E-business Diffusion in Hungarian SMEs: Challenges and Opportunities

ANDRÁS NEMESLAKI, Ph.D.
ASSOCIATE PROFESSOR

e-mail: andras.nemeslaki@uni-corvinus.hu

SUMMARY

In this paper we introduce the main results of a survey describing the e-business adoption situation of Hungarian small and medium sized enterprises (SMEs). We used the e-w@tch methodology, and this enables European wide comparison of the status of e-business applications, but does not explain how individual SMEs might take advantage on using ICT resources.
Therefore, we propose a theoretical framework based upon recent research, in order to better understand the e-business value creation process. We outline a multi-layer model where the value creation process is in the core, and several environmental factors exort their influence. We demonstrate the impacts of the macro level economical environment and the influence industrial sectors. After that, going deeper to the corporate level – in our cases we were mainly focusing on SMEs – we refer to the importance of using the concepts of online information capabilities and digital options to transform ICT resource toward organizational outputs.
In the last section of our paper we used the EU-5 2003 and the 2004 Hungarian SME e-business adoption measurement to specify the resource side of the European e-business value creation. We found that the resource specifications are rather consistent, and concentrate around six groups of e-business resources: communication, remote access, complex ICTs, operational efficiency, knowledge and content management, and on-line sales resources.

INTRODUCTION

Significant achievements have been accomplished in measuring European e-business activities. There is an ongoing quest to understand how information communication technologies (ICT) create organizational value; more effective process management, customer satisfaction and very importantly improved economic performance. We believe this issue is especially significant in the period of EU enlargement when the region´s global competitiveness will depend on how quickly the newly joined economies close the digital divide, how efficiently companies put ICT into operation and squeeze business benefits in order to provide more values to their stakeholders.
In this paper we first introduce the main results of a survey describing the e-business adoption situation of Hungarian small and medium sized enterprises (SMEs). We used the e-w@tch methodology (The E-business Report, 2003) and this enables European wide comparison of the status of e-business applications but does not explain how individual SME might take advantage on using ICT resources.
In the second major part we propose a theoretical framework based upon recent research in order to better understand the e-business value creation process. We outline a multi-layer model where the value creation process is in the core, and several environmental factors exort their influence. We demonstrate the impacts of the macro level economical environment and the influence of the more immediate industrial sector. After that going deeper to the corporate level – in our cases we were mainly focusing on SMEs – we refer to the importance of using the concepts of online information cabalities and digital options as first steps to transform ICT resource toward organizational outputs.

E-BUSINESS ADOPTION OF HUNGARIAN SMES ACCORDING TO THE E-W@TCH CONCEPT

The Small Business Development Center and the E-business Research Center of the Corvinus University of Budapest completed a pilot survey amongst Hungarian Small and Medium Size Enteprises (SMEs) according to the e-business w@tch 2002/2003 research methodology during the first half of 2004. This project had been initiated by the Hungarian Ministry of Economics and Transportation with the main objective of exploring the level of ICT usage and e-business adoption amongst small and medium sized companies (SMEs). The broader context of the inquiry was to use the results as inputs to develop policies to enhance e-business diffusion in this sector of the Hungarian economy, and to harmonize

Hungarian e-business measurement with the already established e-w@tch project.

The investigation was focusing on the following issues:

