance it is also focused on qualitative issues such as control, commitment and flexibility. Decisions on performance options should only be made when there is a clear agreement on the terms of value delivery set by the customer.

Processes are essential. Processes are ‘strategy facilitators’. Unless the ‘strategy-structure- process fit’ is appropriate it has been found that the long-term success of the organization is very doubtful. Capabilities ‘underwrite’ the success of the processes in implementing strategy. There is another issue and this concerns the development of an asset base from which the capabilities can be developed. Kay (2000) argues that the development of a strong capability base is essential if the momentum of competitive advantage is to be maintained. Indeed it could be argued that neglect can lead to competitive rigidities, these in turn eliminate any advantages that may once have been established. It follows that the asset portfolio be regularly monitored for relevance as well as performance.

Performance metrics are proposed in **Figure 9**. Empirical evidence from on-going suggests that the measure indicated are typical. Some are new and some are difficult to obtain. However a number of organizations that are becoming increasingly involved in alliances and partnerships are beginning to adopt both the structure and the metrics.



**Figure 2:** Virtual organisations participants and their expectations

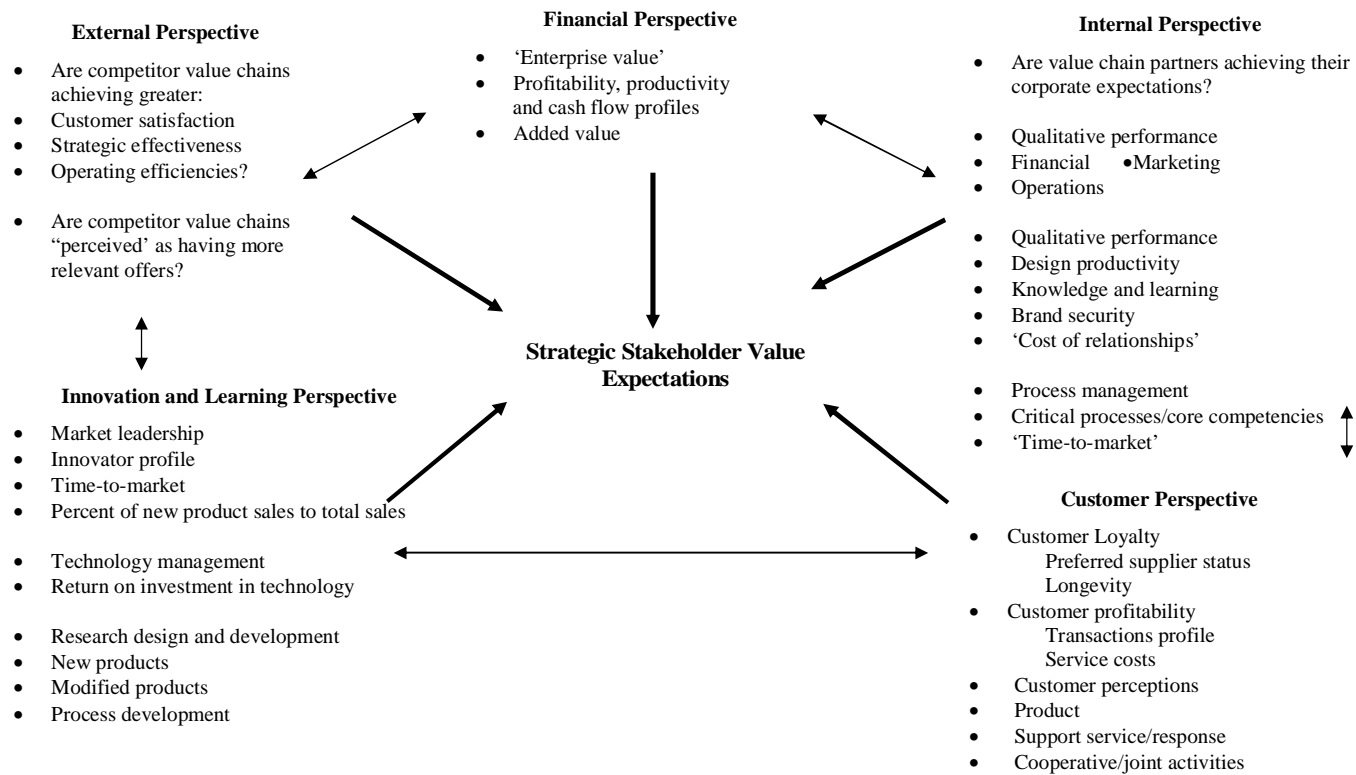


**Figure 3 :** Stakeholder performance expectations

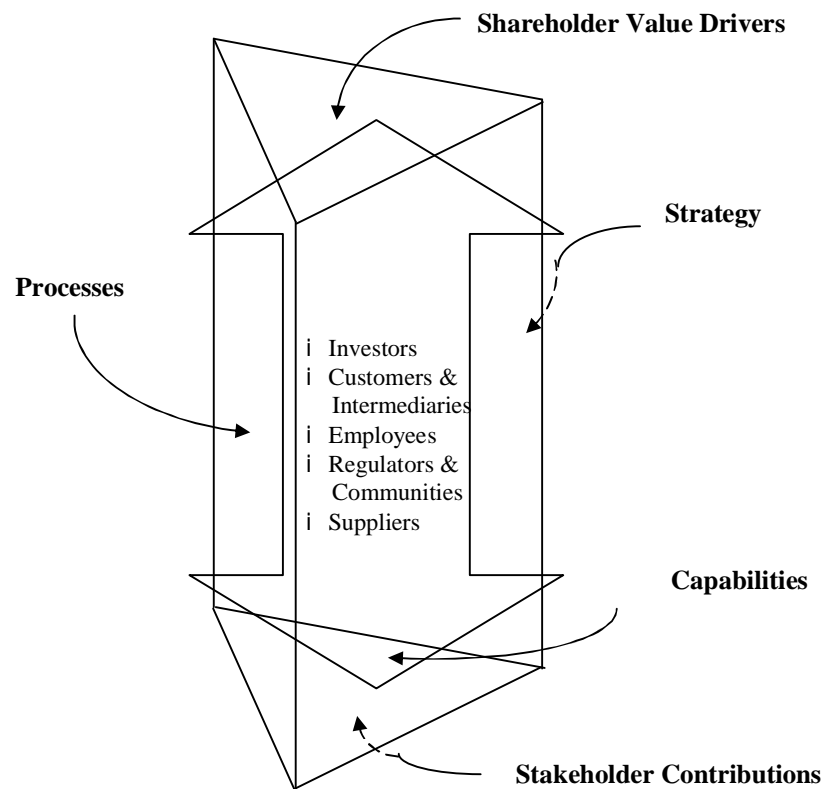
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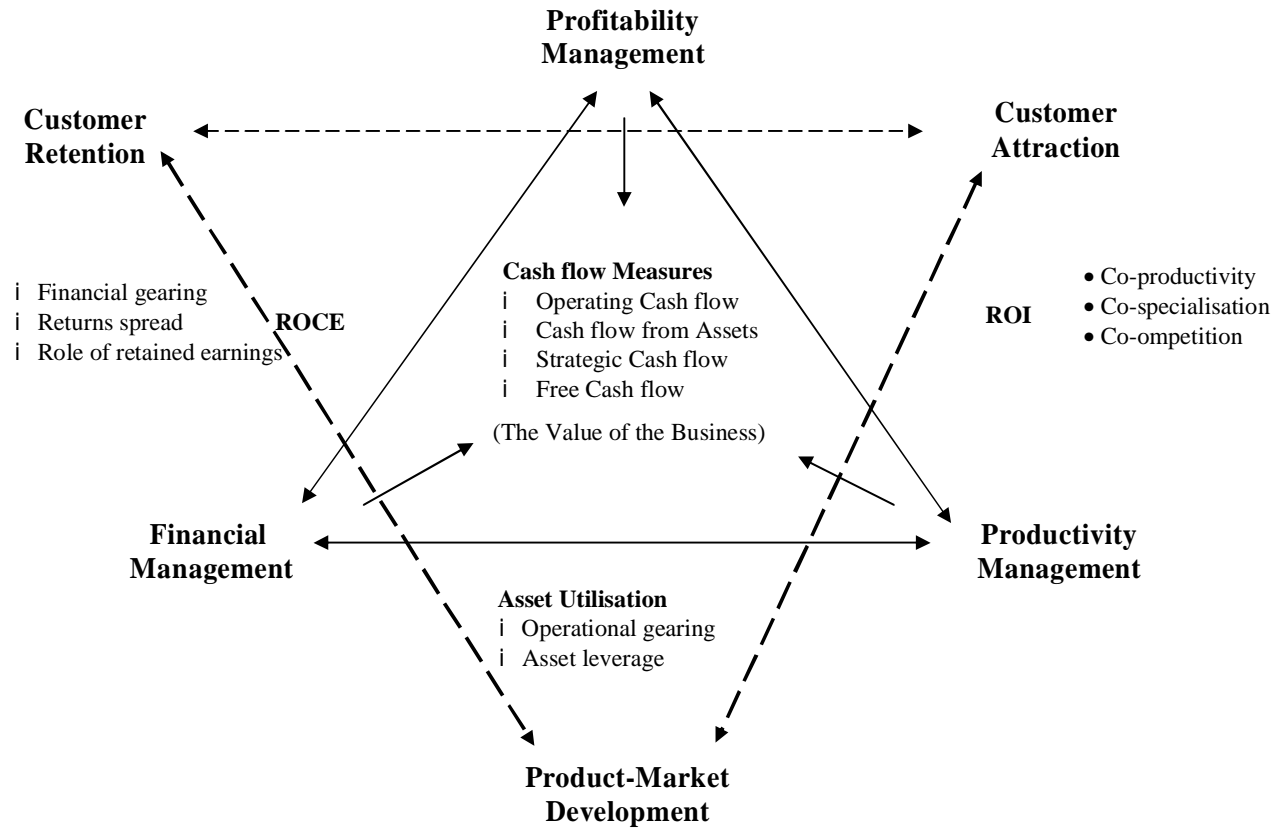




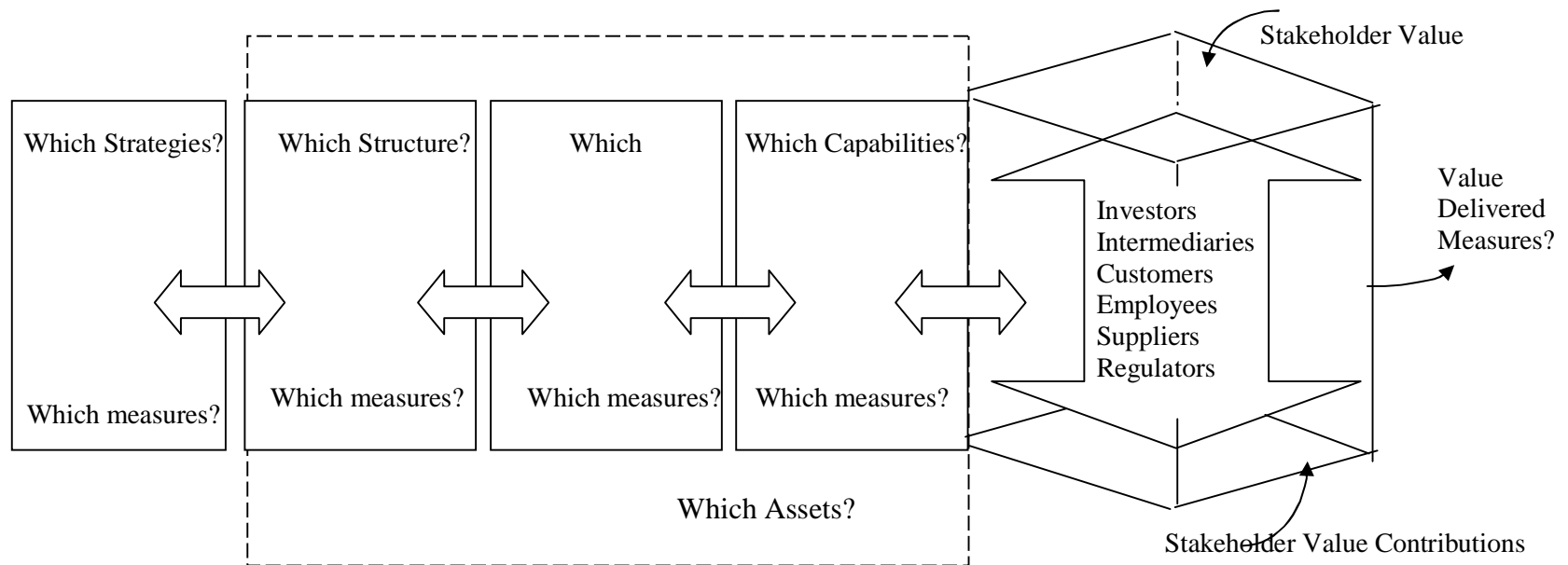
**Figure 4:** Identifying the underlying value drivers



**Figure 5:** The Performance Prism  
 (Based on: Performance Planning nad Management Prism (Neely: 2000))



**Figure 6:** Integrating the objectives and strategies of a Virtual Organisations



**Figure 7:** Value Chain Performance Management: Integrated objectives, strategy, structure, processes and capabilities

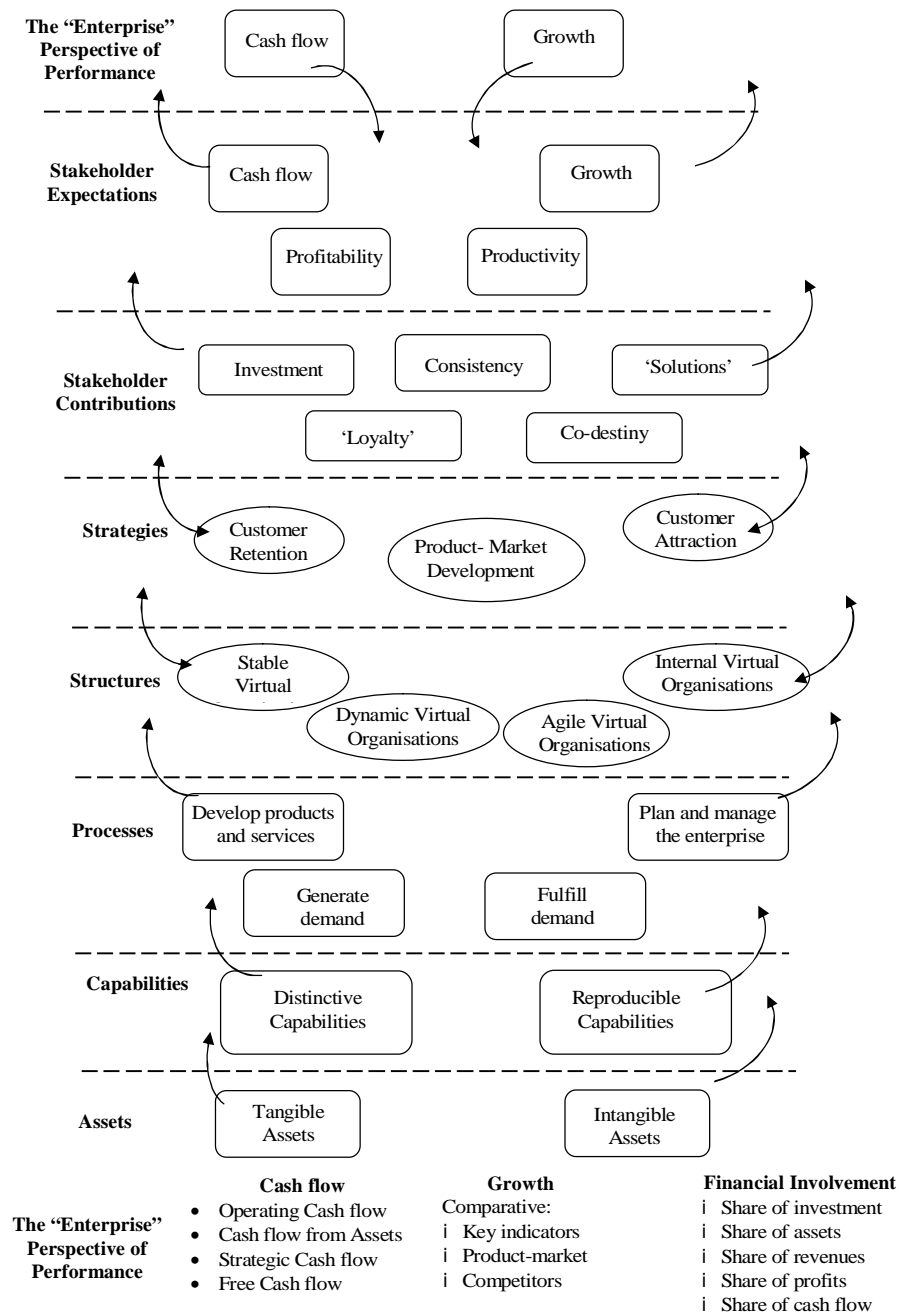


Figure 8: Planning and Performance: A Virtual Organisation perspective

	<b><u>Investment</u></b>	<b><u>Profitability</u></b>	<b><u>Productivity</u></b>	<b><u>Growth</u></b>
<b>Stakeholder Expectations</b>	i Economic cash flow i Share price appreciation i Dividend growth	i Profit margin on current and future sales i Long-term profitability	i Ratio of current and future sales to total assets i Long-term productivity	i Ratio of 'business' growth rate to growth rate of the 'market' i Ratio of 'business' growth rate to growth rate of competitors
<b>Stakeholder Contributions</b>	<b><u>Investment</u></b> i Capital for growth i Assume risk	<b><u>'Solutions'</u></b> i Co-productivity i Co-option	<b><u>Consistency</u></b> i Conformity i QC	<b><u>Co-destiny</u></b> i Cooperation i Co-specialisation i Learning
<b>Strategies</b>	<b><u>Product-Market Development</u></b> i NPD and patents i % New product/total sales i Share of market value i Free cash flow generated	<b><u>Customer Retention</u></b> i <b>Visits/orders</b> i <b>Transactions</b> i <b>"Loyalty"-T/O rate</b>	<b><u>Customer Attraction</u></b> i New customer accounts i % New customer sales/total sales i Customers from competitors	
<b>Structures</b>	<b><u>Stable Virtual Organisations</u></b> i No of O/S suppliers i Length of p'ships i Cash flows	<b><u>Dynamic Virtual Organisations</u></b> i No of new partners i No of new ventures i Cash flows	<b><u>Agile Virtual Organisations</u></b> i No of new ventures i No of temporary partnerships	<b><u>Internal Virtual Organisations</u></b> i <b>Financial</b> i <b>Time</b> i <b>Customer loyalty</b>
<b>Processes</b>	<b><u>Develop Products and Services</u></b> i Sales from new products & services i Time-to-market i Budget performance	<b><u>Generate Demand</u></b> i <b>Response rates</b> i <b>No of proposals /enquiries</b> i <b>Level of investment in new/improved products</b>	<b><u>Fulfill demand</u></b> i On-time deliveries i OCLT performance i Inventory performance i Returns	<b><u>Plan and manage the enterprise</u></b> i <b>Product/service fulfilment</b> i <b>Demand generation</b> i <b>Time-to-market</b> i <b>Cash flows</b>
<b>Capabilities</b>	<b><u>Distinctive Capabilities</u></b> 'Value' generated from: i R & D i Brands i 'Relationships' i Knowledge and Processes		<b><u>Reproducible Capabilities</u></b> <b><u>'Value generated from:</u></b> i Out sourced components and services	
<b>Assets</b>	i NPV of free cash flow	i Return on Assets	i Return on Equity	i Relevance

Figure 9: Setting Performance Measures for a Virtual Organisation

## 5 SUMMARY

Performance measurement is beginning to take on a 'virtual' approach. It is essential that the ramifications of decisions taken in these important structures are identified and evaluated to ensure that the decisions do not eventually prove to be dysfunctional. The combination of the scorecard principles with those of the performance prism offers an approach that shows promise but requires more research and evaluation.

