

# *The Philosophy of Supply Chain Management in the New Economy: Net Readiness in the Net Supply Chain*

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The internet has been described as *breakthrough technology*. Its use in business can drastically change the situation in the business sector leading traditional enterprise to collapse. In the era of the Digital Revolution, postindustrial society is evolving towards the information society creating the foundation of the New Economy. Its basic elements include globalization processes, massive implementation of Information Technology and the establishment of *virtual enterprises*. Implemented processes take the form of *pro-active business* that fosters *innovation* and *personification* of its market offer.

Enterprises that utilize Internet infrastructure in their activities carry out a specific *e-business model*. Their key commodity is *information*. It is based on changing the traditional SCM into e-SCM as well as on creating the so-called '*Internet value network*.' In order to be created, the enterprise has to be properly prepared for the new conditions, which is called *net readiness*. This article describes the characteristics of supply chains in the new economy, stresses the significance of information and effective business management in addition to a potential effect of the new economy on the market competitiveness of enterprises. Net readiness has been described here based on a study of a group of the biggest Polish businesses.

## **From Old to New Economy**

World economies function under the conditions that result from human evolution based on a continuous creation of added value<sup>1</sup> (Table 1). The 'virtuality' of our era has its roots in 'tough' historic solutions.

*Digital Revolution* changing the post-industrial era society into the information society laid the foundations for *the New Economy* based on a massive implementation of *Information Technology – IT*. Here are 12 principles of the New Economy according to D. Tapscott (1998):

1. Information – departure from physical labor; 'information input' is an essential component of products.

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Table 1: Evolution of Old Economy (author's analysis based on Sadler 1988)

Degree of development (phase)	Period	Social systems	Significant technological inventions	Basic economic activity	Value added for the future of economy	Basic tools	Basic product	Value added for the client	Client's expectations
Pre-agrarian	Beginnings of civilization (2-4 mln. years)	Uncom- pleted society of nomads	—	Hunting, gathering	Simple tools operated by direct human force	Force of human muscles	Meat	Satisfying basic physiological needs	Lack of clients
Agrarian	Approx. 7000 years B. C.	Agrarian settlements	Metal- working	Agrarian economy	Tools operated by animal force	Force of human and animal muscles	Bread	Satisfying group physiological needs	Basic existence
Industrial	Approx. 1800 A. D.	Industrial towns	Steam engine	Production of goods	Mechani- zation	Force of human muscles, machine	Basic industrial goods	Self- sufficiency of local society	Industrial goods
Post-industrial	1965	Suburban communities	Computer	Services	Automation	Human brain, computer	Highly- processed goods	Simple information systems	High scale of production, high quality
Electronic	1983	Virtual communities	World Wide Web	E-business	Robotization	Human brain, hardware, Internet	Infor- mation (proces- sed)	Satisfying international economic needs	Variety of production, access to information
Post-electronic information	1999/2000	Virtual reality, information society	Mobile com- munications, cordless Internet	Information processing and management	Artificial intelligence based on information	Human brain, software, Internet	Infor- mation	Global security, self- realization	Acces- sibility of infor- mation

Table 2: New Economy and production processes

Business challenges before 2020	Ways of accomplishment
Reaching high level of competitiveness in all operations (on all levels of the process of production).	LEE – Lean, Effective Enterprises
Integration of human and technology resources in order to raise production effectiveness and customer satisfaction.	CRE – Customer Responsive Enterprises
Immediate transformation of information obtained from a wide network of various sources into useful knowledge which facilitates making effective decisions.	TCE – Totally Connected Enterprises
Reduction of production waste and influence on the natural environment to ‘almost nil’.	Environmental Sustainability
Fast reconfiguration among production businesses in response to changes in various needs and opportunities.	Knowledge Management
Quick innovations in production processes and products keeping in mind a constant reduction in their physical size.	Technology Exploitation

Source: Manufuture 2003.

