Sourcing IT Skills in Organizations: A Comparison Among European Countries

Ronald Batenburg
Utrecht Universirty

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Ronald Batenburg
Utrecht University, The Netherlands
r.s.batenburg@cs.uu.nl

ABSTRACT

Organizations deal with the matter of sourcing and governing their IT skills. This paper provides insights how this is done by firms in different European countries. It addresses the insourcing/outsourcing of IT skills trade-off, and explores the effects of country characteristics. Analyses are based on 1,464 companies extracted from the E-business W@tch dataset, covering two distinct industries in eight European countries around the year 2003. It appears that European organizations, then, marginally recruited IT personnel on the external labour market (insourcing). Instead, outsourcing and allocating IT training were more popular as a sourcing policy. Also, it appeared that different policies to attain IT skills do not coincide. Sourcing policies significantly vary between countries, taken industry and size effects into account. Suggestions for interpreting these variations between companies and countries are put forward.

Keywords: IT skills; insourcing; outsourcing; training; international comparison.

INTRODUCTION

Investments in IT and their return for organizations have been the subject of many academic and policy discussion. This discussion has been prominently run by, e.g., the 'productivity paradox' initiated by Solow (1987); the book by Landauer (1995), *The Trouble with Computers*; the "IT Doesn't Matter" paper by Carr (2003); and many reactions to these publications (e.g. Brynjolfsson, 1993; Brynjolfsson & Saunders, 2010; Turban, Leidner, McLean, & Wetherbe, 2007). Obviously, there is no doubt that over the past decades an increasing amount of companies invested largely in Information Systems and Information Technology (IS/IT), but trend also knows it fluctuations. Around the year 2000, the prominent pressure in many European countries was to attract as many IT persons as possible to keep pace with the latest developments in IT. Later on, the dotcom-crash dramatically changed the labour market for IT specialists (Min, Caltagirone, & Serpico, 2007). In many European countries, both the demand and supply side of the labour market for IT employees seem to have resettled. Both trend watchers and policy makers forecast renewed tensions on the labour market for IT-skilled employees and severe shortages of 'e-skills' (Commission, 2007; Lanvin & Passman, 2008).

While currently new developments in the field of IT, skills and sourcing take place at a high pace, it is also of relevance to look back at trends and relationships in earlier years. In this study we benefit from the opportunity to analyses an extensive survey dataset collected among (in total 1,464 companies from 8 European countries in 2003. From this, we can address a number research questions, that are, obviously restricted to the dataset as well. First, we can describe how European companies sourced their required level of IT skills in 2003; an interesting period as being just a few years after the dotcom crises. Secondly, the data enables us to distinct between organizational policies recruiting IT personnel on the external labour market ('insourcing', cf. Lacity & Hirscheim, 1995; Slaughter & Ang, 1996), and policies that are aimed to outsource IT activities to external parties (Grimpe & Kaiser, 2010; Hirschheim, Heinzl, & Dibbern, 2002). Also, questions can be addressed as how insourcing and outsourcing policies are related to the internal training of IT skills of employees. Finally, as the dataset covers different European countries, it can examined how IT skills sourcing policy of organizations differ between countries in 2003, and what the influence might be of national or sector specific characteristics like the tightness of the labour market, and level of IT development and application.

In this paper we approach these questions by the analysis of the large-scale dataset mentioned, that resulted from a international survey among 20,000 European organizations in 2003 (Commission, 2004). The survey was conducted by order of the European Community under the label 'e-Business W@tch'. The next section starts with a basic description of the methodology of the e-Business W@tch data, after which it is described how the sourcing of IT

skills can be measured by it. The variety of IT skills sourcing by organizations is then described, and possible explanations of this variation is subsequently analysed by a (multivariate) breakdown analyse by country and by sector. The results are interpreted and concluded in the section of the paper, including suggestions for the practice of organizations and further research.