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## SUPPLIER PERFORMANCE MEASUREMENT IN THE SUPPLY CHAIN NETWORK OF ELECTRICAL EQUIPMENT MANUFACTURING

### MERANIE VÝKONNOSTI DODÁVATEĽOV V SIETI DODÁVATEĽSKÝCH REŤAZCOV VO VÝROBE ELEKTRICKÝCH ZARIADENÍ

KYÖSTI HUHTALA, JOSU TAKALA

#### 1 INTRODUCTION

This research was carried out in co-operation between the university and a case company in electrical industry. The aim of the research was to create and compare methods for measuring supplier performance. The research began from a situation where the case company did not have any instrument to make holistic and systematic measurements for its suppliers. This research was carried out to build a proper instrument for that. The aim was to build a reliable instrument that gives a score for each supplier so that they could be compared to each other by the scores given.

The supplier performance consists of many and versatile dimensions measured by variables. These variables have to be evaluated with respect to their importance. This is done by AHP (Analytical Hierarchy Process) offering us a reliable method for evaluating the variables by pairwise comparison. The result of the first stage of the research was not very clear or reliable enough for everyday usage. That is why we compared three different methods for supplier performance measurements. After that we were sure that the method built for the case company fits to its purpose.

#### 2 RESEARCH SETTING

The objective of the research was to answer to the question: **What is the supplier performance and how could it be measured?** The theoretical part of the work tells us what are the variables of the supplier performance, and the empirical study was done to show how performance could be measured in a reliable way.

The case company works on area of electrical industry. Nowadays the delivery times are about two days but they should be shortened to one working day very soon. The company is also going to diminish the number of its suppliers and to build the vendor relationships more on the long term partnership principle with the remaining ones. These things have led the company to the situation where it has

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to know how good performance its suppliers can show. The main idea of the research bases on the philosophy: “If one can’t measure one can’t control. If one can’t control one can’t lead. If one can’t lead one can’t develop.”

The purpose of purchasing is to create value to a company. But how we could asses which supplier produces the highest value just by looking through the offers? Especially if the offers have the same price the purchaser has to evaluate which offers should be preferred and accepted. The research is done to help the purchaser to estimate the suppliers and rank them according to their performance. So, the methods developed in this study should provide the purchaser with more information for the supplier selection process.

Analytical Hierarchy Process (AHP) is used to build the decision making hierarchy for the supplier performance management by helping us to determine the priorities for the variables of supplier performance. AHP makes possible, when utilising a small group of experts along the supplier chain, to conclude **mathematically** weights for the multicriteria decision making process of supplier performance evaluation. That’s why AHP gives reliable results. AHP works as human decision making. In other words it outlines factors into groups and levels according generality and speciality, and so it creates a multicriteria decision making hierarchy. AHP process includes the following steps: At first the research problem has to be defined. All the solutions and factors that affect the decisions are defined and they are used for building the hierarchy. The hierarchy demonstrates the dependencies between the factors. The next step is to do the pairwise comparison between the factors/variables to have numeric values for them. AHP includes the mathematical function that counts these values. After that the numeric values are used to show the weights (priorities) of the factors in the hierarchy. The last step is to collect the results of the weights to count the total score for the supplier ranking process.

### 3 SUPPLIER PERFORMANCE

The chapter describes how the performance could be divided into measurable factors. Those dimensions/variables are used to build the AHP hierarchy. The supplier performance is defined by the supplier’s capability to create value to its customer. Christopher (1992) The more value the supplier can make the better is its performance. Supplier performance can be divided into bigger areas of consideration in many ways. Dobler<sup>1</sup> divides it into three main parts:

1. Technical and qualitative competitiveness. This includes good ideas for improvement, excellent planning, flawless product quality and effective production lines.
2. Price competitiveness. The aim of a purchaser is to select the suppliers that have the lowest production costs.

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<sup>1</sup> Dobler, Burt. 1996. Purchasing and supply management. P. 239.

3. Service competitiveness. The purchaser must recognise the suppliers that are especially keen to accomplish the service oriented contract having the desire and capability to create some extra value for the deliveries and co-operation.

Lillrank<sup>2</sup> divides the performance in the same way. He says that the supplier with high performance can satisfy the customer needs by just the products that are competitive in price, quality and service. The performance hierarchy used later follows mainly the Dobler's and Lillrank's philosophy. So, the next chapters describe what are the factors/variables that implement quality, service and costs based supplier management.

**Quality** is divided into four factors that implement both supplier operations' quality and product quality. The variables are **delivery promptness, delivery time, capability to make quality and economy**. Delivery promptness shows how promptly the supplier has delivered its products to the customer compared to the delivery terms. Delivery time means the time that is spent from the order to the delivery. Capability to make quality shows how many errors and none in the stock situations the supplier has caused. Economy of the supplier is also measured because continuing the co-operation has to be so sure as possible. Economy which means economic factors is measured by profit, self-sufficiency grade and ROI.

**Service** is measured by six factors showing how the supplier's service meets the customer needs. They are **location of supplier, resources, co-operation, speed of operations, documentation and flexibility**. Location is measured by the distance of the supplier from case company. Resources show how supplier's tools and machinery, buildings and how its workes success in manufacturing the products ordered. Co-operation measures if the supplier has the desire to co-operate or not and how the co-operation is run in practice. Speed of operations describes how long does it take for the supplier to handle problems, errors, offers and changes. Documentation tells if the offers, order acknowledgements, shipping boxes and documents are correct enough or not. Flexibility tells in this case study how much the supplier has free capacity and how much it can be adapted to fit the delivery time needed.

**Costs** mean here the straight purchasing costs. Costs are mentioned as one holistic factor which consists of product price, shipping costs, handling costs and stock costs. Unstraight costs, for example the costs caused by low delivery promptness or low quality, are not measured here because they have been taken into account in the other variables.

#### 4 DESCRIPTION OF THE MEASURING METHODS FOR SUPPLIER PERFORMANCE

This chapter describes three different methods to measure supplier performance. Methods 1 and 2 are based on AHP. They are summing methods and Method 3

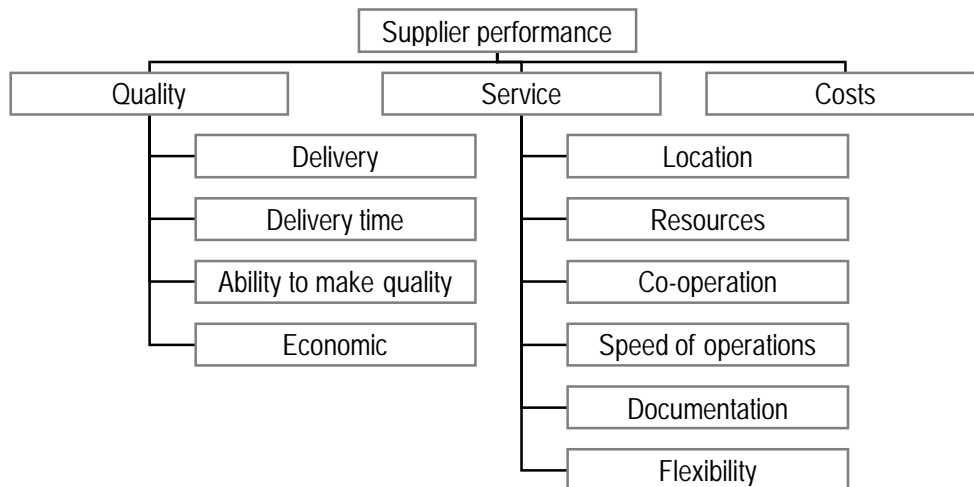
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<sup>2</sup> Lillrank P. Capability Based Strategy.

called TAST bases on multiplying (cross-correlating) method according to the mathematical function they are utilizing for the management of the dimensions (factors, variables) in the supplier measurement system.

### Method 1: The supplier performance measuring by two level hierarchy

The research began by building a hierarchy for the supplier performance that describes the performance like a tree. The “performance tree” includes the main branches and lower branches. The has to be evaluated as a complete system. The supplier performance is described as a tree in **Figure 1**.



**Figure 1:** Performance tree

Method 1 utilises two levels in the hierarchy described in **Figure 1**. **Table 1** depicts the scales of the factors and sub-factors and how they are scored by summing mathematics.

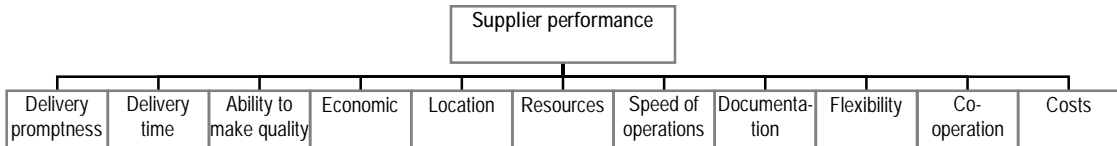
**Table 1:** Scoring table for the supplier performance measurement system

<b>QUALITY</b>	<b>Detailed explanation</b>	<b>Scale</b>				
<b>Delivery promptness</b>	% of deliveries in time	85%...100%				
<b>Delivery time</b>	Time from order to shipment	0...3 weeks				
<b>Capability to make quality</b>	% of errors and non-stocks	0...1% defects				
<b>Economic (factors)</b>	Profit, self-sufficiency grade ROI	8...16% 30...60% 10...20%				
<b>SERVICE</b>		<b>0p</b>	<b>1p</b>	<b>2p</b>	<b>3p</b>	<b>4p</b>
<b>Location</b>	Where does the supplier locate?	Foreign	Finland	<100km	<10km	<1km
<b>Resources</b>	Does supplier have good machinery and tools?	Lacks				Response well to need
	Are the facilities of the supplier suitable for doing products ordered?	Lacks				Response well to need
	Skills of the employee?	Lacks				Response well to need
<b>Co-operation</b>	Desire to invest	Wants to leave the business				Invests
	Desire to co-operation	Not at all				Much
	Openness	Does not reveal anything				Everything is open
	Fluency of co-operation	Much of problems				Fine
<b>Speed of operations</b>	Problem solving time?	Takes weeks				Gets solves on same day
	Error handling time	Takes weeks				Gets solves on same day
	Offer handling time?	Takes weeks				Gets solves on same day
	Speed of change, routine, action...	Takes weeks				Gets solves on same day
<b>Documentation</b>	Offer	Continuously uncorrect				Always perfect
	Order acknowledgement	Continuously uncorrect				Always perfect
	Shipment documents	Continuously uncorrect				Always perfect
<b>Flexibility</b>	Free capacity	70...90%				
	Flexibility in delivery time?	% in rush cases				

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### Method 2: The supplier performance measuring by one level hierarchy



**Figure 2:** Performance hierarchy with one level

Method 2 is similar as Method 1 but the hierarchy has only one level. **Figure 2** shows the hierarchy used when the weighing values were counted.

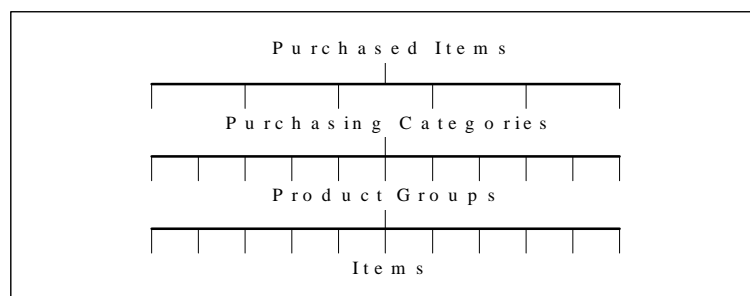
All the factors are on same level in Method 2 and so the pairwise comparisons in AHP were carried out in one group instead of the situation in Method 1 where the main group (the upper level hierarchy) and sub- groups (the lower level hierarchies) are assessed separately. The total score for the supplier performance is counted in the same way, by making the sum of the variable weighing values, in both Methods 1 and 2.

### Method 3: The supplier performance measuring by TAST

Method 3 is called TAST that is abbreviation of the Finnish words Toimittaja-Arviointin Systemaattinen Toteuttamismenetelmä, a systematic method for the evaluation of supplier performance. The use of TAST goes through a couple of steps described as follows<sup>3</sup>, see Nirhamo et al (1994).

#### Classification of the purchased items

The first step in the application of TAST is to recognise what the company is purchasing. There are several ways of classifying the purchased items. The structure shown in **Figure 3** can be recognised in every manufacturing company.



**Figure 3:** Structure of purchased items.

<sup>3</sup> Takala Josu & Timo Nirhamo. Further development of the systematic method for supplier evaluation.

Another way to classify the purchased items is to divide them by the ABC-analysis, that is using the frequency of the purchasing events and the types of the sources. The purchasing portfolio is also commonly used to classify the purchased materials. Every purchasing situation which consists of the combination of different classifications has goals fixed in the contracts, and a certain strategy is needed to meet them.

### **Setting the goals and defining the strategies**

The goals for every purchasing situation have to be settled. It is obvious that these goals have to support the general goals of the company.

### **Defining the measurable variables**

The performance of purchasing has to be measured in order to examine how the settled goals are achieved. To measure the performance a range of variables is needed. The most commonly used variables are probably the delivery promptness and defects in quality.

There are two ways to measure the suppliers. One way is to analyse the data which is available from the information system of the company. Another way is to arrange an inquiry. Analysing the data from the information system is effective and quite easy to be carried out. It is obvious that this method can be used only when evaluating the existing suppliers. An inquiry is needed in the evaluation of new and potential suppliers or if the data required when evaluating the existing suppliers is not available for some reasons. The right form of the inquiry is important. The questions have to be very simple and there can not be any opportunities of misunderstandings. The inquiry used in TAST consists purely of yes or no questions.

### **Computing the grades**

In TAST method the grade is computed to every combinations of supplier and product group. The purpose of the grade is to measure the performance of the supplier in a certain product group. The grade is used to give a general view of the status of supplying in a certain purchasing category. It is also used as a basis for classifying the suppliers as required in the ISO-9000 standard.

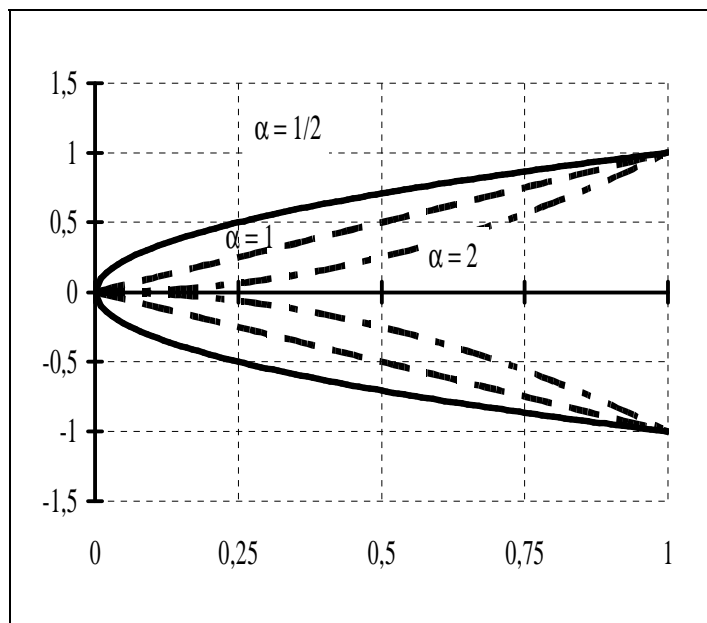
The results measured are heterogeneous and can not be compared with each other. They have to be divided into classes in order to combine them. In TAST there are three classes called a negative, neutral and positive class. The idea is that negative results decrease the grade and positive results improve it. Neutral results does not affect the grade.

The desired influence on the results can be obtained by taking an average of the factors T calculated by using the rules shown in **Table 2**. P is the weighting value of measured Variable A.

**Table 2:** Defining the values of the classes.

Class	Influence on the grade	Calculation of T
I / Positive	Improves	$P(A)^a$
II / Neutral	Does not affect	= 0
III / Negative	Decreases	$-P(A)^a$

Parameter  $\alpha$  is used to search an appropriate sensitivity to the definition of the grades. In the case where ten measured variables were used was the parameter  $\alpha = \frac{1}{2}$ . The sum of the weighting values of the measured variables are always 100 % as described later. This means that using ten measured variables the weighting values are most likely between 0 and 0,25 and  $\alpha = \frac{1}{2}$  gives an appropriately sensitive result as shown in **Figure 4**.

**Figure 4:** Examples of the functions with different values of  $\alpha$ .

### Determining the limits of the classes

When the results are divided into classes the limits of the classes have to be determined. There are no rules how to determine these limits. It is, however, obvious that they have to support the goals of the purchasing. Another aspect is that the limits of the classes can be used in order to improve the performance.