2. Power of digital technology – departure from analogue technology.
3. Heading toward virtual reality by searching for virtual solutions corresponding to present ones.
4. Molecularization – departure from systems hierarchy toward ‘individual creators of values’.
5. Integration (work) on the Web.
6. Elimination of intermediaries and indirect functions.
7. Correlation of market areas – combining their organizational structures, areas and functions (e-content).
8. Innovation – key success factors.
9. Consumer-producer – consumers participate in production already on the level of product design.
10. Functioning in real time (real-time economy).
11. Globalization.
12. Era of anxiety and threat (for societies outside the ‘loop’).

These processes require a continuous process of adaptation on the part of businesses to meet evolving consumers’ needs (Table 2).

### **New Economy Enterprises – Virtual Organizations**

New economy enterprises apply new principles of operation. Traditional solutions based on the concepts of Total Quality Management

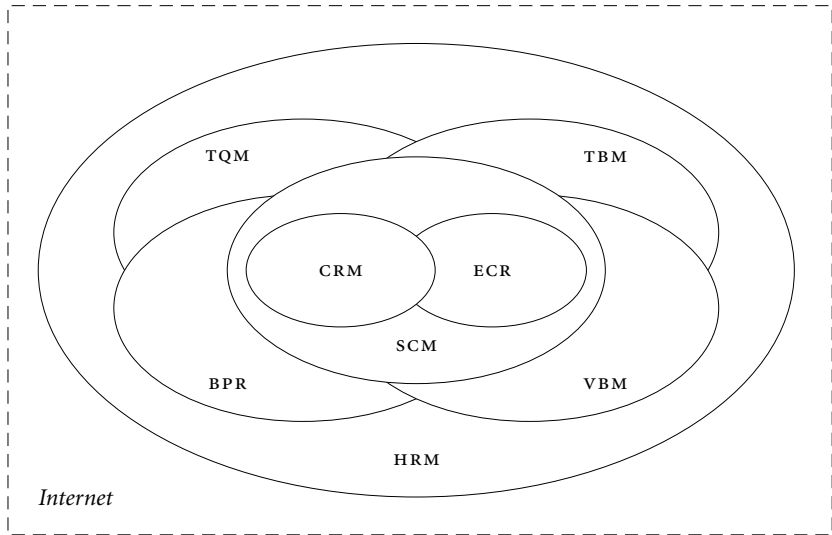


Figure 1: Sources of internet value network in the New Economy (author's analysis)

(TQM), Business Process Reengineering (BPR) or Value Based Management (VBM), see a comeback in popularity in the informational era. The implementation of the Internet guarantees an ever-increasing effectiveness within the Time Based Management (TBM). Capitalizing on the advantages of Human Resources Management (HRM), it creates a previously unthinkable synergy effect in the form of holistic (multi-aspect) management of an entire chain of cooperating enterprises in all areas (Figure 1). The logistics pipeline comprises physical, informational and financial flows.

The processes described lay real foundations for the development of the new economy through the creation of virtual organizations defined as:<sup>2</sup>

1. Temporary, goal-specific network of independent businesses joined by Internet Technology, based on synergy-effect cooperation (alliances, joint ventures, competition).<sup>3</sup>
2. New business that integrates processes previously implemented by different enterprises but now operates independently and creates added value due to the synergy of its combined functions.
3. A totally new creation offering totally new products and totally new functions.

Practically speaking, virtual organizations are treated as production systems, i. e. designed and organized economic unions (enterprises) used in order to create certain products and satisfy customers' needs. They utilize concrete supplies, i. e. input, (e. g. hardware, software) or information supplies (e. g. data base, graphics etc.) and output (e. g. Web page content, financial transactions, contacts with subcontractors) that satisfy the needs of the market and ensure expected profit.

### Virtual Supply Chain – Internet Value Network

#### eSCM

Enterprises that utilize Internet infrastructure in their operations can be divided into three groups: users, telecommunications businesses and suppliers. They offer both traditional and virtual enterprises a wide variety of services to access on-line resources and opportunities. This access is based on the '5c' (Afuah and Tucci 2003):

1. Coordination,
2. Commerce,
3. Community,
4. Content,
5. Communications.

In this way a virtual supply chain is created which is strictly connected with the traditional supply chain based on the flow of goods and services (Figure 2).