THE E-BUSINESS W@TCH DATA SET

The e-Business data collection project was coordinated and executed by Empirica GmbH (a German research institute), who coordinated all Computer Added Telephone Interviewing (CATI) interviews among companies during the period June-July 2002 in initially 15 member states of the European Union (i.e. Austria, Italy, Belgium, Luxemburg, Denmark, The Netherlands, Germany, Portugal, Finland, Spain, France, Sweden, Greece, UK and Ireland). In March and November 2003, Empirica coordinated a second and third wave of interviews was held in Norway and the 11 new UE member states (Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Malta, Poland, Slovenia and Slovakia). With almost 20,000 cases in total, it is one of the largest organization surveys ever held in Europe (cf. Commission, 2004 and the website www.ebusiness-watch.org). Field work in each country was executed by national market research organizations, supervised by Empirica. The standard procedure for sampling within each country was to first select enterprises that "were active at the national territory of the country", "have their primary business activity in one of the sectors specified by ['Nomenclature Générale des Activités Économiques dans les Communautés Européennes'] (NACE) categories", and "can be defined as a business organization of one or more establishments comprised as one legal unit" (Commission, 2004). Each national sample was stratified by economic activity (15 NACE-defined economic sectors) and size (3 classes; 1-49, 50-249 and 250+ employees), resulting in target number of responses per *stratum* (here: country-sector-size category) as can be seen by the numbers in Table 1 below.

Due to specific interests within the EU-project and practical restrictions, not every subject, industry and country was surveyed in each of the three waves. Consequently, we needed to select sub-samples from the complete E-Business W@tch dataset. Because the main questions about sourcing of IT skills and personnel (including outsourcing) were posed in the November 2003 wave, we first needed to select this half of the complete dataset. Secondly, not every country-industry combination is present in the (November) 2003 dataset. The sectors that were included for the maximum number of surveyed countries appear to be two: (1) the textile, footwear and leather industries, and (2) the health and social services sector. With regard to these two sectors, eight countries can be described and compared: The Netherlands, Estonia, Poland, France, Germany, Italy, Spain and the UK. Despite the limitation of this sub-sampling, a substantial number of cases remain to perform further analysis as Table 1 demonstrates.

	Textile, footwear and leather industries	*Health and social services*	*Total*
The Netherlands	100	102	202
Estonia	50	50	100
Poland	80	80	160
France	100	100	200
Germany	100	100	200
Italy	100	100	200
Spain	101	101	202
UK	100	100	200
Total	731	733	1,464

Source: Commission, 2004: E-Business W@tch 2003 survey; N=1,464

Table 1: Dataset: Numbers by Country and Industry

The resulting group of eight countries and two sectors hold a relevant and interesting mix of several diversities that drive the analysis we elaborate later on in this paper. With regard to the countries the basic east-west and north-south variation is covered, as well as spreading in country size, including Estonia and Poland as interesting opportunities to compare these two new EU member states. The two sectors are clearly limiting an extended sector-based analysis, but they do contrast on important aspects. The health and social services are typical service-oriented

with strong governmental influence, while the textile industry concerns the traditional manufacturing of physical products and traditional market competition.

In the next section we describe how the IT skills sourcing by companies can be measured with (this subset of) the e-Business W@tch data.

MEASURING IT SKILLS SOURCING POLICIES

As stated in the introduction of this paper, companies have several options to source their required IT skills. First of all, organizations opt to recruit (insource) one or more persons to manage the IT infrastructure (Slaughter & Ang, 1996). Secondly, organizations can decide to investment in training of their current employees to improve IT skills. And third IT can be outsourced, i.e. services are hand over to an external IT service provider (cf. Clark, Zmud, & McCray, 1998; Hirschheim et al., 2002; Lacity, Willcocks, & Feeny, 1996; Steenbeek, Van de Wijngaert, Van den Brand, Brinkkemper, & Harmsen, 2005; Venkatraman, 1997).