### **Defining and determining the weighting value of the measured variable**

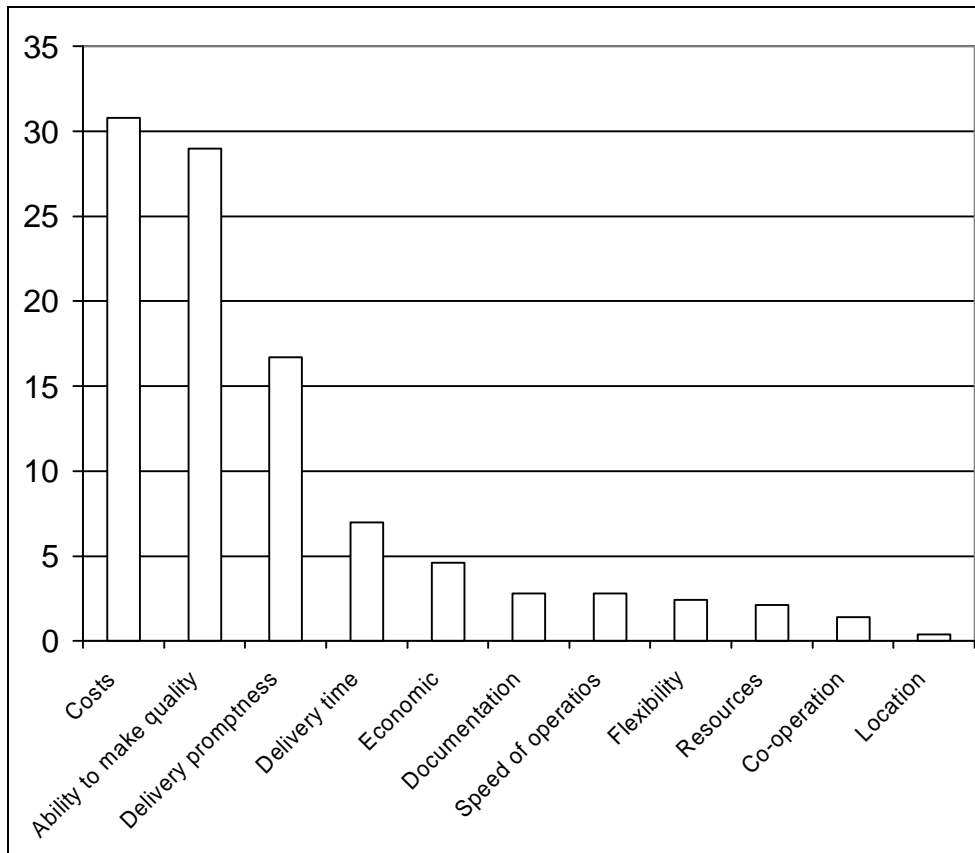
The weighting value of the measured variable is a quantity which describes the importance and the effectiveness of the measured variable. The grade computed consists of several performance measurements i.e. measured variables. The weighting values of the measured variables describe which part of the grade is formed by a certain measured variable. The weighting value is expressed as a percentage and the sum of the weighting values of all the measured variables is always 100 %.

The measured variables are defined and determined in order to measure the fulfilment of the goals settled for purchasing. This means that the effectiveness of the measured variable depends on its effect on the goals. In order to describe the effectiveness of the measured variable the weighting value of the measured variable has to be defined. The measured variables have a certain influence on a certain goal and another influence on another goal. The weighting value describes the combination of the influence of the measured variable on all goals.

## **5 COMPARISON OF THE METHODS**

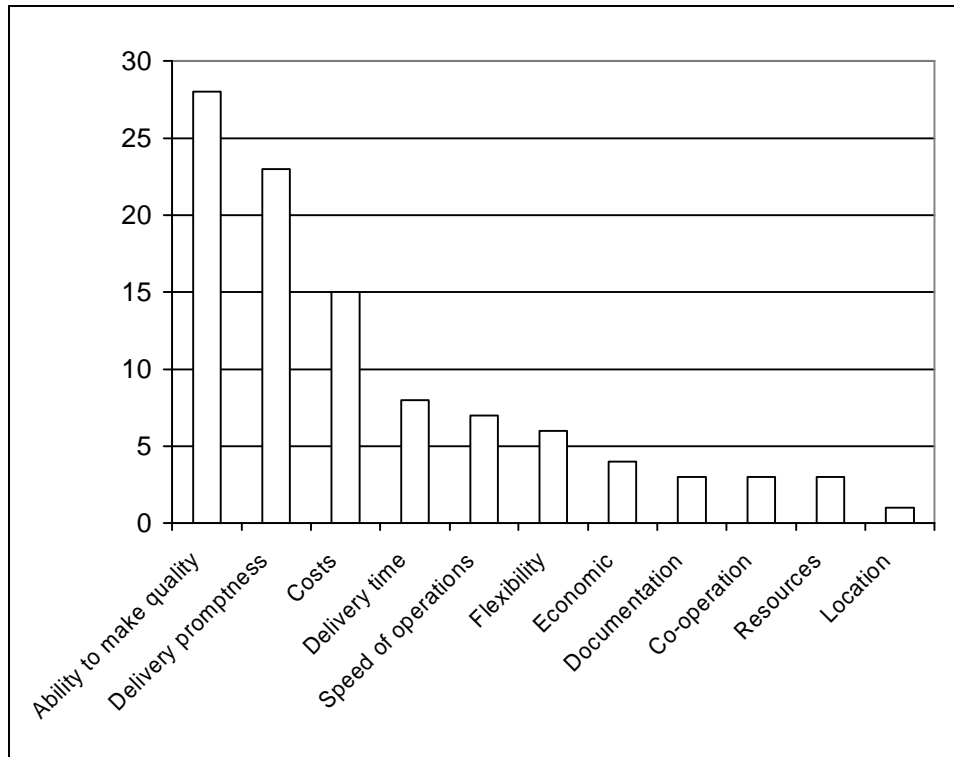
To compare the methods three different empirical tests were carried out for Methods 1, 2 and 3. The research was carried out by interviewing more than ten highly qualified informants having long working experience. They were mainly from the case company itself but some experts from the customers and suppliers were also interviewed to give more perspective view. The answers included some brainstorms to validate the decision trees proposed and the comparisons of the significance and level of the performance factors/variables. This information was used separately for Methods 1, 2 and 3.

Methods 1 and 2 give different results because the scores are counted and weighted in different ways because of the decision hierarchies applied. **Figures 5 and 6** show that AHP weights were different in one and two level hierarchy.



**Figure 5:** Weights of performance in two level hierarchy. (Method 1)

Figure 5 shows that costs and separate factors of quality are the most important according to two level hierarchy in Method 1.

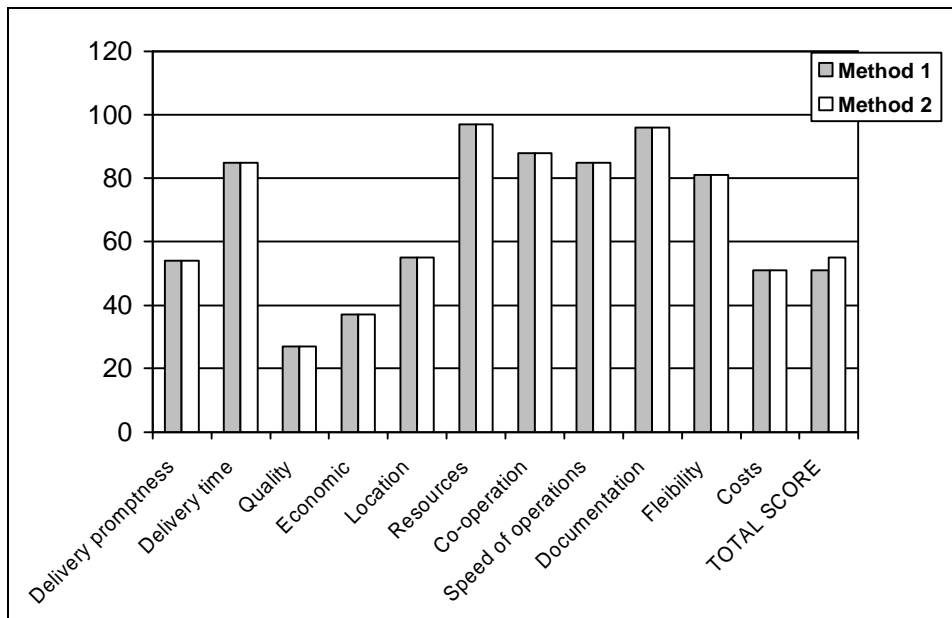


**Figure 6:** Weights of performance factors with one level hierarchy. (Method 2)

**Figure 6** shows that straight pairwise comparison (Method 2) gives the highest weights for the quality and delivery promptness but the costs are ranked on the third place. All the factors of service achieve higher weights as well.

In this case study Methods 1 and 2 provide us with quite similar results because the philosophy of Method 1, using a more structured strategic architecture for the case company's total manufacturing competitiveness, evidently reflects to the results in Method 2 using no hierarchy for the total manufacturing strategy. For generalization purposes, we should utilize these methods during a longer run because the changes in the order of the priorities of the performance variables already in this case study show us that if the evaluator does not exactly remember the strategic basis of the manufacturing competitiveness he/she'll put the weights into different order, see **Figures 5** and **6**.

**Figure 7** shows the average scores for all the factors the suppliers of the case company achieved. The total scores of Method 1 and 2 are only a little bit different.



**Figure 7:** Comparison of Methods 1 and 2.

**Method 3** (TAST) uses the multiplying method. That's why it is not at all suitable for counting the total scores in this case having not so high performance levels in all the variables. By cross-correlating all the factors in Figure 7 gives us only 0,0071 for the total score of the supplier performance!

TAST should be used so that the factors multiplied are the critical factors of the company's supply process from strategic point of view. Therefore, the number of the factors in TAST must not be more than about 3-5. This method factors is usable because it simply makes the process effective when using only the critical factors. In other words, Method 3 emphasizes the importance of high performance in every factor in the supply chain. This is caused by the high sensitiveness of the cross-correlation function. The factors that are not critical (and that can not stop the business process) for example costs should be utilised as summing principle. In that way all the critical factors should be in very high level to achieve acceptable total scores and uncritical factors can not drop the total scores to zero. This is the situation where the supplier relationships have been transformed to long term partnerships.

Another feature and even a problem when using TAST is that in that method the supplier performance is scaled and compared to the best suppliers' results. That causes a problem that if even the best supplier (in that factor) is on a low level of performance the results do not give us any impulse to make efforts for better performance because the performance looks like it were good enough! In other words the scores are good in relative but not in absolute manner. So, when using a method like TAST, a systematic and continuous strategic benchmarking process

is warmly recommended to make sure highly competitive supplier performance levels.

**As a conclusion** from this simple empirical induction, Methods 1 and 2 using AHP to determine the weights for the performance measurements will be utilized in the case company. Besides, the scales of the counting scores for different performance variables are defined by the objectives of the case company. Method 2 seems easier to be used in the future but Method 1 is probably more reliable thanks to its strategic hierarchy for manufacturing competitiveness in the more and more partnering dynamic and complex supplier relationships. However, some other but at this moment still preliminary results show us that, when the supplier chain is already utilising highly competitive world class partnerships under continuous benchmarking processes, Method 3 might be just the proper method for supplier performance evaluation, see Hakkarainen et al (2002).

During the research we discussed that Method 1 could work in a situation where strategic weighting is needed. Besides, if the research problem is so complicated that it cannot be investigated straight-forwardly in one group by Method 2, Method 1 would be just the proper method. It looks that easy-to-use Method 2 might work in best way in the case company. That's because our problem was clear from strategic point of view and we thought that using the two level hierarchy would even distort the results in some way.

The summing method works better in a case of holistic supplier measurement where we do not know well the nature of the relationships e.g. how much there are partnerships among them. The multiplying method could be used in a limited situation, e.g. in a case of partnerships. For example the factors that are critical in the supply process could be factors for it and all the other factors should be used by the summing principle. In this way the total score would not be so sensitive for low performances in single factors.

## 6 CONCLUSION

The aim of the research was create and test preliminarily a method to measure the supplier performance. We did that and made also some verifying tests and comparisons to other methods for one new method that seems evidently work in the case company. The future'll show what kind of method discussed during the study'll take the dominance in use.

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**PERFORMANCE EVALUATION OF GROCERY RETAIL  
STORES NON-MANAGERIAL DETERMINANTS OF  
STORE PERFORMANCE  
(AN EMPIRICAL STUDY)**

**HODNOTENIE VÝKONNOSTI VÝSLEDKOV  
POTRAVINÁRSKÝCH MALOOBCHODNÝCH PREDAJNÍ  
– NEMANAŽÉRSKE FAKTORY PODMIEŇUJÚCE  
VÝKONNOSŤ PREDAJNÍ  
(EMPIRICKÁ ŠTÚDIA)**

MIKAEL HERNANT

## **1 INTRODUCTION**

The question addressed in this study is concerned with non-managerial determinants of retail store performance. Standards for evaluating the performance of retail store managers in companies with numerous stores may be difficult to formulate because of differences in the profit potentials of the various stores [1]. Differences in measured performance among stores may be explained by differences in the characteristics of stores' reversible and irreversible attributes, external environment, and by differences in the performance of store managers. Irreversible store attributes refer to unchangeable attributes, primarily decided upon at the time of location, such as store size and site.

For management of a retail chain, an important issue is knowledge about if and to what extent performance at store level is influenced by factors beyond the control of the store manager. Variations in the performance potential between stores call for a differentiation between the evaluation of the performance of the store manager and that of the store. To correctly assess store manager performance, the impact of such factors on store performance need to be considered and separated in, or extracted from, the performance evaluation system. This is particularly important, e.g. in situations when the best managers are assigned to problem- or failing units in an attempt to revive those units [2].

Store performance is usually divided into three broad categories: (1) market-based performance, which captures how well a store succeeds in the competition for customers in the marketplace, (2) productivity performance, which typically relate output in terms of sales to some measure of input, e.g. selling area and labor hours, and (3) financial performance, which captures the profit and profitability generated from a store [3]. Ultimately, retailers are concerned with their financial performance [4]. Measures of profit and profitability, however, are rarely available

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for short-term (e.g. daily or weekly) performance evaluation. Hence, a key question for chain management in setting up a performance evaluation system is to what extent readily available measures of short-term performance are related to financial performance.

The purpose of this study is to investigate if performance of a grocery store is influenced by factors beyond control of the store manager. A second purpose is to investigate if readily available short-term measures of a retail store's market-based performance are related to its financial performance.

## 2 DESIGN OF STUDY

Previous research on how store performance is related to various factors is generally categorized as store location research or store assessment research [5]. The former typically departure from the classical Huff [6] model of consumer store choice behavior and is essentially concerned with identifying the ideal site for a new store, while the latter is oriented towards an evaluation of the existing branch stores held by a company and typically involves the utilization of multivariate statistical techniques (see [7] for an overview). This study joins the field of store assessment research.

A cross-sectional design is adopted for this study. A unique set of data is constructed from pooling internal accounting records, local environment data and survey data of 168 supermarkets in Sweden. The supermarkets are affiliated to the same retail chain and each supermarket is managed and owned by an individual retailer.

### 2.1 Performance Variables

Measures of store performance in previous studies have primarily comprised market-based performance of stores, involving measures of market share [8,9], sales [10-13], sales per square foot [14] or sales and sales per square foot in conjunction [15,16]. Measures of profit performance at store level are encountered in a single empirical study [17], investigating the performance of a sample of stores affiliated to a non-food merchandise retail chain.

In the present study, seven variables are defined to depict store performance. Three of these are measures of market based performance and four are measures of productivity and profit performance. Operating profit is defined as gross profit less operating costs (cost of capital excluded). See Table 1 for descriptives.

### 2.2 Measures of Environment and Irreversible Store Attributes

A critical moment in analysis of how environment affects store performance is the definition of the trade area of the store. Suggestions from previous research encompass the conduct of consumer surveys [18], rules-of-thumb [19] and some readily-available statistical classification of metropolitan areas [17]. In the present study, the trade area of a store was defined as a geographic area within a circle surrounding the store, with a radius defined by the retailer of each store. The



application of such a subjective measure of trade area size follows recommendations of Gripsrud and Gronhaug [20].

Table 1. Descriptives of store performance variables (n=168).

Variable	Mean	Median	St.dev.	Min.	Max.
<b>Market-Based Performance</b>					
Net sales (mill. SEK)	38.0	31.1	23.2	6.1	168.0
Store traffic	8,135	6,858	4,574	2,404	28,588
Average transaction size	131	130	29	65	220
<b>Productivity and profit performance</b>					
Sales per square meter	48,573	45,421	15,957	15,144	100,083
Gross margin percent	20.8	20.7	1.7	16.7	26.5
Gross profit per sqm	10,065	9,371	3,334	2,992	21,598
Operating profit per sqm	1,385	1,223	1,292	-3,064	6,428

Previous researches on grocery retailing have suggested characteristics of demand in terms of population [13] and demographics [4] to be determinants of market potential. Competition in previous studies typically is reflected by some crude measures, such as the number of competing stores in the local market area [9,12], or some measure of the store's relative size to competitors [8,13].

In the present study, sales potential in the trade area of each supermarket is operationalized by two measures. First, a measure of retail saturation is calculated through relating trade area population to the total amount of grocery store selling area. Second, data on the share of households in trade area with one or more child with age below 16 years is collected. Competition is operationalized by a Herfindahl Index (HHI), calculated as the sum of the squared market shares of all stores in the trade area. Measures of two irreversible attributes of each store are collected: (1) selling area (number of square meters) and (2) number of parking places adjacent to the store. See Table 2 for description.

### 3 RESULTS

The analysis was commenced by a bivariate analysis of the relationship between performance and characteristics of the stores and their environment. Average performance is compared between sub-groups of the 168 supermarkets. For each environmental variable and irreversible attribute variable, the set of 168 stores is split-in-half, based on the median value of each, into "low" and "high". Average performance in groups of "low" and "high" is reported in Table 3.

Table 2. Descriptives of environmental variables and store attributes (n=168).