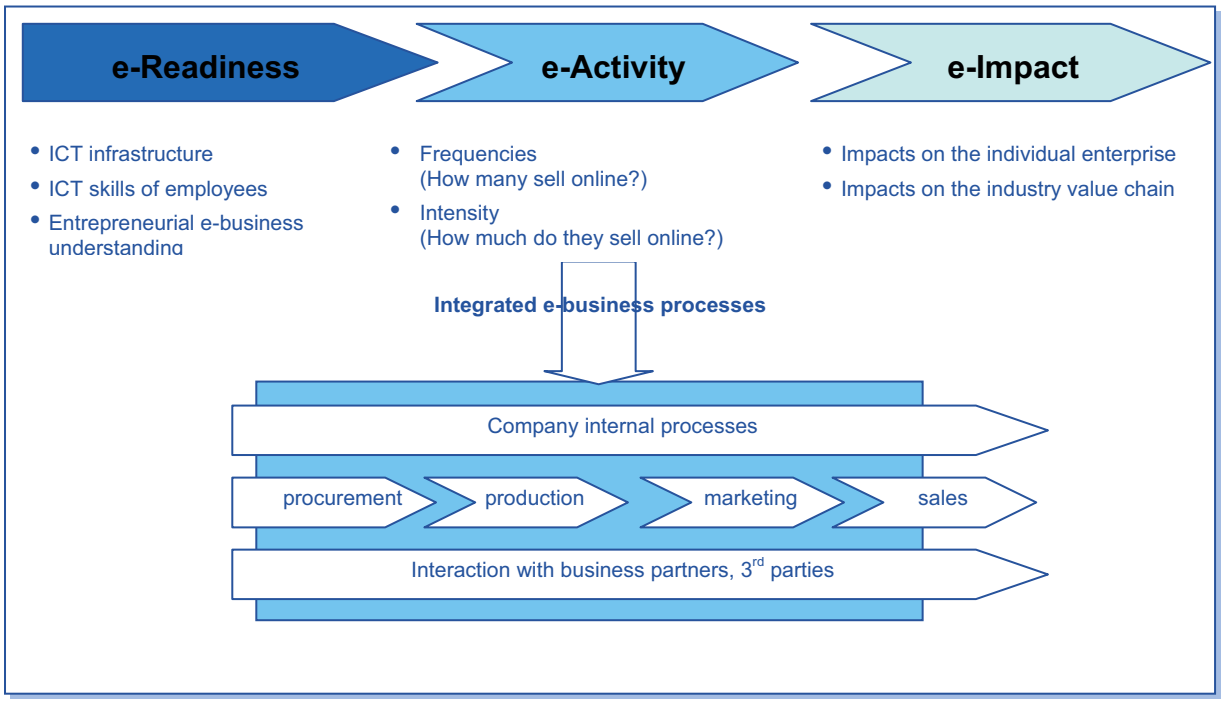
- ICT infrastructure and e-readiness of SMEs
- Diffusion of e-business
- Integration and sophistication of e-business solutions
- Significance and impact of e-business
- Sectorial perspective of e-business

The sample was representative, the research was based on 320 personal interviews, mainly with SMEs which have shown some interest in applying e-solutions. Of the total 320 SMEs 30,3% were micro (less then 9 epmloyees), 43,1% were small enterprise (10-49 employees), and the rest 26,6% were medium enterprises (50-249 employees). The original EU-5 survey was not dividing the small and micro groups, and it also contained 10% over 250 employees.

Companies were selected randomly from the following industries: food, beverages and tobacco, chemical, electrical machinery and electronics, transport equipment, retail, tourism, and ICT services.

Generally, the survey concluded that 96,9% of these SMEs have used computers and 94,5% of them have had internet connection of some kind. They have operated in a stabile economic environment, generating steady revenue streams, producing net profits and increasing employment. Details of the results are available in (Szirmai et. al., 2004) according to the e-w@tch representation.

As we stated in the introduction, our objective in this paper is to discuss the theoretical aspects of the e-business value creation process in the context of the enlarged EU. In Figure 1. we summarized the widely accepted e-w@tch concept adopted from the 1999 OECD e-business assimilation model. We also organized the key findings of the Hungarian SME survey according this structure in Figure 1. The essence of this model is, that appropriately used ICT infrastructure and ICT skills lead to higher level of e-activities (on-line sales, internal process management and on-line procurement) which in turn create some kind of business impact.



- More than 40% of SME-s have DSL connection in Hungary
- Percentage of firms >2Mbit/s connectivity is only 11,3%
- More than 60% of firms have already implemented LAN.

  About 10% of SME-s had difficulties in finding IT staff in the last 12 months

- There is a strong correlation between firm size and the complexity of adopted e-business solutions
- Strong buyer orientation. Much more SME-s indicated online exchange of information towards supplier than towards consumer
- Online procurement is more widespread than online sales.
- E-markets are still in infancy.