The synergy of Internet properties, wide use of Electronic Data Interchange (EDI), knowledge and intellectual capital of organizations as well as the effectiveness of traditional SCM system solutions all lead to management of the supply chain in the new economy, i. e. eSCM (electronic Supply Chain Management) and to the creation of the *Internet value network* (Afuah and Tucci 2003). Though it is based in many cases on the so-called *dynamic network*, utilizing the cooperation of the mother company with a network of specifically selected partners, it is generally based on a wide use of the Internet in the following processes: commerce, production, physical movement, planning, supply and product design (Figure 3). Knowledge and intellectual capital of new economy enterprises create, according to L. Edvinsson's rooted tree theory (Edvinsson and Malone 2001), the basis for their real sphere, i. e. physical and production flow, which stimulates the development of other spheres of their

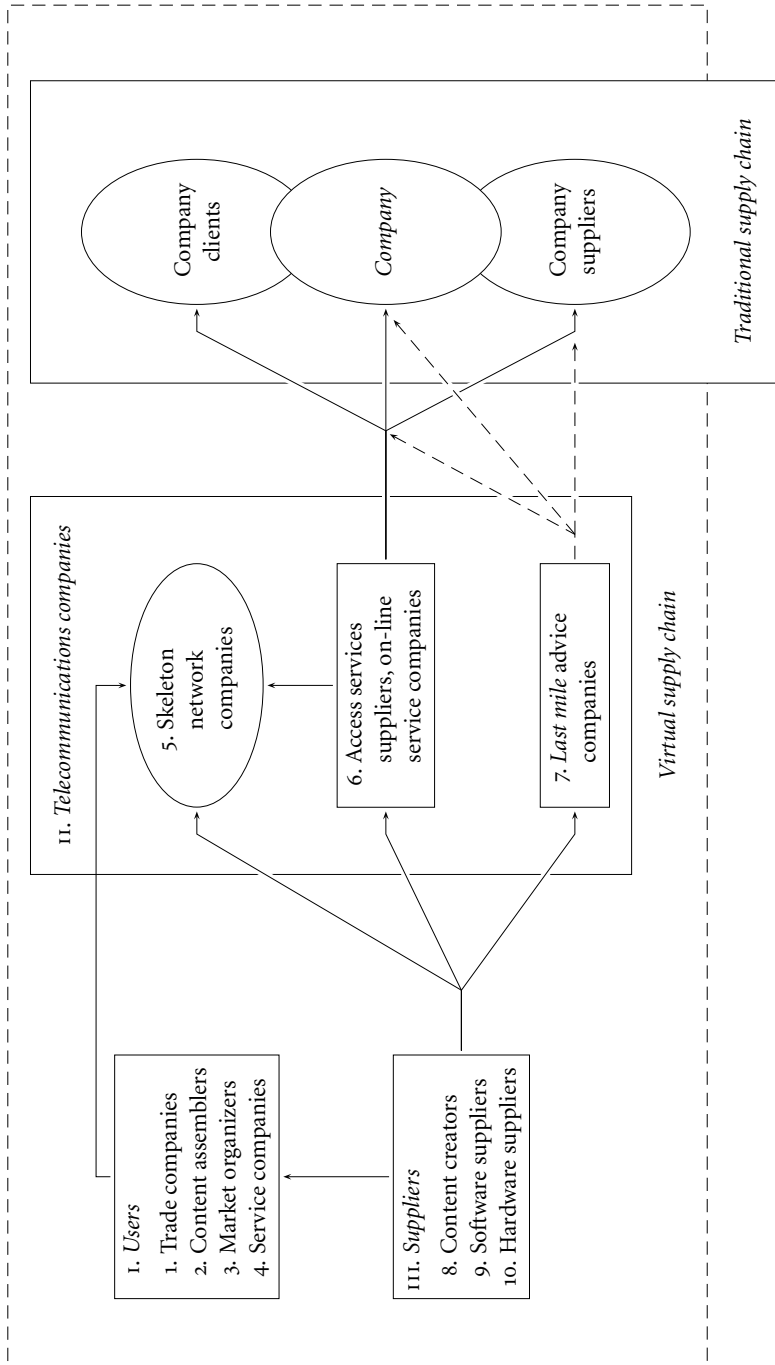


Figure 2: Virtual supply chain (author's analysis based on Afuah and Tucci 2003)