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Variable	Mean	Median	St.dev.	Min.	Max
<i>Environment</i>					
Population in trade area	10,856	7,314	10,128	873	57,546
Retail saturation in trade area ( <i>Population per sqm</i> )	3.3	2.9	1.7	0.7	11.9
Share of hh. with child	24.6	23.7	6.5	11.1	44.2
Competition in trade area ( <i>Herfindahl Index</i> )	3,523	3,079	2,201	288	10,000
<i>Irreversible store attributes</i>					
Selling area [Sqm]	782	698	364	400	2,000
Number of parking places	88.2	50.0	95.8	0	700

In a subsequent step to the bivariate analysis, the environmental and store variables were entered as independent variables into seven regression models of store performance. The seven models were estimated twice, with two combinations of environmental variables in the regression equation due to the existence of strong intracorrelation between the variables depicting the external environment. First, a strong negative correlation was uncovered between population and Herfindahl Index of competition ( $r = -0.578$ ,  $p < 0.01$ ) in the trade area. Second, "share of households with child" was disclosed to be significantly related to both trade area population ( $r = -0.376$ ,  $p < 0.01$ ) and competition ( $r = 0.478$ ,  $p < 0.01$ ).

Due to these correlations between environmental variables, the regression analyses comprise two regression models for each performance variable. In the first, "population" and "share of households with child" is entered, while "Herfindahl Index" is excluded among the independent variables (see Table 4). In the second, the "Herfindahl Index" is included, and "population" and "share of households with child" excluded (Table 5).

Further, the store attributes "selling area" and "number of parking places" are highly correlated ( $r = 0.664$ ,  $p < 0.01$ ), introducing potential problems with multicollinearity. These potential problems were reduced by a transformation of the parking place variable through a division by the number of square meters of selling area for each store. This transformed measure of "parking places per sqm selling area" reports a correlation with selling area of  $r = 0.273$ , which, although significant ( $p < 0.01$ ), substantially reduces the potential problems of multicollinearity. The correlation of the new "parking place per sqm" with the original parking place variable is  $r = 0.839$  ( $p < 0.01$ ).

The results of the two sets of estimations of the seven regression models are reported in tables 4 and 5. All models are statistically significant in both

combinations of external factors. The adjusted  $R^2$  ranges from a highest value of 70% for net sales, to 7% for "operating profit per sqm".

Two of the three sales potential variables are significantly related to net sales and store traffic, while all three are related to average transaction size. The directions of the relationships are mixed, however, leaving no room for clear-cut conclusions. For instance, "share of households with child" is negatively related to store traffic, but positively related to average transaction. Two of the three sales potential variables are positively related to sales per square meter. Profit performance and trade area potential is positively related. Both gross profit per square meter and operating profit per square meter is uncovered to be positively related to the measure of trade area saturation (population per sqm).

Competition, i.e. the Herfindahl Index (HHI), is positively related to average transaction size, but negatively related to store traffic. Stores located in areas with intense competition (i.e. low values of HHI) thus experience larger volumes of store traffic but smaller transaction sizes, compared to stores located in areas with less intense competition. The HHI reports a positive relationship with gross margin percent; indeed, it is the single variable significant in the regression model. However, no clear-cut support is provided for profit being related to competition.

Store size (selling area) and parking places are positively related to both store traffic and average transaction size. Number of parking places adjacent to the store is disclosed positively related to sales per square meters, while selling area is reported unrelated. The number of parking places adjacent to the store is positively related to both gross and operating profit per square meter.

A correlation analysis of operating profit per square meter and market-based performance reports significant coefficients for net sales ( $r=0.301$ ,  $p<0.01$ ) and store traffic ( $r=0.244$ ,  $p<0.01$ ), while average transaction is uncorrelated. Productivity performance (sales per square meter) reports a correlation of  $r=0.510$  ( $p<0.01$ ) with operating profit per square meter.

#### 4 CONCLUSIONS

The purpose set out for this study was to investigate if store performance is related to factors beyond store manager's control. The results show that this is the case. Both characteristics of the store's environment and irreversible attributes are related to performance.

The implications for retail chain management from the results are several. First, when setting up a performance evaluation system, the results imply that characteristics of the local market and of the stores' physical facilities need to be considered in setting target levels for performance. Second, the results recommend a distinction between evaluation of stores vs. evaluation of store managers. Some stores are expected to perform better than others, due to circumstances beyond the control of store managers. This has implications for issues on the construction of reward systems for store management.

A sub-purpose for the study was to investigate if market-based performance measures are related to profit performance. Such a relationship is found in the study. However, a large amount of profit performance is unexplained by market-based performance measures. These imply that caution should be taken to rely solely on market-based performance measures in a performance evaluation system.

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## CHALLENGES OF SUCCESSFUL SUPPLY CHAIN DESIGN

### NOVÉ SMERY PRI ÚSPEŠNOM NÁVRHU DODÁVATEĽSKÝCH REŤAZCOV

GERALD REINER, REINHOLD SCHODL

#### 1 INTRODUCTION

Nowadays different concepts of supply chain management are implemented. The optimization of the flow of goods, information and funds is not limited to one's own organization, but it concerns each firm involved in fulfilling a customer order. Consequently, in order to achieve a higher competitiveness of each entity and of the entire supply chain, the chain should be designed accordingly.

The design of supply chains comprises a broad range of decisions at a strategic and tactical level. Regardless of the fact that the performance of a company and its supply chain is essentially affected by these decisions, the respective support is limited. Therefore, we will discuss some basic essentials for the proper selection of design alternatives in order to increase the performance of companies and of the whole supply chain in which they operate. Thus, this paper will discuss what can be designed, what the criteria for design are and how the design process can be supported.

With this objective in mind, the following questions are of particular interest. (1) What are the configurable processes (e.g., order fulfilment process) in regard to supply chain design and what specific requirements do they have? A taxonomy of supply chain processes should act as a basis for a systematic evaluation of design alternatives. (2) How can the effects of design decisions be measured? A comprehensive process-orientated performance measurement system is needed which is able to integrate the requirements of a specific company as well as the characteristics of the product-specific supply chain. (3) We want to discuss the requirement for supply chain design process. Additionally we wish to describe how software tools can be utilised to support the design process. Finally we want to explain a concept for integrated supply chain design.

#### 2 SUPPLY CHAIN PROCESSES

In the theory and practice of supply chain performance measurement, one specific process is the focus of attention, the so-called order fulfilment process. It is possible to find a lot of supply chain specific research work, which deals with the order fulfilment process problems and improvement opportunities, e.g., the

bullwhip effect [1]. But there are also research works, which discuss the clockspeed effect. In order to reduce the clockspeed effect it is necessary to take the following processes into account: product development, marketing, supply chain design, order obtainment and order fulfilment [2]. Therefore it is mandatory to develop a performance measurement system for supply chains which covers all relevant supply chain processes. One example of a supply chain performance measurement system is given by the SCOR Model. The Supply Chain Operations Reference Model (SCOR model) is a process reference model as a cross-industry standard for supply chain management. This model has been developed by the Supply Chain Council (SCC). The aims of the SCC are better customer-supplier relationships, software systems that better support members and benchmarking through the use of common measurements and terms as well as the ability to rapidly recognize and adopt best practice, no matter where it originates [3]. The SCOR model is a tool to build standardized, comparable and appraisable process models of supply chains. In this model plan, source, make, deliver and return are the sub-processes considered. The problem is that very important areas of supply chain management are not included, e.g., product development, order obtainment, marketing. In particular the dependencies between the product development process, supply chain process design and order fulfillment are interesting and necessary to understand. Here, e.g., “time to market” is a key process spanning supply chain performance measure.

In this context, it is interesting that traditional quality management standards (e.g., ISO 9001, QS 9000) and total quality management methods (EFQM model, etc.) cover almost the full spectrum of possible supply chain processes. This is not surprising because as defined in the context of quality management, customer focused practices involve the establishment of links between customer requirements, satisfaction and internal processes. But this is not far reaching in the context of supply chain management because these quality management concepts are not enterprise-spanning, only the interfaces between the companies are taken into account. Therefore we want to extend the customer focus to company spanning processes (supply chain processes), too. Selected supply chain processes are e.g., supply chain design process, product development, order obtainment, order fulfilment and after sales service. In general, the supply chain design process and in many industries the order fulfilment process - because of high customer requirements - occupies a central position. Therefore this paper describes (see below) the design of the order fulfilment process in detail.

### 3 SUPPLY CHAIN PERFORMANCE MEASUREMENT

Having identified the supply chain processes, it is necessary to assign performance measures to supply chain processes. Accordingly objectives for these performance measures have to be derived from the company strategy and supply chain strategy. An adequate system will be described below in detail. These are the pre-condition for supply chain management.

In order to facilitate the analysis of all aspects regarding the design and restructuring of supply chains, we define the requirements of a performance measurement system, which enables the effects of supply chain improvements to be estimated. A systematic evaluation of supply chain improvements should consist of three parts:

- **Supply chain measures:** These measures (e.g., work in process, lead time, cycle time variability, service level) try to measure the performance of supply chain processes. They have to meet two requirements: first, by looking at these measures it must be possible to evaluate supply chain efficiency (i.e., low waste achieved by reducing non-value-adding activities and inventories) and, secondly, a translation of these measures into financials must be feasible.
- **Customer satisfaction:** The second area is customer satisfaction. It is the central measure for quantifying the company's success in serving its customers' needs, which could also be called supply chain effectiveness.
- **Financials:** Financial measures (e.g., ROI, EBIT, cash flow) are still the most important indicators of a company's success. Many indicators have been developed to quantify performance. However profit, return on investment and cash flow still represent a firm's most important objectives.

The problem is that a company will only use one performance measurement system which should cover all company-specific requirements. But a company is also a partner in different supply chains, and each of those has specific requirements. These supply chains have different consumers and offer different products. Thus, a company is faced with the problem of integrating intraorganizational and interorganizational objectives. In order to be competitive with a product, a supply chain strategy that especially considers consumer requirements is necessary. The reasoning is that competition takes place between the supply chains, and not between the single companies.

Above, we have stated that process orientation is a precondition for supply chain management. Therefore, the structure of a process-oriented performance measurement system is described that could help companies to integrate supply chain strategy requirements. This concept consists of three levels. The first level includes financial (e.g., ROI, cash flow) and non-financial business results (customer satisfaction, customer loyalty and market share). The second level shows the business processes of the company and the third level comprise the



product specific processes. The first (business results) and the second (business process performance) levels are aggregates of the underlying third level (product specific processes). The third level is also interesting from the perspective of supply chain management and design.

The idea is that the company with direct consumer contact identifies the consumer requirements and satisfaction as well as communicates these requirements to the other supply chain partners having their position in upstream of the chain. Furthermore, company spanning teams are necessary to identify collect and monitor company spanning performance measures. Subsequently these teams are also ideal to carry out company spanning continuous improvement projects.

## 4 SUPPLY CHAIN DESIGN

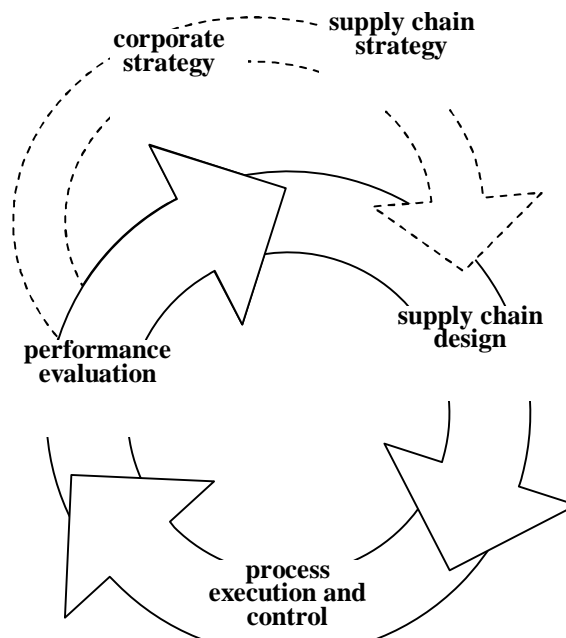
In supply chain management decisions can be classified, according to the time horizon and the level of detail of decisions, into strategic, tactical and operative decisions. Strategic decisions are addressed to the specification of the long-term environment in order to develop the supply chain and comprise for example the selection of business locations, the determination of long-term capacities of production and inventories, as well as the selection of a long-term product programme. Tactical decisions are based on strategic decisions and establish a foundation for operative actions, which refer to the fulfilment of particular customer orders. The time horizon of tactical decisions is shorter than of strategic ones. Tactical decisions comprise for instance the determination of optimal stock levels, and order policies, as well as the establishment of appropriate supplier relationships. Strategic-tactical decisions of supply chain management can be summarized under the term supply chain design. The content of the supply chain design includes on the one hand the design of appropriate process structures and on the other hand measures for the coordination of the supply chain.

### 4.1 Supply Chain Design Process

In the following we show an improvement cycle (see **Fig. 1**) for supply chain design, which is based on the assumptions of a decentralized design process and supply chain partners with equal rights and power. Product specific customer requirements are determining the type of the consumer product (e.g., functional, innovative). These product types provide the basis for the selection of an adequate supply chain strategy (e.g., lean, agile). As a consequence the chosen supply chain strategy influences the selection of suitable market qualifiers and winners out of the pool of potential supply chain measures. The term market qualifier refers to the minimum requirements of a supply chain to enter a specific market place. Market winner is the capability of a supply chain to actually acquire a customer order. Christopher and Towill [4] propose for different supply chain strategies corresponding market winners. Accordingly, a market winner for an agile supply chain is service level, for a lean supply it is cost, and for a hybrid form of a lean and agile chain it is lead time. Apart from the supply chain strategy the corporate

strategies of the supply chain partners have to be considered as well (e.g., cost leadership, technology leadership).

The selected supply chain strategy and the corporate strategies have a direct impact on the design of the supply chain. The design comprises the supply chain structure, as well as the supply chain coordination. Supply chain design is the basis for the execution and controlling of value adding processes. After that analysis and assessment of the supply chain performance has to be carried out regularly. This step should involve process oriented performance measurement and should take the existence of operational risks into account. The evaluation of the supply chain efficiency and effectiveness consists of a comparison of the requirements of the strategies and the achieved performance, whereby for the ideal values of the performance measures not only a single target value but also an upper and a lower limit should be determined. The results of the evaluation are the basis for further design steps in the next improvement cycle. If substantial discrepancies between the achieved and the desired performance are discovered, and moreover if the customer requirements or the market conditions have been considerably changed, in addition the supply chain strategy and corporate strategy have to be adapted.



**Figure 1** Cycle for Supply Chain Improvement

## 4.2 IT-Support for Supply Chain Design

For successful supply chain design the support of IT-solutions is needed. While Enterprise Resource Planning (ERP) systems concentrate on a company's internal

logistics and production processes, Advanced Planning Systems (APS) offer functionalities for the planning and controlling of the company spanning supply chain. However, it should be mentioned that mostly planning at operational level is supported by these systems. [5]. Furthermore APS usually solely support centralized planning and controlling of the supply chain. In case functionalities for supply chain design are offered, the whole scope of possible functions is typically not covered, but instead only selected modules (e.g., location planning) are offered by such tools. For the purpose of a current overview it can be referred to a market study [6], which compares IT-solutions in the field of supply chain planning of 23 software producers. The assessment is based on a model, which classifies planning tasks of supply chain management that also covers the tasks of supply chain design.

### 4.3 Integrated Supply Chain Design

Next, the question will be answered, how the explained improvement cycle for supply chain design can be integrated with existing transaction systems. For that reason a concept for integrated supply chain design will be presented (see **Fig. 2**). The aim of the design cycle is the continuous improvement of the supply chain design by modifying the supply chain structure and coordination. This can be achieved by the application of dynamic, stochastic process simulation. As an input for simulation the processes have to be represented firstly, which can be supported by reference models for supply chain management (e.g., SCOR model).

The operational planning, execution and control of the value adding processes is carried out within the framework of the execution cycle. For that purpose an interaction between ERP systems and operational oriented modules of APS takes place. Additionally, data warehouses are utilized for centralized data management. When we look at the design and execution cycle, dependencies and interactions do indeed exist. On the one hand the design cycle determines the supply chain processes, which are executed in the execution cycle. On the other hand the execution cycle delivers the input for the evaluation of the processes in the design cycle.

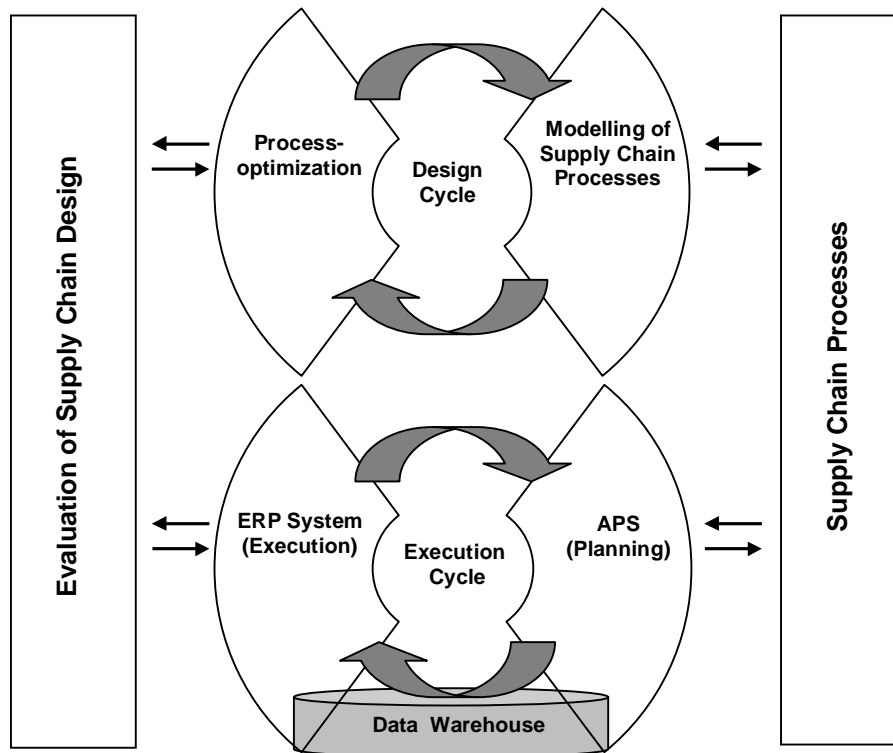


Figure 2 Integrated Supply Chain Design [8]

## 5 CONCLUSION

In general companies understand that performance measures are essential to support successful supply chain management. Traditional approaches to monitoring performance had been metrics projects and balanced scorecards. Although conceptually compelling, most balanced scorecards were implemented as static management "dashboards", unable to drive action or performance improvement [7]. Therefore it is important that enhanced performance measurement systems try to overcome these limitations and take into account process orientation and continuous improvement. Additionally it is essential that these supply chain performance measurement systems include traditional performance indicators (cost, quality, flexibility and performance) and also company spanning performance measures (bullwhip effect, inventory days of supply, cash to cash cycle time, etc.). Furthermore the translation from performance measures to financial ones must be feasible.