- The smaller the SME the more positive opinion about e-business effects
- Half of the SME-s saying that online sales have increased the number of consumers
- The effect of e-business first experienced through sales and procurement channels
- We have found connection between sector characteristics and satisfaction with e-business

Figure 1. The e-w@tch e-business adoption model and the status of Hungarian SMEs

The OECD model provides an opportunity to compare the status of SME e-business adoption, for instance using our Hungarian data we can assess the major differences in ICT infrastructure and most widely used e-business solutions. Building upon this powerful descriptive feature we propose the theoretical extension of this concept in order to go beyond the static "situational" analysis to understand deeper connection between e-business infrastructure and potential business results. Using some of the findings of the e-w@tch surveys and combining them with recent theoretical achievements in the area of the resource based view (RBV) of strategic management and its off-springs we can understand more clearly the transformational steps how an SME level e-infrastructure leads to e-activity and that to measurable business impacts.

ICT AND BUSINESS VALUE CREATION MODEL

Results of the e-business w@tch measurements have proved that the level of e-business adoption and the articulation of real or perceived organizational impacts are influenced by country and industry characteristics. To conceptualize these influences we have adopted (Melville et. al. 2004) who argued that IT resources make their impact on organizational performance through an onion-like layer structure, as it is described in Figure 2.

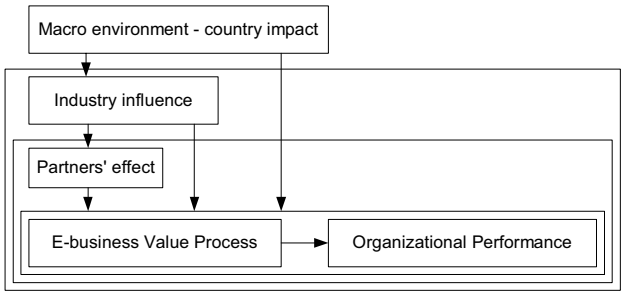


Figure 2. E-business Value Model – adopted from Melville et. al. 2004.

Country Impact

The impact of country characteristics are illustrated for instance by Dutta and Jain (Dutta − Jain, 2005) who plot the relationship between GDP – as a key country performance indicator – and internet adoption, measured by their eEurope 2005 Index.

Without discussing the computational details, the index compounds the following parameters:

- internet indicators (access of citizens, access of enterprises, access costs),
- modern on-line public services,
- dynamic business environment,
- secure information infrastructure,
- broadband services.

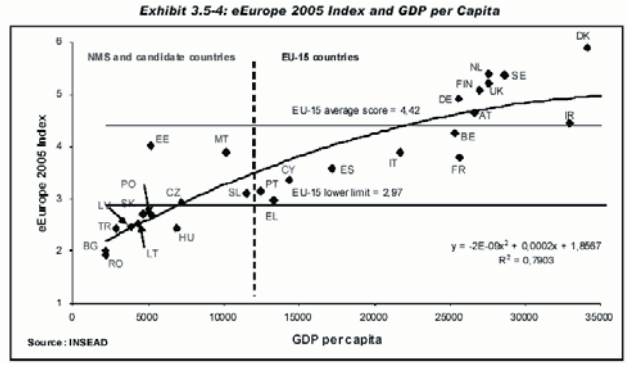


Figure 3. The eEurope 2005 Index and GDP per capita − Dutta − Jain (2005)

Dutta and Jain have shown that given their economical potentials some are performing better than others. For instance in the newly joined country group Estonia and Malta are in the former while Hungary is in the latter group (above or below the average line).

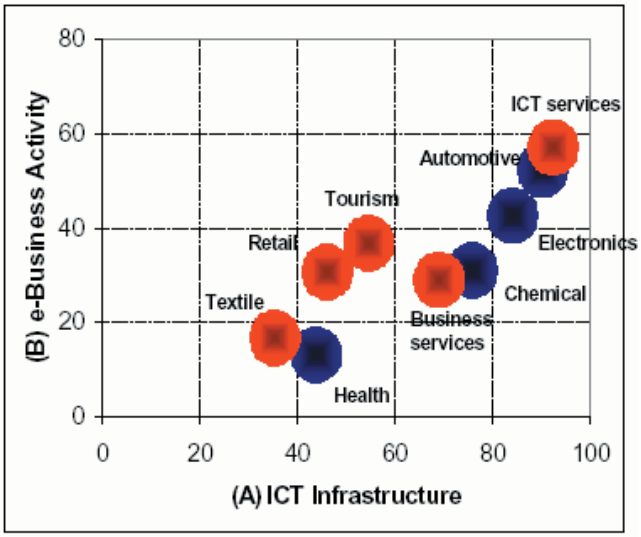
Economic Intelligence Unit (EIU) has also been measuring country level e-readiness for 5 years, comparing the following compound indicator:

- Connectivity and technology infrastructure (25%)
- Business environment (20%)
- E-commerce consumer and business adoption (20%).
- Legal and regulatory environment (15%).
- Social and cultural infrastructure (15%).
- Supporting e-services (5%).