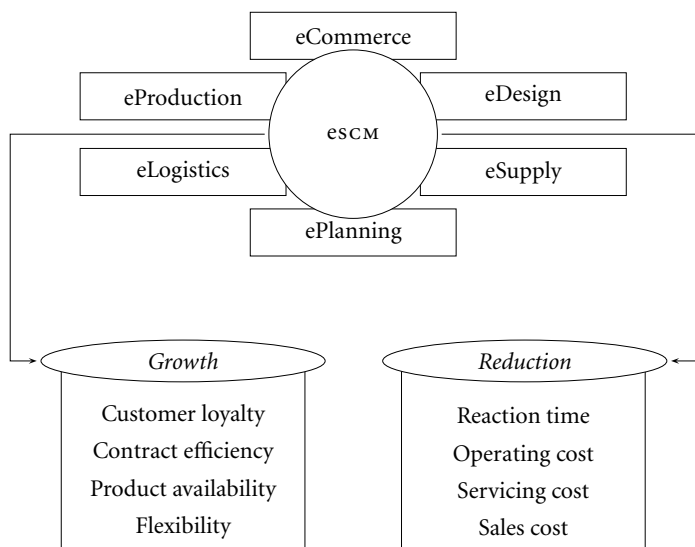


Figure 3: Elements of eSCM (author's analysis)<sup>4</sup>

activity in their close and global environment as well as contributing to their growing competitiveness.

#### CHARACTERISTICS OF THE SUPPLY CHAIN IN THE NEW ECONOMY

The specific characteristics of the supply chain functioning in the new economy are mainly based on the synergy effect of traditional business solutions and Internet technology applications. The comparison of the characteristics of the chains in the old and new economies is presented in Table 3.

### Net Readiness of Polish Enterprises

#### RESEARCH METHODOLOGY

The utilization of evident advantages of supply chains in the new economy is conditioned by a number of factors that are chiefly related to the internal characteristics of a business. They are referred to as *Net Readiness* (NR), i. e. the degree to which an enterprise is ready to conduct its business activity using the Web.

Employees of Cisco Systems (Hartman, Sifonis, and Kador 2001) are the authors of the Net Readiness methodology used to research Polish

Table 3: Internet value network: characteristics of supply chains in the Old and New Economies<sup>5</sup>

Sphere of activity		New economy – information economy		Subsystems esCM
Old economy (description)		Characteristics		Sources of synergy
<i>Basic Processes</i>				
Production preparation and internal logistics	Production preparation is based on demand analysis and collecting orders sent traditionally from sales network.	Client communications is done on-line. <sup>6</sup> Information comes directly from consumers, mostly through Websites. It reduces the time for demand analysis and the process of production preparation.	ePlanning, ECR, CRM, TQM, BPR.	
Production	Scale Economy decides about the position of a competing business.	Wide variety of production, high quality of goods and high level of logistic customer service.	eProduction, BPR, ECR, TQM, CRM.	
External logistics – supplying of products to consumers	Products reach their final consumer mostly through a company's distribution network using own means of transportation. It extends the time of customer service.	Sales takes place through an Internet store. Sales documents are transmitted electronically. Goods are delivered by delivery companies which results in lowering costs and prices, reduction in order fulfillment time, expanding credibility of exchange through the Internet due to the so-called 'third-party transactions'.	eCommerce, eLogistics, ECR, TQM, CRM.	
Marketing and sales	Limited scope of marketing and advertising. A brand is promoted in sporadic advertising campaigns. Sales are conducted through traditional channels, usually agreements with chain stores.	The image of a business is strengthened through electronic marketing methods such as its own Websites or actions directed at specific consumers. Sales are usually conducted electronically on line and take place mainly on the B2B, B2C or B2G markets.	ePlanning, eCom- merce, eLogistics, ECR, HRM, TQM.	