This article has explained the range of relevant supply chain processes, measures to evaluate supply chain improvements, and introduced a procedure for integrated supply chain design. In general we have shown the theoretical framework. In order to cope with the challenge of the practical implementation as a consequent step it

is planned to test the integrated supply chain design concept in a laboratory environment in co-operation with industrial supply chain partners, academic institutions and providers of IT-solutions for supply chain management.

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## MARKETING AKO INOVATÍVNA STRATÉGIA ROZVOJA VYSOKÉHO ŠKOLSTVA

### MARKETING AS AN UNIVERSITY EDUCATION DEVELOPMENT INNOVATIVE STRATEGY

OTO HUDEC, NATAŠA URBANČÍKOVÁ

#### 1 ÚVOD

Vo vzdelávacom systéme každej krajiny majú univerzity tradične významnú úlohu. Pripravujú nové generácie na realizáciu spoločenského rozvoja. Existujú však aj v istej dobe a za určitých podmienok. Znamená to, že by mali byť zapojené do skutočného spoločenského procesu (Ďaďo, Laščák). Pokiaľ chcú univerzity napomáhať procesu rastu priemyslu a služieb a byť stimulom v procese zmien národnej a regionálnej ekonomiky, musia si osvojiť cieľavedomé správanie sa, ktoré pomôže posilniť nové spôsoby spolupráce vo vnútri aj mimo univerzity (podniky a rozličné regionálne inštitúcie). Do tohto úsilia musia byť zahrnuté odborové zväzy, profesionálne združenia, vlastníci firiem, miestna obchodná a priemyselná komora, univerzity, miestne a regionálne agentúry a organizácie, štátne rozvojové agentúry ako aj neziskové organizácie.

Pracovníci univerzít, ktorí zabezpečujú styk univerzity s komunitou musia zároveň zabezpečovať vzájomnú vysokú informovanosť ako aj spätnú väzbu vo vnútri univerzít. Je potrebné presvedčiť verejnosť, že univerzity nestoja bokom od praktických činností a že skutočne zohrávajú inovatívnu úlohu, ktorá povedie k udržateľnému rastu. Uplatnenie praktík marketingu s cieľom získať záujem verejnosti, vytvoriť vysokú úroveň imidžu inštitúcie a tým zlepšiť hodnotenie jej činnosti, to sú len niektoré prínosy pochopenia významu marketingu ako inovatívneho nástroja rozvoja vysokého školstva na Slovensku.

#### 2 MARKETINGOVÝ MIX A JEHO VÝZNAM PRE VZDELÁVACIE INŠTITÚCIE

Marketing je podľa **Payneho** (1996) procesom vnímania, porozumenia, stimulácie a uspokojovania potrieb špecifických cieľových trhov pri využití zdrojov organizácie. Je súborom činností a procesov, ktoré majú slúžiť k rozpoznaní alebo rozvinutiu potreby alebo želania zákazníka, k vývoju tomu zodpovedajúceho produktu a ku komunikácii a následnej distribúcii tohto produktu zákazníkovi, čoho výsledkom je vzájomne výhodná výmena vedúca k dlhodobej spokojnosti zákazníka, a teda v konečnom dôsledku i ku spokojnosti organizácie a spoločnosti. Býva definovaný aj ako manažérsky proces, zodpovedajúci za

identifikáciu, predvídanie a uspokojovanie požiadaviek klientov pri dosahovaní zisku (Janečková a Vašítková, 2000). Podľa Westwooda (1999) zahŕňa vyhľadávanie toho, čo spotrebiteľ chce a porovnáva produkty organizácie s týmito potrebami v procese vytvárania zisku. Často je však spájaný aj s predstavou „oklamania“, „nalákania“ či „podvedenia“ zákazníka, čo je však v protiklade s jeho podstatou, ktorou je vytvorenie určitej hodnoty v prospech zákazníka a ktorú zákazník ocení (Urbančíková, 2002). Baker (1995) uvádza, že marketing je procesom výmeny medzi jednotlivcami alebo organizáciami, ktorého výsledkom je vzájomný prínos a uspokojenie zúčastnených.

V diskusii o stratégiách trhových produktov marketingoví pracovníci obvykle vychádzajú zo štyroch základných strategických elementov často označovaných ako 4 P marketingového mixu: produkt (**product**), cena (**price**), miesto alebo distribúcia (**place**) a komunikácia so zákazníkom alebo podpora predaja (**promotion**). Avšak povaha služieb, zvlášť takých aspektov ako zahrnutie zákazníka do produkcie a dôležitosť faktora času vyžaduje, aby boli v marketingovom mixe služieb obsiahnuté aj ďalšie strategické elementy. Na vyjadrenie povahy služieb sa používa označenie 7P integrovaného manažmentu služieb. Úspech v oblasti služieb si vyžaduje synergiu a integráciu 7P. Okrem produktu, ceny, distribúcie a komunikácie je nutné pripojiť ďalšie 3P - materiálne prostredie (**physical evidence**) ktoré pomáha zhmotneniu služby, ľudia (**people**) usmerňujúci vzájomnú interakciu medzi poskytovateľom služieb, a sledovanie a analýza procesov (**process**) poskytovania služieb, ktoré zefektívňujú produkciu služby a robia ju pre zákazníka príjemnejšou (Janečková a Vašítková, 2000). Lovelock a Wright (2002) popisujú marketingový mix služieb pomocou 8 P, ôsme P predstavuje produktivitu a kvalitu (**productivity and quality**), ktorá udáva, ako efektívne sú vstupy služieb transformované na výstupy, ktoré pridávajú hodnotu pre zákazníkov.

Marketingový mix je významným nástrojom predaja. Organizácia ho využíva vo fáze využitia výsledkov segmentácie a umiestnenia (pozicionovania) služby (Mateides a Ďaďo, 2002). Je prostriedkom realizácie marketingovej stratégie a marketingového plánu. Marketingový mix musí zladiť všetky kľúčové prvky marketingových aktivít. V **tabuľke 1** je znázornený možný marketingový mix vzdelávacích inštitúcií pripravený pre Ekonomickú fakultu Technickej univerzity v Košiciach.

V ďalšom sa budeme detailne zaoberať vzťahmi s verejnosťou, ktoré ako súčasť marketingového mixu vytvárajú podmienky pre budovanie pozitívneho imidžu vzdelávacích inštitúcií v očiach verejnosti.

**Tabuľka 1:** Návrh marketingového mixu pre Ekonomickú fakultu TU Košice

<b>Produkt</b> (hmotný a nehmotný statok, ktorý je predmetom ponuky)	Sortiment	<ul style="list-style-type: none"> <li>• Študijné odbory denného a externého bakalárskeho a inžinierskeho štúdia (klasická výučba a dištančné vzdelávanie)</li> <li>• Kurzy ďalšieho vzdelávania</li> <li>• Realizácia výskumu, odborných prác, spracovanie štúdií, analýz, projektov</li> <li>• Odborné poradenstvo</li> <li>• Hĺbka a šírka sortimentu – napr. aké kurzy ďalšieho vzdelávania, aké vzdelávacie technológie, dĺžka kurzov a štúdia</li> </ul>
	Kvalita	<ul style="list-style-type: none"> <li>• Systém riadenia kvality, certifikácia</li> </ul>
	Značka	<ul style="list-style-type: none"> <li>• Logo, názov kurzu, slogan, odkaz a pod.</li> </ul>
	Popredajné služby	<ul style="list-style-type: none"> <li>• Zasielanie informácií o ďalších službách, odborné poradenstvo, profesné poradenstvo, aktualizácia správ, produktov a podobne.</li> </ul>
<b>Cena</b> (suma, ktorú má zaplatiť zákazník, ak chce produkt získať)	Úroveň	<ul style="list-style-type: none"> <li>• Rozlíšenie cien na základe produktov a cieľových skupín, stanovenie hornej a dolnej hranice ceny, dolná hranica – suma nákladov vynaložených na vyprodukovanie produktu plus primeraný zisk, horná hranica – očakávané alebo už realizované ceny porovnateľných produktov konkurenčných subjektov</li> </ul>
	Platobné podmienky, spôsob platby, cenová diferenciácia a zľavy	<ul style="list-style-type: none"> <li>• Platba vopred, platba zálohová, platba po poskytnutí služby, opakovaná pravidelná platba pod.</li> <li>• Závislosť na kvalitatívnej kategórii služby, od množstva, od času, doplnkových služieb, subjektu spotreby, množstva spotrebovanej služby apod.</li> </ul>
<b>Miesto</b> (spôsob ako sa produkt dostane od producenta k spotrebiteľovi)	Lokalita služby a jej prístupnosť	<ul style="list-style-type: none"> <li>• Umiestnenie vzdelávacej inštitúcie</li> <li>• Realizácia vzdelávacích aktivít na mieste určenom zákazníkom</li> <li>• Dostupnosť z hľadiska transportu, z hľadiska prístupu na Internet, z hľadiska vstupných predpokladov na štúdium</li> </ul>
	Distribučné kanály	<ul style="list-style-type: none"> <li>• Priama výučba</li> <li>• Internet, pošta, e-mail, fax a iné</li> </ul>



	Pokrytie trhu	<ul style="list-style-type: none"> <li>• Miestne, regionálne, celoslovenské, zahraničné</li> <li>• Určenie segmentov trhu, ktoré organizácia pokrýva</li> </ul>
<b>Podpora-komunikácie</b> (sprostredkovanie informácií o produktoch aj organizácii, presvedčovanie cieľového segmentu dopytu o kúpe)	Reklama Osobný predaj Publicita Podpora predaja	<ul style="list-style-type: none"> <li>• Internet, Web stránky</li> <li>• Masovokomunikačné prostriedky (televízia, rozhlas, tlač)</li> <li>• Brožúra, direct mail, bulletin</li> <li>• Videokazety, CD-ROM, multimédiá</li> <li>• Písomné informácie pre poradcov na stredných školách</li> <li>• Služby špecializovaných agentúr</li> <li>• Konferencie, workshop-y, semináre</li> </ul>
	Vzťahy s verejnosťou	<ul style="list-style-type: none"> <li>• Sledovanie ohlasov v tlači, verejnosti, televízii, rozhlase a inde.</li> <li>• Sponzoring, vzťah s tlačou, lobing</li> <li>• Tlačové konferencie</li> </ul>
<b>Materiálne prostredie</b> (vnemy a dojmy zákazníka)	Prostredie	<ul style="list-style-type: none"> <li>• Navodenie atmosféry: profesionalizmu, ústretovosti, pohodlia, bezpečnosti, kvality, výnimočnosti</li> <li>• Vytvorenie tzv. corporate identity – jednoty štýlu a charakteru organizácie</li> <li>• Značenie – grafické správy, symboly a označenie</li> </ul>
	Dizajn	<ul style="list-style-type: none"> <li>• Veľkosť priestoru, druh nábytku, vzhľad učební, farebnosť</li> <li>• Rozmiestnenie zariadení vzhľadom na bezpečnosť,</li> <li>• Úroveň topenia, hluku,</li> <li>• Intenzita osvetlenia</li> </ul>
<b>Ľudia</b> (zamestnanci)	Správanie sa, výber, motivácia, vystupovanie, postoje, medzilidské vzťahy	<ul style="list-style-type: none"> <li>• Stotožnenie sa s potrebami zákazníka</li> <li>• Sledovanie a hodnotenie zamestnancov</li> <li>• Spolupráca všetkých útvarov fakulty</li> <li>• Existencia a pochopenie kultúry organizácie</li> <li>• Spôsob prijímania zamestnancov</li> <li>• Odborný rast a ďalšie vzdelávanie zamestnancov</li> <li>• Odmeňovanie zamestnancov a ich motivácia</li> <li>• Monitorovanie a kontrola zamestnancov</li> </ul>

<b>Ludia</b> (zákazníci)	Vzdelanie, postoje, motivácia, hodnoty	<ul style="list-style-type: none"> <li>• Flexibilita ponuky podľa druhov zákazníkov</li> <li>• Realizácia prieskumu trhu, pochopenie zákazníckych potrieb</li> <li>• Súlad hodnoty pre fakultu a hodnoty pre zákazníka</li> </ul>
<b>Proces</b> (interakcia medzi zákazníkom a fakultou)	Postup, priebeh aktivít, spolupráca so zákazníkmi	<ul style="list-style-type: none"> <li>• Spôsob realizácie, prídavná hodnota oproti konkurencii, rozdielne pedagogické prístupy</li> <li>• Rozdelenie procesov do jednotlivých etáp, riadenie kapacity organizácie, riadenie dopytu, sledovanie produktivity</li> <li>• Zákazkové a profesionálne služby</li> <li>• Vysoký kontakt so zákazníkom –poradenské služby</li> <li>• Stredný kontakt so zákazníkom – vzdelávanie</li> <li>• Zapojenie zákazníka do procesov</li> <li>• Úloha tretích strán</li> <li>• Vybavovanie sťažností</li> </ul>

### 3 VZŤAHY S VEREJNOSŤOU

Medzi prioritné ciele univerzít musí patriť zvýšenie ich konkurencieschopnosti a príprava na viaczdrojové financovanie. Tieto ciele nie je možné naplniť bez rozvoja vzťahov s verejnosťou. Žáry (1997) definuje verejnosť (publikum) ako sociálne diferencovanú skupinu ľudí, významnú z určitého hľadiska pre fungovanie príslušnej organizácie/inštitúcie/firmy a pod. Rozoznávame napr. tieto druhy verejnosti: parlamentné kruhy (poslanci, funkcionári, úradníci), vláda (ústredná štátna správa - jej členovia, ministri, aparát; orgány a predstavitelia územnej/miestnej štátnej správy), činitelia a orgány samosprávy, finančné kruhy (banky, sporiteľne, poisťovne, burzy, finanční analytici a pod.), partnerské organizácie doma i v zahraničí, akcionári, zamestnanci, zákazníci (skutoční/potenciálni), novinárske kruhy a pod.

Vzťahy s verejnosťou sú nástrojom manažmentu a pomáhajú, aby organizácia mohla prežiť v konkurenčnom prostredí a úspešne sa rozvíjať. Termín vonkajšie vzťahy sa väčšinou stotožňuje s termínom vzťahy s verejnosťou (external relations/public relations), odlišnosti závisia od definície oboch termínov.

Vytvorenie koncepcie vonkajších vzťahov je možné, ak už má univerzita/fakulta vyjasnené a stanovené ciele, po analýze vnútorného a vonkajšieho prostredia a formulácii stratégie. Je dôležité uvedomiť si, aké významné cieľové skupiny sa nachádzajú vo vonkajšom prostredí univerzity/fakulty.

Vzťahy s verejnosťou - public relations sú systematickou, premyslenou a spravidla dlhodobou obojsmernou komunikáciou s verejnosťou, diferencovanou vzhľadom na presne vymedzené externé aj interné cieľové publiká. Cieľom je

objektívne informovať, vytvárať priaznivý obraz, presvedčať, obhajovať a presadzovať špecifické záujmy a budovať pozitívne vzťahy. Budovanie vzťahov s verejnosťou je integrálnou súčasťou marketingovej stratégie fakulty. Pokiaľ chápeme marketing fakulty ako súbor činností, ktoré sú zamerané na vytvorenie, udržanie alebo zmenu postojov a konania cieľových skupín voči fakulte, potom bez existencie marketingovej stratégie a marketingového plánu fakulty sa oblasť vzťahov s verejnosťou stane osamoteným bojovníkom bez možnosti komplexného pochopenia danej problematiky a účinného uvedenia do praxe.

Jedno zo základných pravidiel hovorí, že public relations sa začína doma – starostlivosť o vnútorné public relations je mimoriadne dôležitá úloha, hlavne v počiatočnej fáze stanovenia taktiky a stratégie public relations je potrebné zamerať sa na vlastných zamestnancov a vnútorné okolie. **Vnútornú verejnosť** tvoria zamestnanci – pedagógovia, výskumní pracovníci, administratíva a ostatní pracovníci zabezpečujúci chod organizácie. Zamestnanci, aby sa mohli stotožniť so stratégiou public relations fakulty, potrebujú mať prístup ku všetkým potrebným informáciám, aby sa vytvoril pocit spolupatričnosti s fakultou, zdieľania spoločných predstáv, hodnôt a postojov. Vlastní zamestnanci sú pre manažment kľúčovou cieľovou skupinou, inak vo vzťahu k vonkajším subjektom dochádza k rôznym poruchám komunikácie a kvalitnej a pozitívnej prezentácie fakulty na verejnosti. Preto jednou z podmienok úspešného budovania vzťahov s verejnosťou je to, aby každý zamestnanec, od najvyšších riadiacich pracovníkov až po výkonných pracovníkov, bol stotožnený so základným cieľom - vytvárať a dlhodobo udržiavať pozitívny vzťah s verejnosťou. Kladné vyjadrenia jednotlivcov a konkrétnych skupín verejnosti sú totiž tou najlepšou reklamou pre fakultu. Ich priaznivé hodnotenia pomáhajú záujemcom o štúdium v rozhodovaní a vytvárajú atmosféru, ktorá priťahuje ďalšiu želanú skupinu – kvalitných potenciálnych študentov.

Na to je potrebné:

- Vytvoriť systém informovania všetkých zamestnancov o všeobecnej politike a postupoch i predpisoch organizácie.
- Vytvoriť systém, poskytujúci kontaktným pracovníkom (tým, ktorí prichádzajú do priameho styku s verejnosťou) znalosti potrebné na primerané a slušné zaobchádzanie s verejnosťou.
- Vytvoriť systém toku informácií o otázkach a kritike zamestnancov a verejnosti cez organizáciu k jej manažmentu.
- Zaručiť otvorenosť informovania verejnosti o aktivitách fakulty.

**Identita fakulty** je najnápadnejšie vyjadrená v podobe jej mena, loga, grafického systému, jednotného vizuálneho štýlu. Fakulta potrebuje tzv. dizajn manuál, plniaci úlohu smernice pre každodennú prax. To sa týka navštíveniek, hlavičkových papierov, všetkých tlačených materiálov, web stránok, označenia budovy a jej vnútorných priestorov, atď.