The EIU measurements separate regions in the global economy according to the similarities in their macro environment: for instance the Scandinavian Region, Western European Region, US, Canada and Australia, Central-Eastern Europe etc.

Industry Impact and Partners' Effect

One of the surprising conclusions of the e-w@tch measurement over the last two-three years is the significance of the sectorial impact on e-business activities. In some cases -like for instance Slovenia and Estonia – industry influence is more dominant in SME e-activity then the regional impact. In Figure 4. and Figure 5. we show the 2004 e-w@tch data and the Hungarian results amongst SME companies.



Source: e-Business W@tch: e-Business Survey 2003

Figure 4. Sectorial impacts of e-business activities

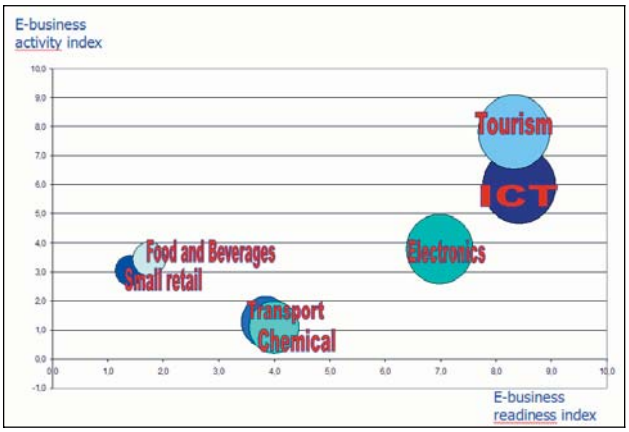


Figure 5. Sectorial impact of e-business activities in Hungarian SME

It is interesting to compare the position of the tourism sector in the Hungarian sample and in the original EU survey. Probably, the strong position in the Hungarian context is due to the fact, that customers in this sector are more global accessing the internet from more "e-ready" regions. At the same time this industry is heavily information driven, hotel reservations, airline bookings, cultural program organizations, ticket access and other coupled services can be organized into integrated portals which provide clear value for their customers.

Concluding the essence of the first two layers in Figure 2., we might say that e-business activities are determined by the macro economical environment, but even in the less internet ready geographical regions opportunities exist for adopting contemporary e-business solutions which might operate as springboard for wider ICT usage.

The E-business Value Rocess

In the heart of the onion-like structure SMEs face the the core problem of how e-business infrastructure is transformed to organizational performance improvement. To explore this process we turn to the concepts of net enabled business transformation and the use of the resource based view of strategic management theory.

Case studies of successful companies demonstrate that the internet and related technologies have enabled them to change the way to interact and coordinate value chain activities with customers and suppliers with the objective of improving operational and financial performance. These changes referred to as Net-enabled Business Transformation (NBT) (Barua et. al., 2004). Conceptually, we see des-intermediation, when elements of the supply chain are eliminated, we experience repositioning the power structure amongst business partners, and also witness impacts with new value services focusing on the concept of reach (providing access to information) and richness (information content). During the last years the Resource Based View (RBV) has become a dominant theory base to study firms´ abilities to deploy technological, organizational and environmental resources in the context of NBT (Wade, Hulland, 2004). The RBV approach provides useful help in the following areas:

- specification of ICT resources
- using ICT resource attributes they can be compared with each other
- RBV sets out a clear link between resources and organizational performance (or outcome constructs), for instance sustainable competitive advantage or financial improvements.

Figure 6. describes our interpretation of the RBV theoretical framework. Putting the e-w@tch methodology into this context we might say that e-business resources (which we consider as a subset of ICT resources) together with other complementary organizational resources, when deployed and exploited properly, lead to improvements in financial performance, competitive position and customer and partner relationships – together defined as outcome construct.