Supporting Processes

Human Resources Management	Employee is usually the supplier of work force. Work is organized on the basis of strictly defined lists of duties and limited competencies.	Employees are the most important business resource (knowledge). They create its <i>know-how</i> and generate its innovations. The company adopts features of a virtual organization. Work is organized on the basis of wide competencies and limited formalization.	Computer networks, ECR, CRM, TQM, BPR, HRM.
Supply	Supply costs are reduced by the <i>just-in-time</i> methods. Their amount is the result of searching for suppliers using traditional, low-effectiveness, time-consuming methods.	Markets B2B and <i>e-marketplaces</i> contribute to lower supply cost. Information technologies speed up the process of searching for profitable market offers, reduce the time of setting up cooperation agreements and add to the flexibility of supplier selection process.	eSupply, VBM, ECR, BPR, TQM.
Services (excluding service enterprises)	Enterprise is not prepared to perform services not directly related to its product.	Services are treated as an integral part of the enterprise operation. In addition to basic services, information and entertainment services are offered among others.	ePlanning, eProduction, eCommerce, TQM, ECR, BPR.
Infrastructure	Infrastructure is very developed; it includes production and social functions. Investment is related to production assets expanding production capabilities.	Infrastructure of the enterprise is adapted to the range of e-commerce it conducts. IT investment is the most important. The main asset of the enterprise is knowledge and information. Investment is related to technical and organizational aspects of accessing data base.	ePlanning, BPR, VBM.
Technology development	Technology development is mainly related to the production sphere and aims at increasing production scale.	Modern technologies development is top priority. They reduce the time of filling orders, increase effectiveness and competitiveness of the enterprise.	eDesign, VBM, TQM.

enterprises. They refer to Net Readiness as a subjective combination of ‘(. . .) four factors that enable enterprises to activate highly effective business processes utilizing Internet technologies and having a real, concentrated and measurable character.’ They include: leadership, management, competencies and technology. Cisco research proves it is very unlikely for any company to be successful in e-business if either of these factors malfunction.

The main NR research tool is the NR evaluation chart. It describes the level of involvement of an enterprise in e-business solutions. It also enables the position of the enterprise to be determined in relation to the best representative in its group. The authors of the methodology divide enterprises into five groups:

1. *Internet visionary* – enterprises displaying best preparation to operate in the Net,
2. *Internet expert* – Net Readiness of the enterprise is impressive but certain significant elements are missing,
3. *Internet savvy* – enterprises showing ‘higher than average distance from the concept and language of Net Readiness’,
4. *Internet aware* – enterprises that are more conscious of than ready for the Net economy challenges,
5. *Internet agnostic* – e-business remains outside of the enterprise’s range of interest.

#### RESEARCH RESULTS

NR research of Polish enterprises was conducted between October 2002 and November 2003. It was funded through a grant from the Polish Scientific Research Committee and was entitled ‘Adaptation of Polish Enterprises to E-Business Competition’. 71 enterprises were researched that had been selected from the year 2001 list of 500 biggest Polish enterprises. The stock exchange and non-stock exchange companies that were studied gained profit in 2001 in the 60 million–2,9 billion USD range (1 USD = 3,5 PLN). They employed between 100 and 100,000 employees while their investment reached from 290,000 to 1,5 billion USD. Managers of the enterprises that took part in the study answered questions regarding the use of information technology, application of the Internet while contacting main customers and suppliers, opportunities for individualization and virtualization of products and processes, speed of services as well as the clients’ attitudes to accepting new means of product delivery.

The Net Readiness Evaluation Chart that was used in this research consisted of 20 questions concerning the following: leadership, management style, competencies and technologies (Table 4). Survey participants rated respective areas on a 1–5 point scale.