Univerzity a ich fakulty majú svoje špecifické úlohy v spoločnosti a hospodárstve krajiny. Ich postavenie nie je zďaleka založené iba na výchove absolventov

rôznych odborov a akademickom výskume. Priamo alebo nepriamo zasahujú do ďalších sfér a vice versa, univerzitný život je ovplyvňovaný dianím v ich okolitom prostredí. Rôzne formy spolupráce, neziskovej aj ziskovej, na vertikálnej a ešte viac na horizontálnej úrovni, sú prirodzenou a typickou vlastnosťou univerzít. Každá univerzita je zriadená tak, aby realizovala svoje ciele, disemináciu znalostí, v rôznych odboroch v medzinárodnom, národnom a regionálnom kontexte. Z priestorového hľadiska preto nachádza fakulta svojich partnerov na spoluprácu na medzinárodnej scéne, v národnom kontexte aj v mieste/regióne svojho pôsobiska.

Akademická inštitúcia má vždy možnosť rozhodovať sa medzi príležitosťou a zodpovednosťou. Okrem toho, že jej brány opúšťajú vzdelaní ľudia, poskytuje rôzne typy vzdelávacích služieb pre región a krajinu, napomáha rozvoj technológií, vytvára vedecké a výskumné hodnoty, často býva jedným z najväčších zamestnávateľov, obohacuje miestnu kultúru a spoločenský život regiónu.

Do akej miery preváži zodpovednosť – voči mestu/regiónu, závisí na mnohých faktoroch. Najmä akademické inštitúcie lokalizované v menej rozvinutých regiónoch prirodzene prejavujú záujem o partnerstvo s ostatnými inštitúciami podieľajúcimi sa na regionálnom rozvoji, regionálnou a miestnou samosprávou. Pociťujú istú formu zodpovednosti za rozvoj mesta a vlastného regiónu, hoci im táto zodpovednosť priamo nevyplýva z ich postavenia.

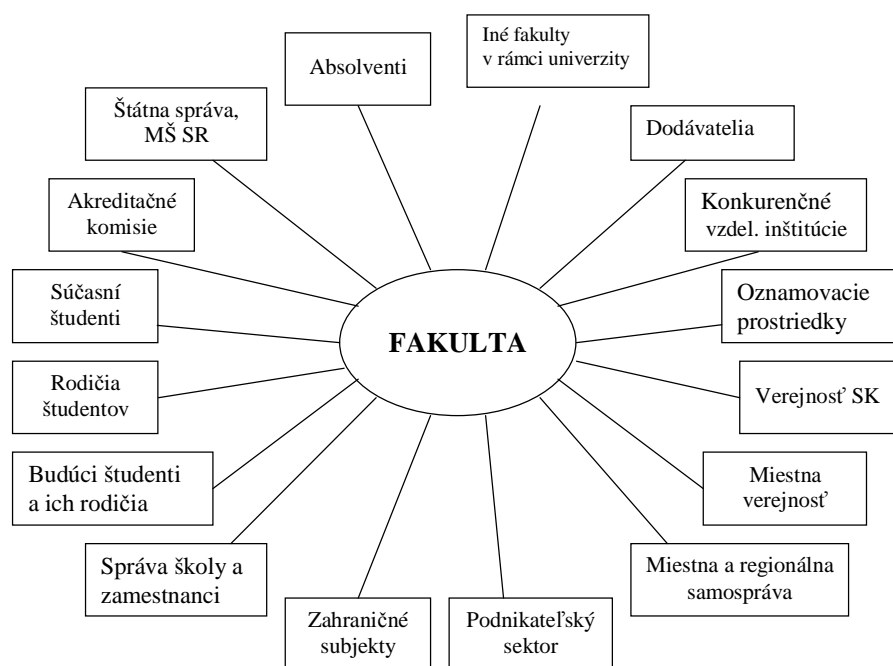
Preto si vzdelávacie inštitúcie potrebujú z tohto pohľadu vymedziť, ktorý **priestor** je pre nich najvýznamnejší, resp. či chcú rovnomerne rozvíjať všetky tri roviny vzťahov a nakoľko chcú svoje snaženie opierať o existujúce príležitosti alebo prevziať radšej viac zodpovednosti.

Marketingové aktivity prenikajú postupne do oblastí, v ktorých sa v minulosti nepoužívali, či považovali za neúčelné. Verejný sektor na Slovensku stále prechádza štádiom významných zmien a napriek ešte stále sa zvyšujúcemu počtu študentov vysokých škôl sa zosilňuje konkurencia medzi vzdelávacími inštitúciami, pretože ponuka vzdelávania sa podstatne zvýšila a demografický vývoj má do budúcnosti jednoznačne negatívny priebeh. Pritom konkurencia sa pre fakultu zvyšuje v regionálnom, národnom aj medzinárodnom kontexte. Na **obr. 1** je znázornené **vonkajšie prostredie fakulty**, s ktorým prevažne fakulta komunikuje. Je zrejmé, že existujúcich aj potenciálnych účastníkov je veľký počet a preto zladíť komunikáciu s nimi vyžaduje premyslenú taktiku a stratégiu. Intenzita faktorov prostredia má svoje cyklické amplitúdy aj sezónne vplyvy (príprava akreditácie alebo evaluácie fakulty, prijímanie prihlášok na štúdium, atď.)

Na základe situačnej analýzy a vytvorení marketingovej stratégie fakulty je možné definovať kľúčové cieľové skupiny fakulty. So zavedením marketingovej stratégie do chodu fakulty sa otvorí priestor pre rad nových činností, ktoré umožnia efektívnejšie zaistiť splnenie cieľov fakulty. Jednou z najviac zanedbávanou cieľovou skupinou sú absolventi fakulty.

**Študenti** sú najdôležitejšou cieľovou skupinou a súčasne dôležitým reprezentantom komunikácie a public relations fakulty. Ak sú spokojní a dobre sa s nimi pracuje, sú najlepšimi vyslancami šíriacimi dobrú povest' školy dlhé roky po jej absolvovaní.

**Absolventi** budú v budúcnosti dôležitým zdrojom podpory univerzitného vzdelávania. Čím skôr absolventa škola podchytí, tým lepšie - na potenciál absolventov je dobre myslieť na už pri nábore a prijímaní študentov a komunikácii s nimi.



**Obr. 1:** Vonkajšie prostredie fakulty

#### 4 NIEKTORÉ NÁVRHY ROZVOJA OBLASTI VONKAJŠÍCH VZŤAHOV PRE FAKULTY POSKYTUJÚCE VZDELÁVANIE V OBLASTI EKONOMICKÝCH VIED

Fakulty existujú na **trhu**, zložky ktorého majú pre fakultu strategický význam – súvisia totiž s plnením jej hlavného poslania a to vzdelávacieho:

- trh študentov –zákazníkov
- trh učiteľov a vedeckých pracovníkov
- trh sponzorov, darcov a ďalších externých finančných zdrojov
- trh tvorcov verejnej mienky a ďalšie.

To znamená, že na strane **dopytu** existujú:

- Fyzické osoby
- Firmy a iné ziskové aj neziskové organizácie, pre ktoré sú vzdelávacie potreby zamestnancov odvodené od celkových cieľov a potrieb danej organizácie
- Úrady práce a ďalšie vládne organizácie financujúce rôzne rekvalifikačné programy

**Poslanie** fakulty zahŕňa:

- Uspokojovanie vzdelávacích sociálnych potrieb študentov a formovanie špecifických osobnostných vlastností najvyššej kvality
- Vedeckú a výskumnú činnosť
- Plnenie spoločenských cieľov
- Zahraničné vzťahy s identicky zameranými pracoviskami a ďalšími vzdelávacími subjektami

V závislosti na kvalite a úrovni plnenia tohto poslania získava fakulta lepší alebo horší **imidž**. Vo vzťahu k oznamovacím prostriedkom je dôležité sledovanie všetkých ohlasov, ktoré sa o fakulte objavia na verejnosti, v tlači a inde a rýchla reakcia, dementovanie, uvádzanie na pravú mieru a podobne. Dôležitá je kategória hovoreného slova, ktorej význam rastie vo veku zahltenia informáciami. Vystúpenia na konferenciách, schôdzach, školeniach, vzdelávacie aktivity mimo fakulty, atď. sú mimoriadne dôležité pre tvorbu verejnej mienky. Na základe niekoľkých nepodarených vystúpení si fakulta môže pokaziť imidž v odbornej verejnosti – preto je nevyhnutné vyžadovať vysokú kvalitu vystúpení, tlačených a elektronických materiálov od všetkých pracovníkov fakulty. Rovnako je dôležité klásť dôraz na kvalitu všetkých publikácií v časopisoch a zborníkoch z konferencií.

V oblasti publis relations sú na prvom mieste prednosti fakulty – výsledky, ktoré dosahuje vo vzdelávacej a vedecko-výskumnej práci, úroveň a možnosti uplatnenia absolventov, spolupráca s vládnymi aj mimovládnymi organizáciami a podobne. Patrí sem tiež sponzoring v oblasti kultúrnej, športovej, humanitárnej a ďalších oblastiach, vzťah s tlačou a tiež lobovanie v zmysle napomáhania prijatia rozhodnutia na základe znalosti vecí.

Oblasť vzťahov s verejnosťou by mali univerzity zameriavať hlavne na nasledujúce **cieľové skupiny**:

1. Súčasných študentov.
2. Potenciálnych študentov.
3. Absolventov fakulty.
4. Zahraničných študentov – samoplatcov a Erasmus/Socrates študentov.

5. Partnerské zahraničné vzdelávacie a výskumné inštitúcie a inštitúcie EÚ.
6. Študentskú komoru a študentské organizácie.
7. Bankové inštitúcie, poisťovne a iné subjekty súvisiace so zameraním fakulty - ako hlavných potenciálnych zamestnávateľov absolventov fakulty.
8. Ziskové organizácie všetkého druhu – ako možných sponzorov a partnerov pre podnikateľskú činnosť pracovníkov fakulty.
9. Verejnú správu v podobe ústrednej, regionálnej či miestnej, legislatívu, úrady a úradníkov majúcich na starosti vzdelávanie – na monitorovanie predpisov, zmien a lobovanie za prijateľné riešenia.
10. Média a novinárov vrátane špecifických študentských médií - rozhlas, časopisy, televízne štúdiá. Pozornosť masmédií vždy priťahujú študentské problémy. Dobré kontakty s médiami sú dlhodobou výbornou investíciou.
11. Verejné inštitúcie (napr. ministerstvá, grantové agentúry, VÚC) – ako možných poskytovateľov grantov.
12. Dodávateľov služieb – DTP, grafický dizajn, fotografie, zariadenia, materiál, atď.
13. Širokú verejnosť a neziskový sektor.
14. Ostatné skupiny: aj rodičia súčasných aj potenciálnych budúcich študentov sú dôležitou podpornou skupinou, s ktorou je potrebné kvalifikovane komunikovať; súčasní a možní budúci donátori, tvorcovia verejnej mienky, filantropické nadácie, sesterské vzdelávacie inštitúcie.

Pre jednotlivé cieľové skupiny je potrebné spracovať stratégie ich oslovenia a zaangažovanosti vo veciach fakulty. Pre všetky cieľové skupiny môže byť oblasť vzťahov s verejnosťou zameraná nasledovne:

- Budovanie pozitívneho imidžu fakulty formou účasti na konferenciách, seminároch.
- Poskytovanie rozhovorov pre médiá.
- Organizácia tlačových konferencií pri významných udalostiach fakulty.
- Organizácia tlačových konferencií, propagácia a diseminácia výsledkov vedecko-výskumnej činnosti, medzinárodných a domácich projektov formou účasti na odborných podujatiach, informačných brožúr, WEB stránky fakulty.
- Zapájanie inštitúcií mimo fakulty do vedecko-výskumných a vzdelávacích projektov v rámci partnerstva.

Špecifiká podľa jednotlivých cieľových skupín:

**Cieľová skupina – študenti:**

- Príprava marketingovej stratégie pre získavanie nových záujemcov o štúdium.

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- Príprava marketingovej stratégie pre kurzy otvoreného a dištančného vzdelávania.
  - Realizácia dňa otvorených dverí pre stredoškolákov.
  - Osobné návštevy vybraných stredných škôl (recruiting).
  - Články v tlači za účelom propagácie fakulty.
  - Pravidelná aktualizácia existujúcej WEB stránky fakulty s osobitnou časťou pre záujemcov o všetky formy štúdia.
  - Realizácia a podpora športových a kultúrnych akcií pre študentov.
  - Organizácia medzinárodných letných škôl s možnou účasťou študentov stredných škôl.
  - Každoročný dotazníkový prieskum pre študentov na hodnotenie vzdelávacieho procesu a vnútorného prostredia fakulty.
  - Zlepšenie poskytovania informácií študentom fakulty.
  - Zapojenie študentov do výskumnej a pedagogickej práce.
  - Pomoc pri profesijnej orientácii pre končiacich študentov a čerstvých absolventov.
  - Estetizácia prostredia fakulty.
  - Hľadanie možností zabezpečenia študentov kvalitnou literatúrou, z vnútorných a vonkajších zdrojov, elektronické publikácie, atď.

**Cieľová skupina –absolventi fakulty:**

- Vytvorenie a udržiavanie databázy absolventov.
- Pravidelná realizácia dotazníkového prieskumu na zistenie uplatnenia sa absolventov v praxi.
- Realizácia dotazníkovej akcie na zistenie možných sponzorov z radov absolventov ako aj možných prijímateľov študentov na praxe, brigády a podobne.
- Príprava plesu absolventov v 3-ročných časových intervaloch, stretnutí absolventov, za účelom budovania imidžu fakulty, obnovy kontaktov, nájdenia obojstranne užitočných aktivít.
- Rozosielanie informácií o aktivitách fakulty, vydávanie časopisu s jednoročnou periodicitou na udržanie kontaktu.
- Založenie asociácie absolventov fakulty ako neziskovej organizácie a propagácia jej činnosti aj medzi súčasnými študentmi.



**Cieľová skupina - bankové inštitúcie, poisťovne a iné subjekty súvisiace so ameraním fakulty na oblasť ekonomických vied:**

- Tvorba propagačných materiálov, výročných správ a pod.
- Osobné návštevy s cieľom vytvorenia a udržania osobných kontaktov.
- Spracovanie databázy študentov a jej sprístupnenie na WEB stránke s cieľom ponuky pracovnej sily (s uvedením charakteristiky študenta/ky, témy diplomovej práce, jazykových a iných zručností – pre študentov, ktorí o to budú mať záujem). Databáza bude slúžiť aj ako ponuka pracovnej sily počas štúdia, ponuka na praxe študentov, ponuka na vypísanie diplomových a bakalárskych prác zo strany praxe a podobne.
- Spracovanie databázy zo strany inštitúcií – umiestnenie ponúk zo strany praxe na pracovné príležitosti, na realizáciu diplomových prác, na riešenie konkrétnych problémov v praxi a ich sprístupnenie študentom cez web stránku.
- Spracovanie ponuky na riešenie úloh výskumných a odborných prác zo strany akademických pracovníkov školy, formou podnikateľských aktivít alebo výskumných grantov.
- Vytvorenie mailing listu inštitúcií (cez sieť kontaktných osôb), pomocou ktorého bude fakulta zasielať informácie o aktivitách fakulty a budovať svoj pozitívny imidž.
- Spolupráca v rámci účasti predstaviteľov inštitúcií vo Vedeckej rade fakulty, na štátnych záverečných skúškach, na pracovných stretnutiach, konferenciách a seminároch.
- Organizácia vedeckých konferencií a seminárov k aktuálnym problémom súčasnosti a na základe podnetov z inštitúcií.

**5 ZÁVER**

Pre marketingové stratégie je charakteristický ich prvok dlhodobého časového horizontu. Zvlášť významnú úlohu zohráva výskum imidžu a tržnej pozície. Imidž je totižto v rastúcej konkurencii (i medzinárodnej) na trhu vzdelávania potrebné stále viac považovať za strategický a dominantný prvok pre všetky vzdelávacie subjekty, ktorý má vplyv aj na ostatné marketingové premenné. A to predovšetkým na ich úspešnosť. Pokiaľ chceme, aby nástroje marketingového mixu vyvolali na cieľových trhoch žiadúcu odozvu, musí byť ich synergické pôsobenie čo najvyššie. Preto je potrebné, aby tieto nástroje, vyznačujúce sa výraznými odlišnosťami a špecifickými rysmi boli „šité na mieru“ práve pre aplikáciu na vysoké školy ako také. Uvedený príspevok by mal byť praktickým návodom ako aplikovať nástroje marketingového mixu služieb na potreby vzdelávacích inštitúcií.

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## AUKCIE V HOLONICKÝCH VÝROBNÝCH SYSTÉMOCH A ICH MODELOVANIE V PROSTREDÍ ZEUS

### AUCTIONS IN HOLONIC MANUFACTURING SYSTEMS AND THEIR MODELING IN ZEUS

MICHAL GIRMAN, PETER KMEC

#### 1 ÚVOD

Vývoj riadiacich systémov prekonal hranicu možností centralizovaných štruktúr a v súčasnosti napĺňa rôzne formy decentralizovaného riešenia. Rozdelením výpočtovej inteligencie do jednotlivých uzlov sa zvyšuje výpočtová kapacita jednotlivého uzlu a tým sú vytvorené predpoklady aj pre zmenu kvalitatívnych vlastností celého systému. Ak je programové vybavenie uzlu na takej úrovni, že svojim „inteligentným“ správaním v danom prostredí dokáže svojimi akciami zabezpečiť určité ciele, označujeme taký uzol (jeho programové vybavenie) ako softvérového agenta. Ak spolupracuje v sieti navzájom niekoľko takých uzlov, hovoríme o multiagentovom systéme. K základným vlastnostiam agenta patria:

- autonómnosť – agent má kontrolu nad svojimi akciami v danom prostredí,
- schopnosť reagovať na zmeny prostredia,
- schopnosť podriaďiť svoje akcie dosiahnutiu určitého cieľa,
- schopnosť komunikácie a spolupráce s ďalšími agentami,
- prispôsobivosť – meniť svoje chovanie na základe predchádzajúcich skúseností.

Jednou z mnohých oblastí, kde multiagentové systémy nachádzajú uplatnenie je aj riadenie výroby. Ak je softvérový agent vybavený aj o mechanické zariadenie, umožňujúce vykonávanie určitých činností v reálnom svete, označuje sa táto kombinácia názvom holón.

Príkladom spoločenstva holónu môže byť napríklad montážne pracovisko pozostávajúce s navzájom komunikujúcich robotických uzlov, ak ich softvérova inteligencia spĺňa prvky softvérového agenta.