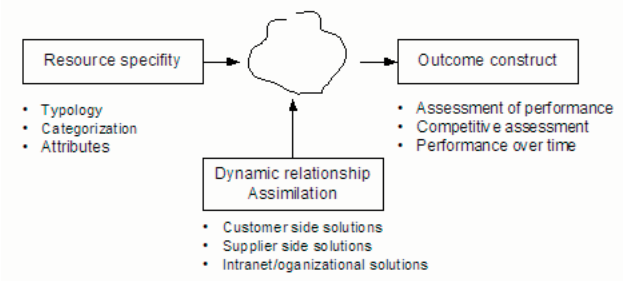


Figure 6. Application of the Resource Based View to understanding and measuring e-business impact – adopted from (Wade − Hulland, 2004)

A quite intriquing research area is the center of Figure 6. i.e. through what mechanisms can the ICT resources be turned into successful business outcomes. Without the desire to fully overview this stream of scholarly contributions we would like to refer to two key concepts which attempt to explain how the value creation process work.

The first construct is the terminology of Online Information Cabalities (OIC) which is defined as the ability of a firm to exchange strategic and tactical information online with customers and suppliers on demand (Barua et.al, 2004). On the customer side these capabilities are for instance product information available on-line, capability of customers to configure there orders and the communication capabilities with service representatives. On the supplier side OICs focus on the ability to share process information with partners (quality, quantity, yield etc.), capability to track changes, share inventory information, update production schedules and continuosly update product information.

The OIC construct nicely harmonizes with concept of digital options introduced by (Sambamurthy et. al., 2003). Digital options are rights to future investment choices without a current obligation for full investment. According to Sambamurthy companies extend their OICs to develop capabilities in the areas of knowledge management and process improvements using the above mentioned concepts of information reach and richness. The philosophy of options is essential, thus these capabilities are not necessarily transformed into direct profitability outputs, they might be abandoned in certain time, might also be further extended through additional investment. It also draws the attention of management to the importance of understanding the sequential nature of the ICT investments, that is unless taking risks at present achievements cannot be attained in the future.

We believe that further research exploring these variables will lead to promising results specially in the context of SMEs in the greater EU region since the way they use e-business solutions will be determining to the entire macro environment.

In the following section we will use the Hungarian SME and EU-5 2003 e-w@tch data to highlight some issue on the resource specifity.

E-BUSINESS RESOURCE SPECIFICATION DIFFERENCES IN EU AND HUNGARIAN SMES

In order to illustrate what kind of basic questions the RBV approach puts forward first we focus on the resource classification of the e-business value creation process. We compared the Hungarian SME sample with EU-5 measurement introduced under Section 1. Given the exploratory nature of our paper we do not discuss the methodology in detail but for a deeper analysis both data and the statistical computation should be harmonized. For the illustrative purposes and the sake of simplicity we used the infrastructure sections of the e-business w@tch surveys without major alterations. The main questions were:

a) What type major e-business related resource groups can we indentify in the EU-5 and the Hungarian SME sample?

b) What characterizes these resource groups in general and what kind of further investigation is needed to better understand the implications to the value creation process?

The results of the factor analysis can be seen in Table. 1. and Table 2.

Table 1. Specification of e-business resources in the EU-5 sample

Variables	*Factors*					
	1	*2*	*3*	*4*	*5*	*6*
Employee training: Does your company offer – participation in computer or IT training offered by third parties?	0.67					
Employee training: Does your company offer – employees can use some of their working time for learning activities?	0.60					
Employee training: Does your company offer – in-house computer or IT training?	0.56					
Does company use the Internet or other online services to purchase goods or services?	0.55					
Can employees access company computer system remotely from a non-business location (eg from home or a hotel)?	0.52					
Use of online technologies other than e-mail – to exchange documents electronically with customers?		0.75				
Use of online technologies other than e-mail – to exchange documents electronically with suppliers, eg orders?		0.71				
Use of online technologies other than e-mail – to negotiate contracts?		0.59				
Use of online technologies other than e-mail – to collaborate with business partners to forecast product demand?		0.51				
Use of online technologies other than e-mail – to collaborate with business partners in design of new products?		0.49				
Has company implemented – an ERP (Enterprise Resource Planning) system?			0.75			