A comparison of overall results achieved in the group of researched companies to the ideal model and Cisco research population (Table 5) confirms the broad technological opportunities of Polish enterprises. However, with lack of e-business orientation (Table 4, question no. 20 – minimum value – 2.67), the results point out, at the same time, that the IT infrastructure is sufficient to conduct e-business (question no. 17 – highest average – 4.42). The discrepancy among these answers clearly shows deficiencies of the largest Polish companies in developing e-business. This has been observed mainly in e-business management. Admittedly, the bosses of researched companies seem to notice some opportunities in e-business, but they lack ideas on how to utilize them, e. g. lack of development strategy, administrative procedures and e-project evaluation.

Marked disproportions can also be noticed between production- and non-production companies as well as between companies with high as opposed to low levels of sensitivity to e-business competition (Table 6). Researched companies generally reached a relatively high level of readiness ('Internet sense'). However, the leading group of the 'Net experts' includes non-production companies in addition to companies with a high level of sensitivity to the risk of e-competition.

On the level of leadership and management, the majority of companies are highly sensitive to competition's e-business. They also show a relatively high level of e-business competencies and technological advancement. This group can only be compared to the non-production companies that dominate as far as technology and competencies are concerned. This fact confirms a general observation that it is relatively easy for these companies to undertake activities leading to the use of the Internet. It is obvious that production companies with low sensitivity to e-business competition, on the other hand, rate much lower. This results from a low susceptibility of their products to virtualization processes.

### **Summary**

Business solutions used in supply chains of the new economy lead to time savings, contribute to value creation for cooperating businesses and enable maximum adjustment of business offer to the needs of the market.

Table 4: Polish enterprises net readiness evaluation chart (median,  $N = 71$ )

No.	Net readiness factor	Mean
	<i>Leadership</i>	3.68*
1	Top leadership keeps in mind opportunities/threats resulting from Internet economy.	4.12
2	Internet projects under implementation are well integrated with the overall business strategy of the company.	4.09
3	There is a culture of information sharing within the entire organization.	3.97
4	Company has a clearly defined and accepted 12- to 18-month development strategy regarding e-business.	3.21
5	Company's e-business efforts stress more the strategic significance of value creation rather than concentrate on its operational effectiveness.	3.00
	<i>Management</i>	3.32*
6	Company has standard principles of work organization of e-business projects.	3.36
7	We have stable indices rating the effects of e-project implementation.	3.00
8	Company has clearly specified functions, range of duties, responsibilities and control in relation to e-business projects.	3.39
9	E-business projects are implemented by the right people who are properly motivated to achieve expected goals.	3.33
10	IT Department sees itself as a business partner and consultant in utilizing Internet services by the company's business units.	3.48
	<i>Competencies</i>	3.62*
11	Company is able to function in the face of rapid and constant change.	4.18
12	E-business projects are implemented quickly and efficiently, i. e. by 3 to 6 people in less than 3 months.	3.15
13	Business managers have IT knowledge while IT managers have business knowledge.	3.70
14	Company is experienced in simultaneous management of internal and external relations.	3.79
15	Company can quickly start and develop cooperation with business partners.	3.30
	<i>Technology</i>	3.90*
16	Entire company is covered by a stable and standard IT infrastructure.	4.27
17	Company has an indispensable technical infrastructure such as the networks, hardware etc.	4.42
18	Company's solutions are flexible enough in response to changes in the environment.	4.15
19	Company's solutions can be easily adapted to changing needs of its customers.	3.97
20	Majority of company's solutions is e-business oriented.	2.67

\* Arithmetic mean of the rating obtained from all answers regarding the specific NR factor. Source: Author's analysis based on Cisco methodology and results of research.

Table 5: Researched companies net readiness

	Leadership	Management	Competencies	Technology
Ideal model	5	5	5	5
Cisco population	4,4	3,9	4,1	4,2
Polish companies	3,7	3,3	3,6	3,9

Source: Based on Cisco methodology and results of research.

Table 6: Net readiness of enterprises according to type of activity and sensitivity to competition

	Leadership	Management	Competencies	Technology
Productive	3,56	3,32	3,57	3,73
Non-productive	3,71	3,19	3,9	4,2
Low sensitivity	3,39	3,13	3,46	3,74
High sensitivity	3,91	3,47	3,65	3,93

Source: Results of research.