Multiagentové systémy, zabezpečujúce výrobu alebo montáž určitých výrobkov si vyžadujú definovanie filozofie riadenia a vzájomnej komunikácie. Vzhľadom na skutočnosť, že jednotlivé prvky (agenti, holóny) majú možnosť rozhodovania pre splnenie svojich cieľov, ktoré nemusia byť totožné s cieľmi celého systému, má

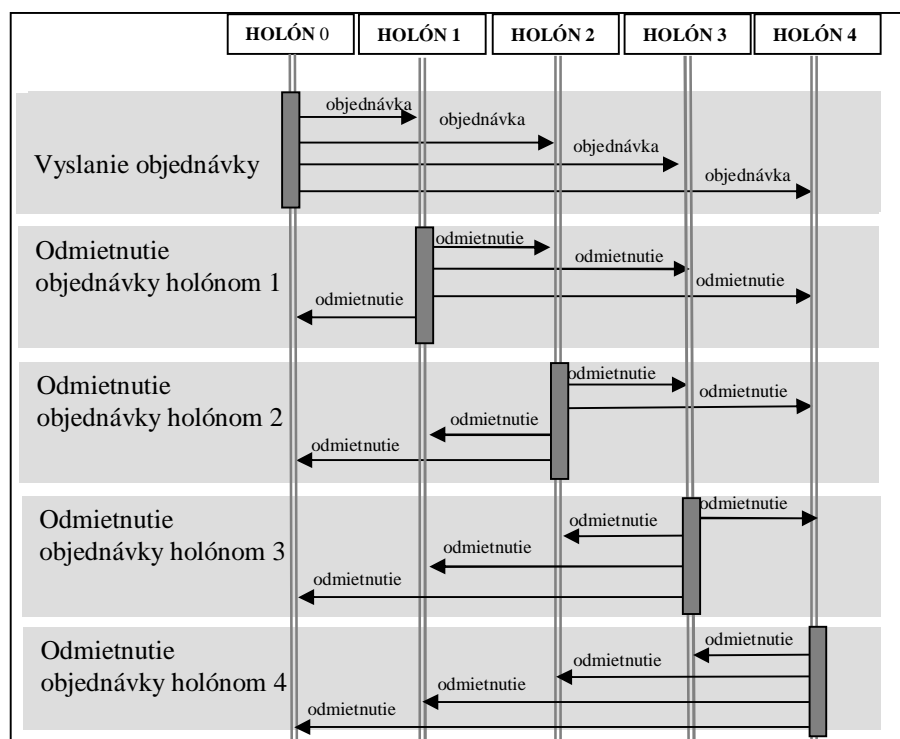
základná filozofia značný význam. V súčasnosti je diskutovaných niekoľko možných prístupov, z ktorých najväčšou mierou diskutovaného riadenia spĺňa filozofia založená na aukcii ponúk.

Aukcia ponúk medzi jednotlivými inteligentnými pracoviskami je zabezpečená šírením vlastnej ponuky definovanými cestami tak, že každý príjemca ponuky vyhodnotí svoju ponuku s prijímanou ponukou a menej výhodné ponuky sú z aukcie vyradené. Po prechode informácie všetkými uzlami je na výstupe víťazná ponuka, ktorá je akceptovaná.

V priebehu aukcie môžu nastať niektoré elementárne prípady, ktoré budú popísané v ďalšom.

## 2 AUKCIA S ODLOŽENÍM OBJEDNÁVKY

Prípád aukcie s odložením objednávky nastáva v situácii plnej vyt'aznosti všetkých uzlov, alebo je objednávka vstupujúca do systému neakceptovateľná z rôznych dôvodov. Sekvenčný diagram komunikácie, uvedený na **obr. 1**, ukazuje situáciu ak všetky holonické uzly sú zaneprázdnené a žiadny z nich nemôže vstupujúcu objednávku akceptovať. Uzol 0 predstavuje vstup do systému (licitátora), t.j. holonický prvok, ktorý zadáva do siete holonických uzlov požiadavky – (objednávky) a hodnotí výsledok každej aukcie. Samotná aukcia prebieha medzi jednotlivými holónmi, pričom každý z nich má agregovanú informáciu o priebehu a výsledku aukcie a tým môže rozhodovať a usmerňovať svoje akcie.



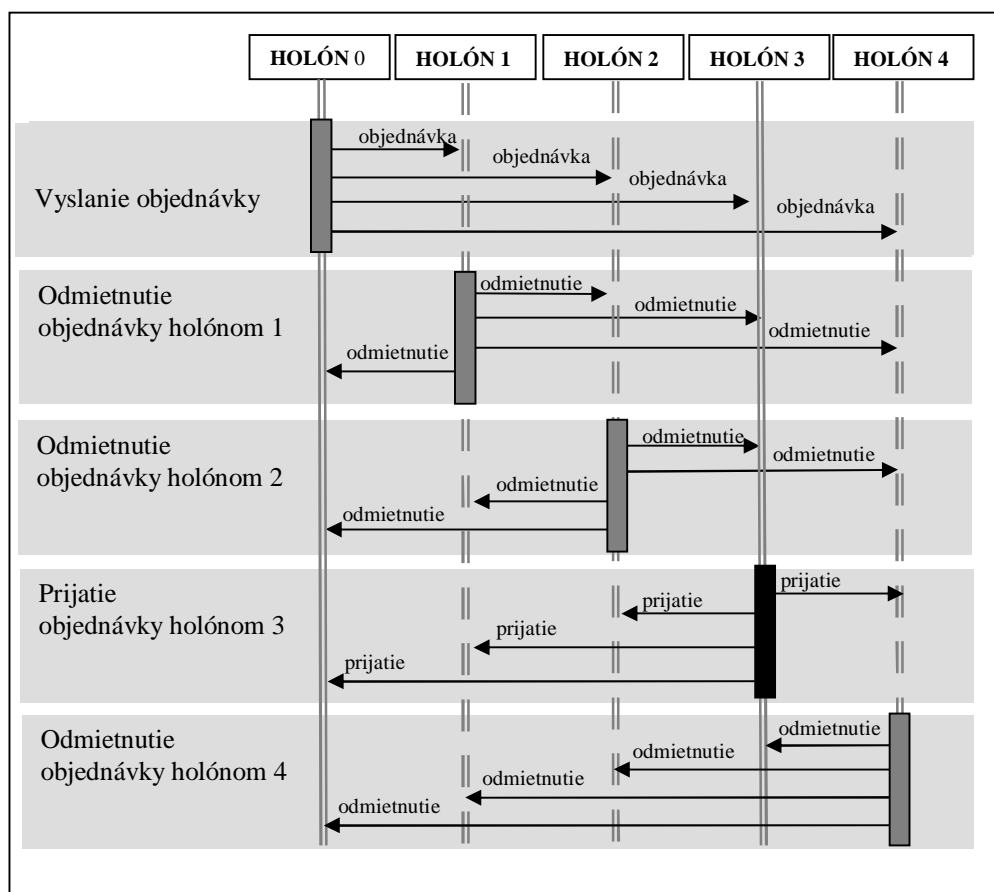
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Obr. 1 Aukcia s odložením objednávky

### 3 AUKCIA S JEDINOU VOĽBOU

Iný elementárny prípad môže nastať ak je voľný práve jeden holonický uzol. Túto situáciu ukazuje obr. 2. Ponuka licitátora je akceptovaná jediným uzlom, pričom podobne ako v predchádzajúcom prípade ostatné dostávajú informáciu o výsledku aukcie.

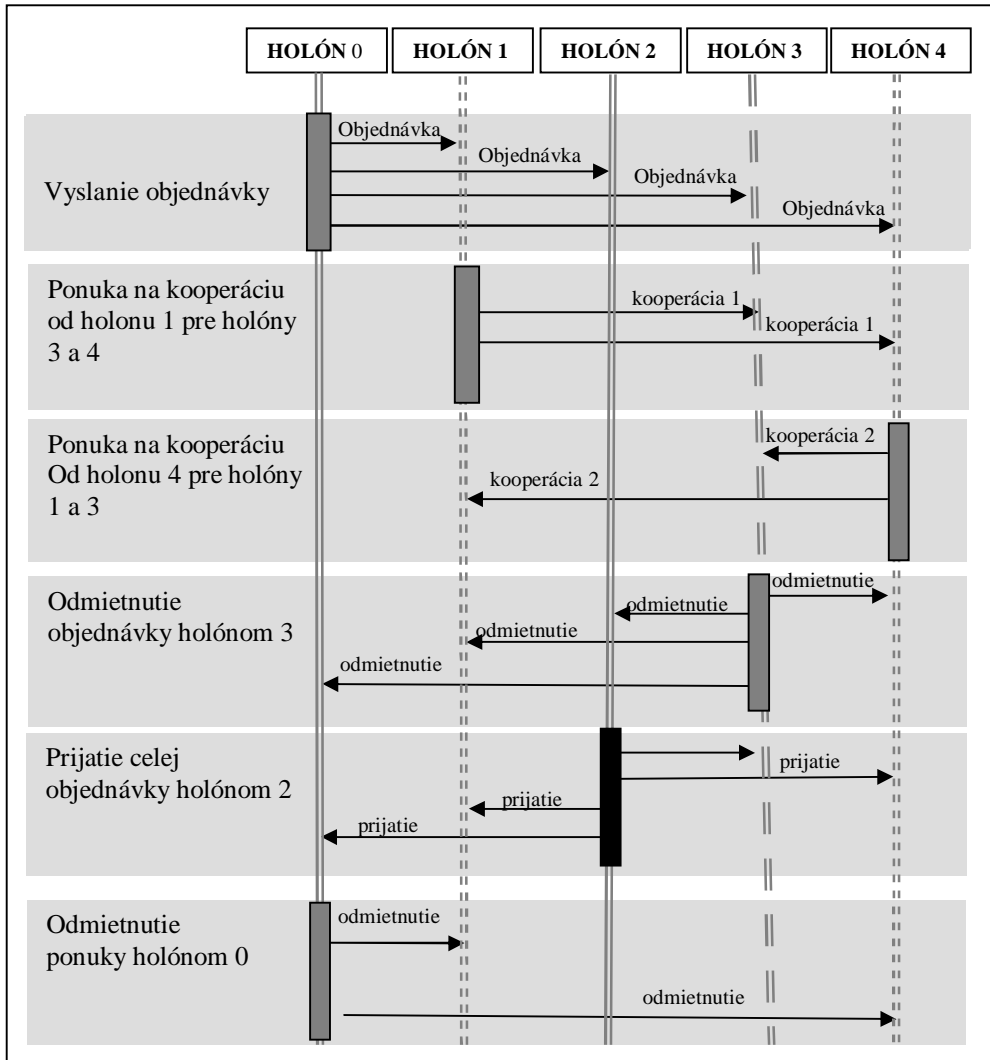


Obr. 2 Aukcia s jedinou voľbou

### 4 AUKCIA S KONFLIKTOM KOOPERÁCIE A AKCEPTOVANIA

Aukcia ponúk nemusí pracovať len s akceptovaním objednávky ako celku. Inteligencia holónu ho predurčuje na efektívnu spoluprácu, ktorá ho vedie k možnosti akceptovať vstupujúcu objednávku za predpokladu spolupráce s iným holónom. Ak sa v takomto prípade predsa len objaví v aukcii holonický uzol

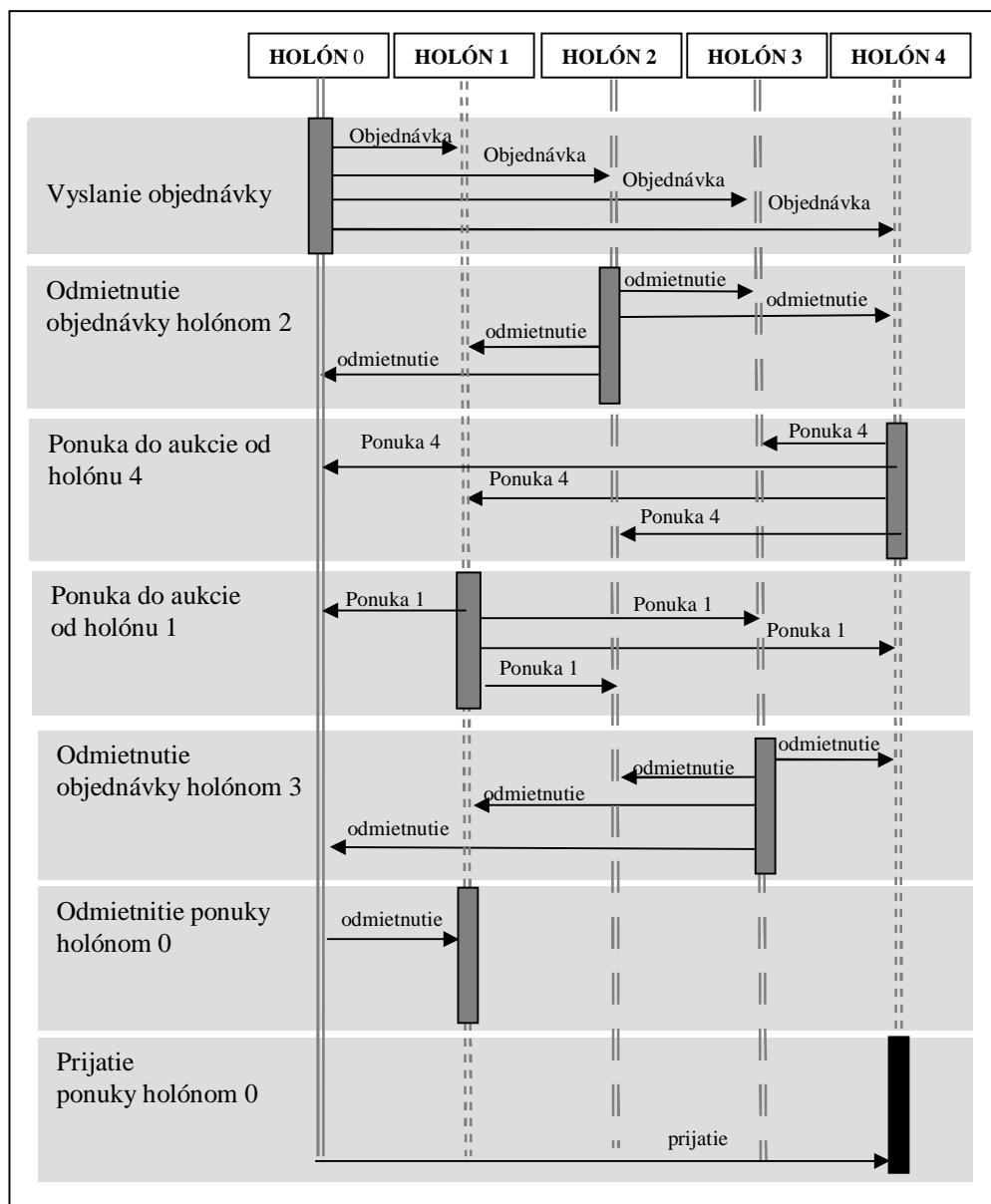
schopný akceptovať objednávku ako celok, jeho ponuka sa stáva v danej aukcii víťazom. Elementárnu situáciu ukazuje **obr. 3**.



**Obr. 3** Aukcia s konfliktom kooperácie a akceptovania

## 5 AUKCIA KONKURENČNÝCH PONÚK

Pri väčšom počte holónov je častý prípad dvoch, alebo viacerých voľných pracovísk, ktoré sú akceptovateľné voči objednávke od licitátora. V týchto prípadoch prebieha aukcia vyhodnotením stanoveného parametra a holón s výhodnejším parametrom v ponuke sa stáva realizátorom objednávky. Popísanú situáciu dokumentuje **obr. 4**.

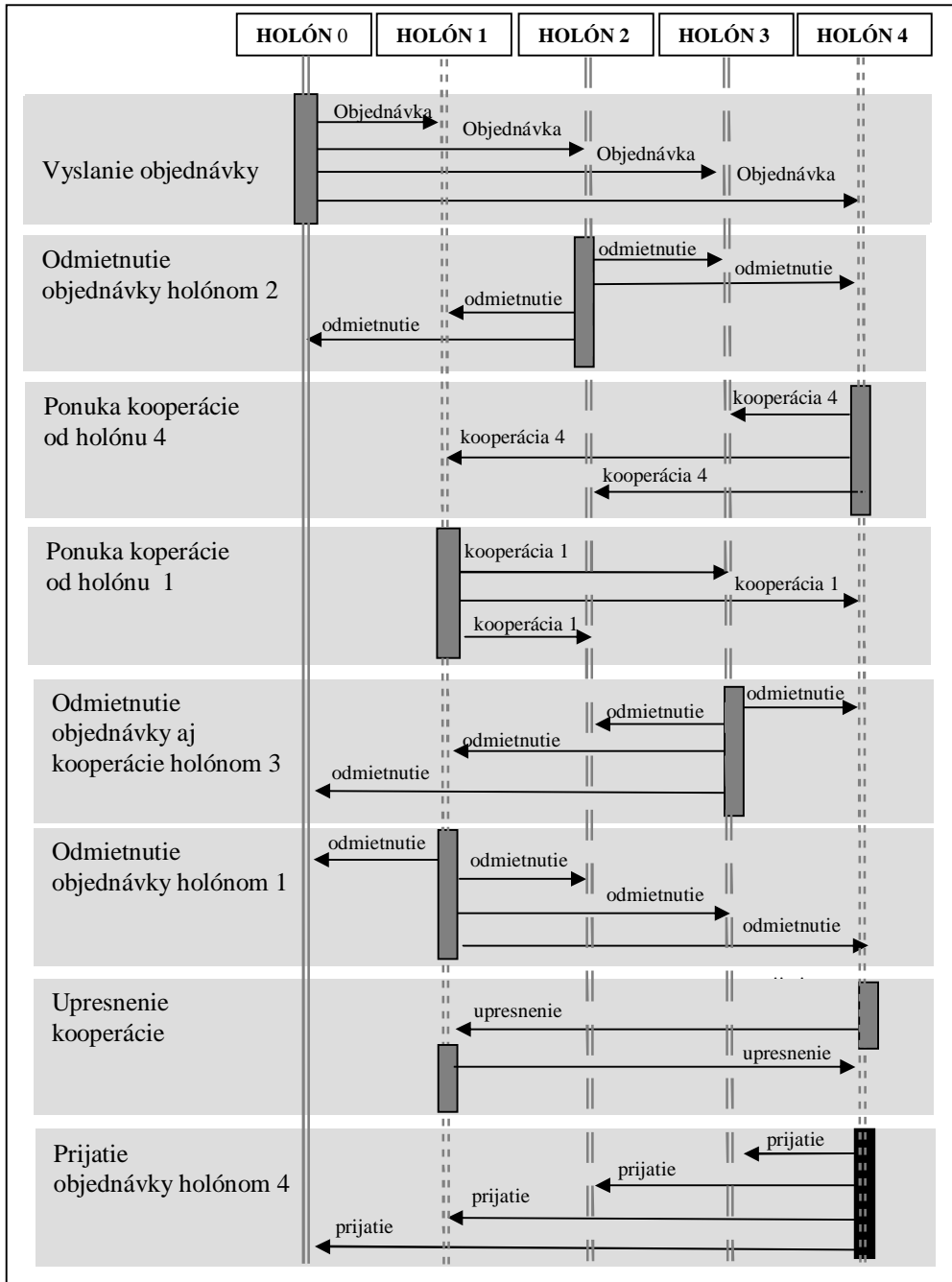


Obr. 4 Aukcia konkurenčných ponúk

## 6 AUKCIA S KOOPERUJÚCIMI PRACOVISKAMI

V stave rozpracovanosti montáže alebo výroby holonický uzol dokáže určiť stratégiu pre svoje akcie. To znamená, že dokáže vyhodnotiť situáciu pre akceptovanie objednávky za predpokladu spolupráce s iným holónom (pri všetkých aukciách je potrebné si uvedomiť, že jednotlivé holonické uzly sa v praxi

môžu podstatne líšiť schopnosťami, výkonnosťou a ďalšími kvalitatívnymi parametrami, majúcimi vplyv na konkurenčnú schopnosť pri aukciách). Situáciu podľa predchádzajúceho popisu znázorňuje (obr. 5).