These three options can be analyzed from the perspective that policies with regard to training, recruitment and outsourcing are often perceived as a trade-offs or dilemmas (cf. Grimpe & Kaiser, 2010). One such dilemma concerns the payoff of (long-term) investments in training of employees. Organizations obviously need to do some investment in the IT skills of their employees, but the problem is that employees easily can take advantage of these new skills by improving their position in other organizations (cf. Crouch, Finegold, & Sako, 1999; Streeck, 1992). In addition, it is hard to decide when to offer certain IT training to certain employees because IT-skills are typically subject to rapid changes and hence devaluation (Bresnahan, Brynjolfsson, & Hitt, 2002; Caroli & Van Reenen, 2001; Dinardo & Pischke, 1997). With regard to outsourcing of IT, a lively debate is concerned with regard to the trade-off between achieving cost reduction on the one hand, but increasing control and coordination costs on the other hand (Gonzalez, Gasco, & Llopis, 2009; Grimpe & Kaiser, 2010; Hirschheim et al., 2002; Ward & Peppard, 2003; Yang & Huang, 2000;). Hosting IT activities with a external service provider can reduce costs and increase IT service levels, but it also increases the dependency and hence vulnerability of organizations (King & Malhotra, 2000). The trade-off between cost of control on the one hand, and commitment or trust on the other, is actually a classic theme that concerns many relationships within and between organizations (cf. Hirschheim et al., 2002; Lacity & Hirscheim, 1995; Willcocks, Hindle, Feeny, & Lacity, 2004). Finally, there might be a dilemma with regard to the combination of the three policy options. If organizations decide to outsource their IT activities, they need to shrink or reorganize their current IT department which might cause painful measurements. If organizations decide to insource IT skills by recruitment of new personnel, the intra-organizational mobility options for current (IT) employees decrease. These dilemmas and trade-offs will probably depend the initial job structure of the organization (Greenan, 2003).

The dilemmas behind the three options of sourcing IT skills are not covered by the dataset that is available for this study, but the options as such have been indeed queried in the E-Business W@tch survey by a number of questions. As the original formulation of questions and answers are highly important in the case of secondary analysis of survey data, we start with presenting these in Table 2. In this table we also present the averages and proportions for our total subsample of eight countries and two sectors (N=1,464), to have a first empirical description of the IT skills sourcing indicators.

Original Question	Answer Categories	Percent in Subsample
Has your company during the last 12 months recruited or tried to recruit staff with special IT skills?	Yes	10.1
	No	89.2
	Don't know	0.7
Does your company offer its employees the following support measures: participation in computer or IT training offered by third parties?	Yes	39.3
	No	60.2
	Don't know	0.5
Has your company outsourced some of its IT activities?	Yes	27.8
	No	70.1
	Don't know	2.1

Source: Commission, 2004: E-Business W@tch 2003 survey; N=1,464

Table 2: Questions, Answers and Percentages for E-Business W@tch Survey on IT Skills Sourcing

We start with a critical reflection of the selected E-business W@tch questions. First, it should be noted that most of the questions implicitly refer to a certain period or time point, i.e. the moment of the interview. This is important, as actions like training and outsourcing might vary on a yearly or even monthly basis, depending on the financial situation for instance. One exception is the question about the recruitment of staff with special IT skills, that concern the "last 12 months". This indicates the (potential) growth of internal IT staff within organizations but it does, however, not indicate the actual number of vacancies. In line with this, a second major remark is the missing indication of quantities or levels in terms of the proportion of employees supported in acquiring IT skills and the scope of outsourcing. To conclude, one should be aware that the IT skills sourcing policy of organizations—as 'theoretically' discussed in the previous sections—is measured on a 'condensed' level by the E-Business W@tch questionnaire. Still, we believe the measurements are valid and reliable enough to describe the variation within our dataset with regard to the three IT sourcing directions organizations can follow, and subsequently test how other factors are empirically related to these policies.

If we inspect the overall scores in Table 2, the highest proportions are found with regard to IT training of staff. It shows that 39% of the organizations in our subsample offer external IT training. Recruitment of IT-skilled personnel, or attempts to do so, is performed by a minority (10%) of the companies over the last 12 months. In relation to this it should also be noted that the average respondent firms employed only 6% of their employees as IT staff. Outsourcing, finally, was mentioned quite often by the firm respondents as a sourcing policy: 28%. As remarked above, the original formulation of the question is of a condensed (simplified) nature. Still, from this measurement and in comparison with the other two sourcing options, it can be concluded that an outsourcing policy is mentioned by a substantial number of organizations.