Variables	Factors					
	1	2	3	4	5	6
Has company implemented – an SCM (Supply Chain Management) system?			0.73			
Has company implemented – an CRM (Customer Relationship Management) system?			0.66			
Has company implemented – services of an ASP (Application Service Provider)?			0.55			
Use of online technologies to support internal processes – to track working hours and production time?				0.74		
Use of online technologies to support internal processes – to support internal processes – to support the human resources management?				0.70		
Use of online technologies to support internal processes – to share documents between colleagues or to perform collaborative work in an online environment?	0.44			0.47		
Use of online technologies other than e-mail – to exchange documents electronically with suppliers, eg orders?				0.47		
Has company implemented – a Knowledge Management solution?					0.62	
Has company implemented – an e-learning application (eg learning material for employees available on Intranet or Internet)?					0.62	
Does company make use of a content management system?					0.48	
Does company sell goods or services on the Internet or throught other online distribution channels?						0.73

Group 1 – Education/Remote access/ Purchasing

The connection between remote access is logical, since companies apply e-learning and training where independence from space and time are essential.

Group 2 – Communication

These set of resources focus on relationship building and information exchange along the supply chain. They involve suppliers, business partners, customers, but also may turn internally to support R+D processes or employee collaboration.

Group 3 – Complex systems

Companies in the EU have adopted complex, integrated ICTs over the past years, such as ERP, CRM or SCM solutions. It is interesting to note that also the ASP solutions fell into this category indicating, that outsourcing or „rightsourcing" business solutions also implies collaboration with specific area experts.

Group 4 – Operative resources

Capacity management, HR management and workflow systems support the efficient operation of business processes.

Group 5 – Content management/Knowledge resources

This groups collects those resources which are in relationship with maximizing organizational memory, e-learning, and knowledge dissemination.

Group 6 – On-line selling resources

This last group is not attached to any other since its elements depend on product and service characteristics. These resource enable companies to exploit their marketing channel.

The analysis of the Hungarian SME data shows similarites but it is interesting to review the differences, as they indicated in Table. 2.

Table 2. Specification of e-business resources in the Hungarian SMEs

Variables	Factors					
	1	2	3	4	5	6
Use of online technologies other than e-mail – to exchange documents electronically with suppliers, eg orders?	0.83					
Use of online technologies other than e-mail – to exchange documents electronically with customers?	0.79					
Use of online technologies other than e-mail – to negotiate contracts?	0.68					
Use of online technologies other than e-mail – to collaborate with business partners in design of new products?	0.62					
Employee training: Does your company offer – employees can use some of their working time for learning activities?		0.82				
Employee training: Does your company offer – participation in computer or IT training offered by third parties?		0.78				

Variables	*Factors*					
	1	*2*	*3*	*4*	*5*	*6*
Employee training: Does your company offer – in-house computer or IT training?		0.65				
Can employees access company computer system remotely from a non-business location (eg from home or a hotel)?		0.46				
Use of online technologies to support internal processes – to track working hours and production time?			0.69			
Use of online technologies to support internal processes – to support internal processes – to support the human resources management?			0.66			
Has company implemented – an ERP (Enterprise Resource Planning) system?			0.58			
Has company implemented – an CRM (Customer Relationship Management) system?						
Use of online technologies other than e-mail – to exchange documents electronically with suppliers, eg orders?				0.69		
Use of online technologies other than e-mail – to collaborate with business partners to forecast product demand?				0.67		
Has company implemented – an SCM (Supply Chain Management) system?			0.41	0.44		
Does company sell goods or services on the Internet or throught other online distribution channels?				0.42		
Use of online technologies to support internal processes – to share documents between colleagues or to perform collaborative work in an online environment?					0.68	
Does company make use of a content management system?					0.64	
Does company sell goods or services on the Internet or throught other online distribution channels?					0.52	
Has company implemented – a Knowledge Management solution?						0.75
Has company implemented – services of an ASP (Application Service Provider)?			0.40			0.66
Has company implemented – an e-learning application (eg learning material for employees available on Intranet or Internet)?				0.41		0.46

Group 1 – Communications

This group shows a great similarity with Group 2 in the EU sample – focusing on communication resources along the supply chain.

Group 2 – Remote access/Education

Basically the same as Group 1 in Figure 7, indicating that remote access is a key resource in e-business activities.