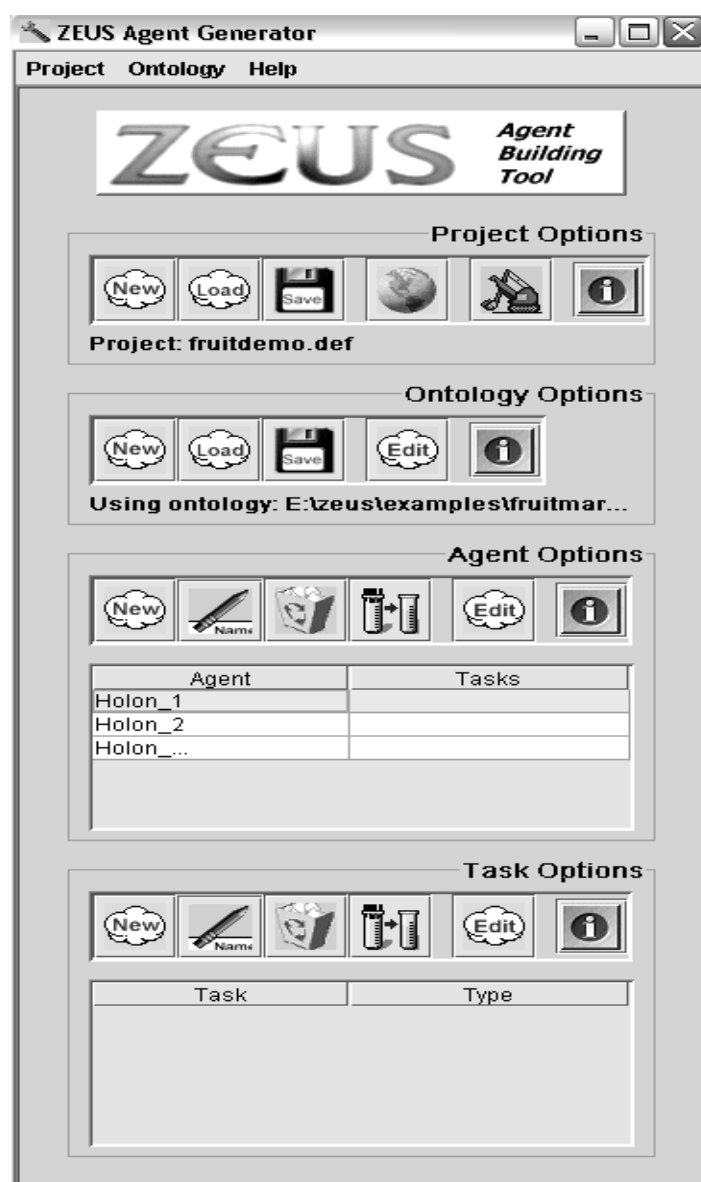


Obr.5 Aukcia s kooperujúcimi pracoviskami



## 7 PRÍKLAD PROGRAMOVANIA AUKCIE V PROSTREDÍ ZEUS

Pre modelovanie jednotlivých elementárnych činnosti bolo použité multiagentné komunikačné prostredie Zeus od firmy British Telecommunications, ktoré zabezpečuje dostatočný komfort pre užívateľské aplikácie. Vzhľadom na príklady v predchádzajúcich odstavcoch ide o decentralizovanú aukciu, t. j. o aukciu bez centrálného arbitra. Holóny, v prostredí Zeus nazývaní agenti, sa určia vymenovaním v generátore agentov (**obr. 6**).

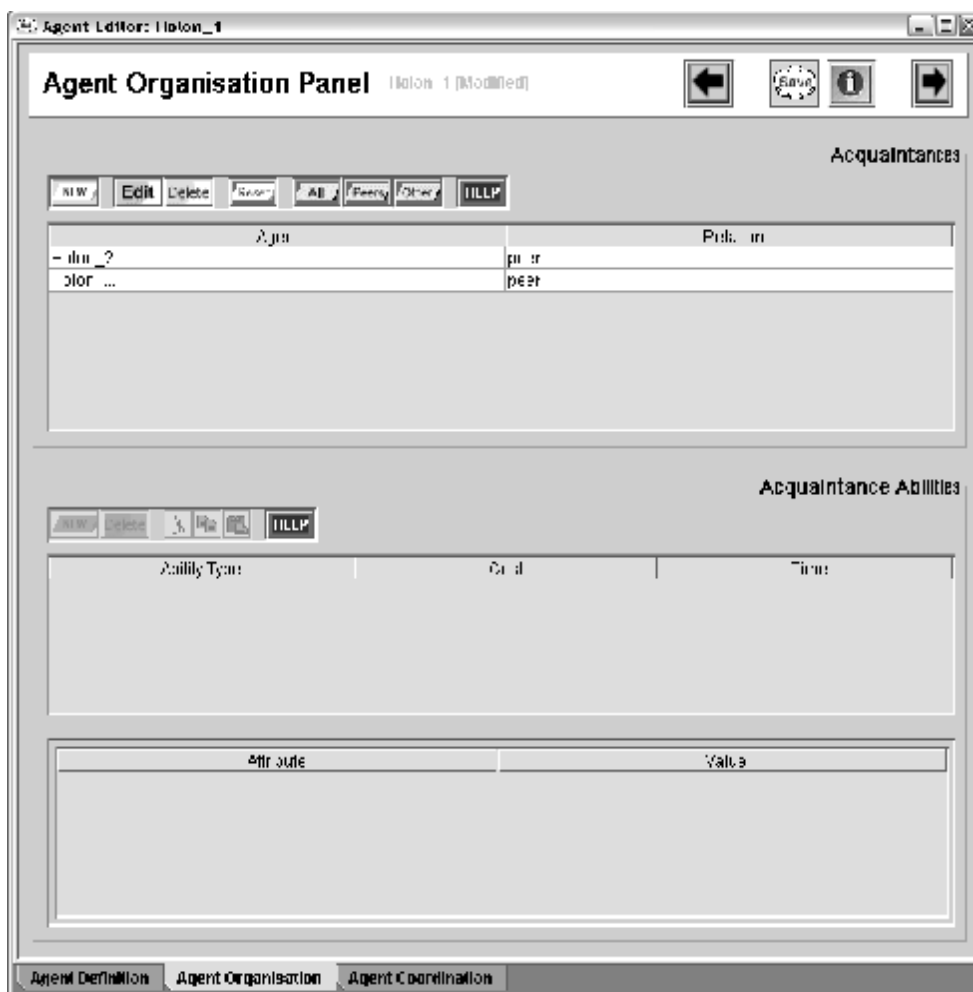


Obr.6 Určenie holónov

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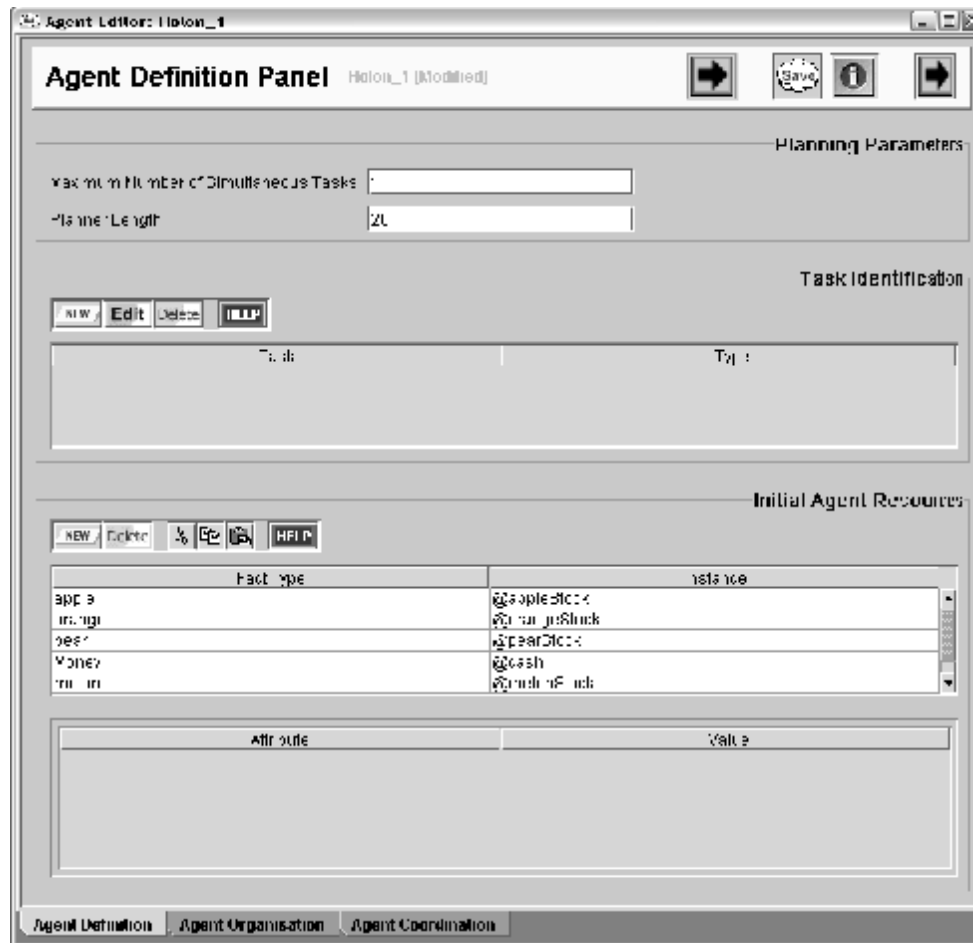
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V najjednoduchšom prípade je trh statický, čiže holóny sa poznajú každý s každým. Táto informácia sa zadáva v editore agentov v hárku **Agent Organisation** v okne **Known Acquaintances**. Keďže holóny jednájú medzi sebou ako rovný s rovným, v stĺpci **Relation** sa použije voľba **Peer** pre všetky možné interakcie (obr. 7).



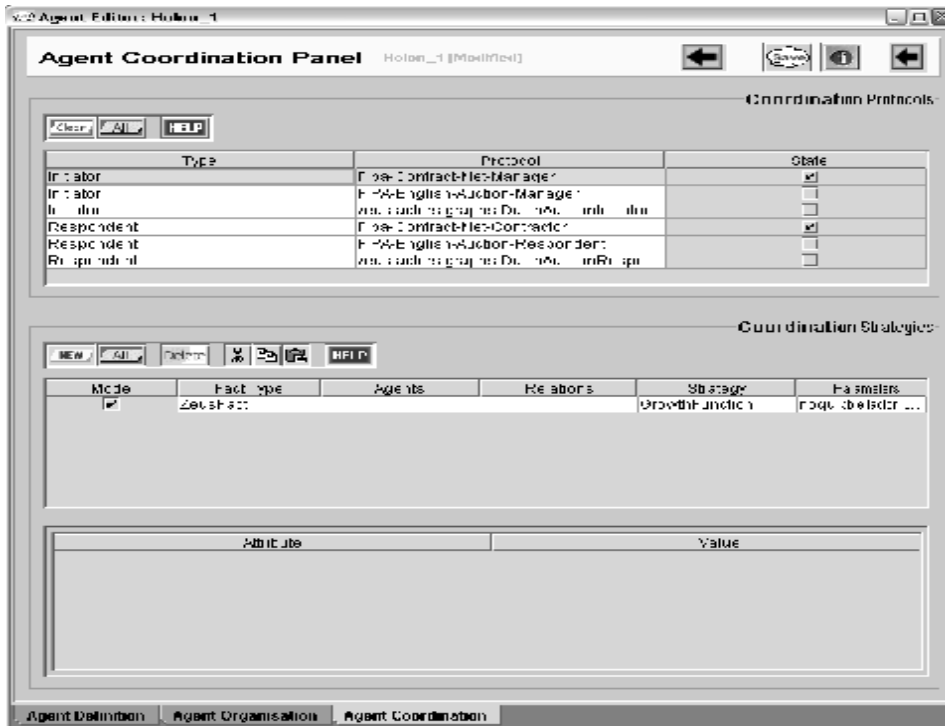
Obr.7 Určenie vzťahu holónu 1 k ostatným holónom

Úlohy ktoré holón môže robiť a zdroje ktoré holón má sa definujú v hárku **Agent Definition** (obr. 8.).

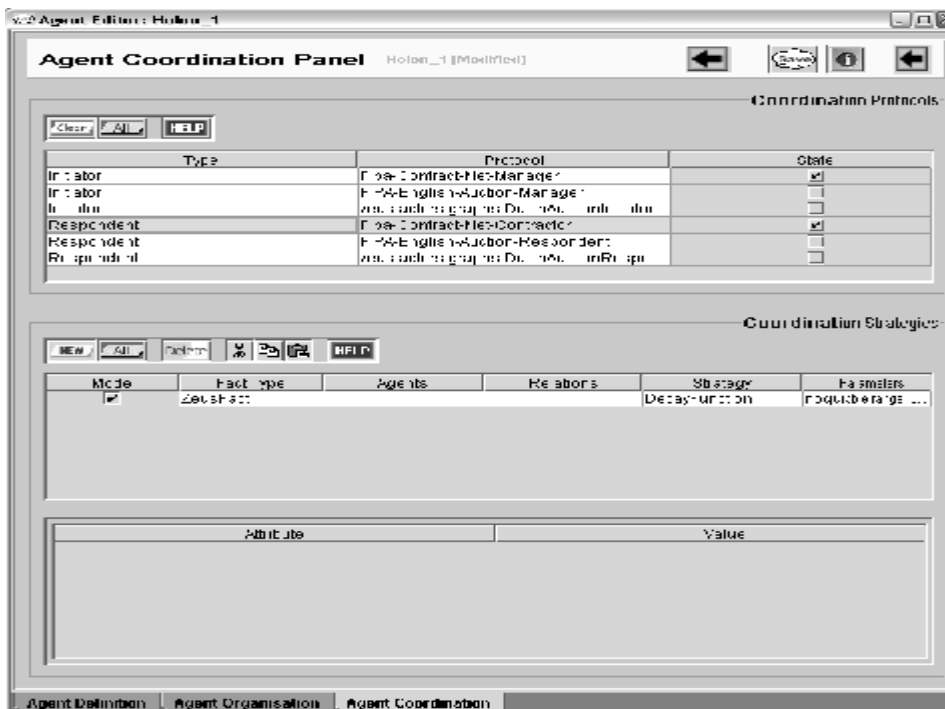


Obr.8 Určenie počiatkových zdrojov holónu

Komunikačný protokol medzi holónmi sa nastavuje v hárku **Agent Coordination** v okne **Coordination Protocols** kde každý holón môže byť iniciátorom aj respondentom vyjednávania. Holóny si môžu voliť rôzne stratégie vyjednávania pre rôzne obchodované komodity, kde komoditou môže byť tovar i služba. Stratégie vyjednávania sa nastavujú v okne **Agent Coordination**. Ak holón používa len jednu stratégiu vyjednávania pre všetky komodity, v okne **Coordination Strategies** sa nastaví v stĺpci **Fact Type** položka **Zeus Fact**. Pre prípad, keď holón službu objednáva, pri aktivovanej položke **Initiator** sa pre stratégiu volí **Growth Function** (keďže objednávajúci chce kupovať čo najlacnejšie a cenu objednávky zvyšovať až postupne), (obr.9). Obdobne pre prípad, keď holón službu ponúka, pri aktivovanej položke **Respondent** sa pre stratégiu volí **Decay Function** (keďže ponúkajúci chce predávať čo najdrahšie a cenu ponuky znižovať až postupne), (obr. 10).



Obr.9 Vyjednávaci protokol a stratégia holónu 1 v prípade, ak je iniciátorom



Obr.10 Vyjednávaci protokol a stratégia holónu 1 v prípade, ak je respondentom

Detaily vyjednávania sa doplnia v poslednom stĺpci **Parameters**: nastaví sa minimálne a maximálne percento hodnoty komodity, za akých je holón ochotný uzavrieť obchod. Ak je vyjednávanie úspešné, obchod sa uzavrie automaticky cez vnútorný koordinačný mechanizmus: ponúkajúci vykoná službu a objednávajúci zaplatí.

## 8 ZÁVER

Prostredie Zeus je výhodné pre modelovanie aukcií v holonických systémoch z nasledovných dôvodov:

1. Pre jednoduchšie aplikácie nevyžaduje znalosť programovania
2. Pre zložitejšie aplikácie je prostredie rozšíriteľné s možnosťou využitia Java knižníc a integrovateľné s existujúcim softvérom
3. Vnútorný koordinačný mechanizmus plne zabezpečuje interakciu holónov
4. Možnosti ktoré pri aukciách nastávajú tak, ako sú rozobrané v článku, vplynú priamo individuálnych stratégií holónov a nie je potrebné ich zvlášť nastavovať

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