Modern supply chains do have a number of advantages; however, they are not free from threats resulting from the characteristics of e-economy (Table 7).

Generally, these threats lie in low net readiness to operate in the e-business environment as well as in the necessity to make broad investments in IT solutions. Limits in new opportunities that can also be noticed are due to a world-wide economic stratification and a clear division into digital civilization and *outsiders*. Additionally, there are difficulties in a free flow of information connected with specific persons or companies (e. g. problems with infrastructure) or problems with a revolutionary transition from the old to the new economy omitting intermediate stages such as the technological gap, social factors, mentality, level and features of consumer needs. Nevertheless, it can be stated that the correlations generally taking place in many aspects of economy will have a growing influence on its basic processes. Economic evolution in different countries, on the other hand, will be wider and more intense, which, in turn, will be conducive to the transition into the new economy of more countries. In this process, the only companies to reach a high level of competitiveness will be the ones effectively managed and ready to function in the Net, showing this readiness by participating in modern, highly flexible, virtual supply chains.

Table 7: Elements of SWOT analysis for eSCM (vs. traditional SCM capabilities)

<i>Strengths</i>	<i>Weaknesses</i>
<ul style="list-style-type: none"> <li>• High flexibility of action</li> <li>• High speed of processes</li> <li>• Very high integration of chain members</li> <li>• Great influence of needs on offer creation</li> <li>• Lower cost of transaction completion</li> <li>• Lower cost of investment in development of cooperation within supply chain.</li> </ul>	<ul style="list-style-type: none"> <li>• Low level of <i>net readiness</i></li> <li>• Necessity of wide IT solutions implementation, especially integrated software</li> <li>• Necessity of purchasing (creating) and constant updating of data base</li> <li>• Necessity to trust all members of e-supply chain</li> <li>• Lack of examples to follow</li> </ul>
<i>Opportunities</i>	<i>Threats</i>
<ul style="list-style-type: none"> <li>• Opportunity for quick action in case of a market niche</li> <li>• Globalization of business activities and consumer expectations</li> <li>• Diversified consumer expectations</li> <li>• Opportunity to use latest technical innovations, e. g. cordless Internet, micro payments</li> <li>• Synergy of opportunities and experiences of supply chain members</li> <li>• Lack of barriers to the flow of information</li> </ul>	<ul style="list-style-type: none"> <li>• Failure of IT systems</li> <li>• Lack of generally accepted legal regulations</li> <li>• Lack of preparation of supply chain members for operating in the new supply chains</li> <li>• Lack of interest on the part of the new supply chain consumers (and potential cooperating firms) resulting from delays related to infrastructure, local culture, mentality or organization</li> </ul>

Adapted from Kisielnicki 2002.

### Opportunities for Future Research

A diagnosis of the current degree of enterprises' readiness to function in the new economy creates new directions for research. Questions ahead are related to, among other things:

1. Possibility and potential scope of process and product virtualization in enterprises with varied levels of technological advancement.
2. Rate of achieving new competitive positions within e-business solutions.
3. Influence of companies' countries of origin, basic activity markets and international connections on effectiveness of e-business solutions.
4. Influence of the past on the functioning of enterprises in the former 'Eastern Bloc' countries in comparison with enterprises from Western Europe, Japan and the us.

## Notes

1. The term 'added value' refers, in this case, to an additional input in the development of civilization at a specific phase of world economy.
2. Author's elaboration based on Grudzewski and Hejduk 2002, 93–7 and 164–5.
3. Coopetition is a tool and a form of competition. It consists in making unions among businesses in order to serve the client and compete more effectively on the market (Pastuszak 2002a).
4. Author's analysis based on Korff and Knak (2001) and author's study of 53 Polish production enterprises (Pastuszak 2002b).
5. When characterizing supply chains in the new economy, the classification of business activities within the supply chain was based on an article by M. E. Porter and V. E. Millar (1985).
6. A lot of attention is paid in this process to the concept of the Virtual Customer, who influences, through the Internet, product development in all stages of its production (see Dahan and Hauser 2001).

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