Group 3 – Resource management especially in the HR context

In Hungary the HR support in ICT applications seems essential. It is also interesting to note, that ASP connections are specified in this group. Logically, we might assume that given the lack of competencies this parameter is rather and HR and knowledge transfer resource than an operational one as in the EU sample case.

Group 4 – Operative resources

This group is resembles great similarity with group 4 in the EU-5 companies.

Group 5 – Workflow and on-line purchasing

This is a different specification than in the EU-5 dataset. The connection of workflow systems and on-line purchasing demonstrates that Hungarian SMEs couple the supplier side e-commerce with the internal process, and workflow is rather operative than contributing to knowledge sharing and management.

Group 6 – Organizational knowledge

We find e-learning systems, and knowledge management systems in this group and also the application of ASPs what with a much lesser weight than in Group 3.

The six factors both in the EU and in Hungary were containing more than half of the variance explained by the sample variables. The first two factors were explaining 21% and 9% in the EU case and 20% and 10% in the Hungarian SME case – in the reverse order. That is Hungary communication resources were more dominant while in the EU-5 the remote access and education. According this data we might hypothesis that the most important resources for companies to start the e-business value creation are in communication, remote access to ICT resources and education of IT people. The other factors are also similar, like for instance, the importance of application service providers and operational efficiency applications.

SUMMARY AND IMPLICATIONS

It is a well accepted notion in the RBV literature that the relationship between the IT resource constructs and the outcome construct is determined by a complex dynamism. In this paper we proposed a multiplayer model to explore how can companies create value from deploying their e-business resources.

First we illustrated the impacts of the macro level economical environment and the influence of the more immediate industrial sector. We used the e-w@tch measurements to underline these impacts and illustrate the importance of business environment on e-business value creation.

On the corporate level – in our cases we were mainly focusing on SMEs – we referred to the importance of using the concepts of online information cabalities and digital options as first steps to transform ICT resource toward organizational outputs. We demonstrated that in order to provide a more action oriented model for SMEs the e-w@tch concept should be extended with measuring the above constructs.

Given the available datasets we used the EU-5 2003 and the 2004 Hungarian SME e-business adaption measurement to specify the resource side and the output side of the European e-business value creation. We found that the resource specifications are rather consistent, and concentrate around six groups of e-business resources: communication, remote access, complex ICTs, operational efficiency, knowledge and content management, and on-line sales resources.

We do hope that further refinements of the e-w@tch model mainly with the inclusion of the concepts of online information capabilities will lead to better understanding of how SMEs create organizational value from their e-business processes.

REFERENCES

BARUA, A. – KONANA, P. – WHINSTON, A. B. – YIN, F. (2004): An Empirical Investigation of Net-Enabled Business Value: An Exploratory Investigation, MIS Quarterly, Vol. 28, pp. 585-620.

MELVILLE, N. – KRAEMER, K. – GURBAXANI, V. (2004): Information Technology and Organizational Performance: An Integrative Model of IT Business Value, MIS Quarterly, Vol. 28, pp. 283-322.

SAMBAMURTHY, V. – BHARADWAJ, A. – GROVER, V. (2003): Shaping Agility Through Digital Options: Reconceptualizing the Role of IT in Contemporary Firms, MIS Quarterly, Vol. 27, pp. 237-263.

DUTTA, S − JAIN, A. (2005): The E-Alignment of the New EU Member States: An Assessment Within the eEurope 2005 Framework, E-business watch 2005

SZIRMAI, P. – NEMESLAKI, A. – CSAPÓ K. – CSÓRI B. – PETHŐ, A. (2004): Digital activities of SMEs and their support policies (A KKV-k digitális tevékenysége és támogatáspolitikai eszközei) – in Hungarian, Hungarian Ministry of Economy and Transportation (GKM 2528/2003 -VIII.2./2004).

The European e-business report – A portrait of e-business in 15 sectors of the EU economy, Second Synthesis Report of the e-business w@tch, July. 2003.

VENKATESH, V. – MORRIS, M. G. – DAVIS, F. D. – DAVIS, G. B. (2003): User Acceptance of Information Technology: Toward a Unified View, MIS Quarterly, Vol. 27, pp. 425-478.

WADE, M. – HULLAND, J. (2004): The Resource-Based View and Information Systems Research: Review, Extension and Suggestions for Future Research, MIS Quarterly, Vol 28, pp. 107-138.