COMPARING IT SKILL SOURCING POLICIES

The next step in our analysis is to explore the relationship between the three sourcing options. Do the indicators for IT staffing, training and outsourcing coincide and accumulate, or might there be a trade-off or compensation between the variables? For this purpose, all variables are coded into dummies (0 = 'no', 1 = 'yes'). The answer category 'don't know' (that was ticked only is a few cases) was recoded to 'no'. Table 3 provides the frequencies of all possible combinations.

	N	*%*
None	682	46.58
IT training only	293	20.01
IT training and outsourcing	182	12.43
IT outsourcing only	159	10.86
IT recruitment and training	51	3.48
IT recruitment, training an outsourcing	49	3.35
IT recruitment only	31	2.12
IT recruitment and outsourcing	17	1.16

Source: Commission, 2004: E-Business W@tch 2003 survey; N=1,464

Table 3: Combinations Between the E-Business W@tch Survey Questions on IT Skills Sourcing

From Table 3 we can conclude that IT sourcing indicators not very often appear in combination with each other. In over 30% of the cases recruitment, training, outsourcing is done or offered as a sole policy, and this proportion is higher compared to the frequencies of all combinations (around 20%). The most frequent combination is training and outsourcing (12%), followed by recruitment and training (3.5%). The low percentages in Table 3 probably indicate that combining different IT sourcing policies is difficult and might be hindered by the trade-offs and dilemmas described in earlier sections (Grimpe & Kaiser, 2010). We will come back to this point later on in the discussion section of the paper.

RELATING IT SKILLS SOURCING TO THE ORGANIZATIONAL IT SITUATION

Before we turn to the central question if IT skills sourcing differs by country, we need to control for the IT situation of every organization, as this will naturally determine the probabilities that these policies appear in organizations. The underlying argument is based on the relationship commonly found between organizational size, IT maturity and IT sources: the more information systems, computers, software and communication applications, the higher the need for IT management and employees to support and maintain the infrastructure (Karimi, Gupta, & Somers, 1996; Turban, Mclean, & Wetherbe, 2001; Ward & Peppard, 2003). The E-Business W@tch survey contains a large number of questions to measure the IT level of an organization. The following queries are selected as these are particularly relevant for the usage, support and maintenance level of IT and hence the required skills and sources. All question were answered by "yes", "no" or "don't know", similar to the sourcing questions presented above. The next Table 4 presents an overview of the variables in descending order by the proportion that answered positively to the question.

Question	Percent Indicating "yes"
Does your company use computers?	90.98
Does your company have access to internet?	81.08
Does your company use e-mail?	74.80
Does your company use the World Wide Web?	69.13
Does your company have a website on the Internet?	46.38
Does your company use a Local Area Network (LAN)?	43.24
Does your company use the Internet to purchase goods or services?	29.44
Are you exchanging standardized data with your buyers or sellers electronically?	26.78
Does your company use an intranet?	25.75
Can employees of your company access your computer system remotely?	19.81
Does your company use Wide Area Network (WAN)?	10.72
Does your company use an extranet?	8.74
Has your company implemented a Enterprise Resource Planning System (ERP)?	8.61
Does your company use a wireless LAN?	6.69
Has your company implemented an e-learning application?	6.08
Does your company use the Internet to sell goods or services?	5.05
Has your company implemented a Customer Relationship Management System (CRM)?	4.71
Has your company implemented a special Knowledge Management software solution?	4.30
Has your company implemented a Supply Chain Management System (SCM)?	2.60

Source: Commission, 2004: E-Business W@tch 2003 survey; N=1,464

Table 4: Questions and Frequencies on E-Business W@tch Survey on Presence of 19 IT Applications

The standard question "do you use computers" is very high, 91%, and therefore does not differentiate. The same holds for the use of Internet, email and the worlds wide web; a large majority all organizations within our subsample use these types of IT (between 81 and 69%). More differentiation is achieved if company websites, intranets and e-business application as e-purchasing are questioned (between 46 and 25%). Most of the enterprise information systems, of which ERP is the most known probably, are in implemented in a minority of companies (less than 10%).

The 19 IT questions are not only positively inter-correlated but also significantly contribute to a one-dimensional scale. Chronbach's alpha as a standard scale coefficient points at .83. Based on this, we added the 0/1-score of all 19

indicators, resulting into an interval scale that varies between 0 (none) and 19 (all IT items were ticked with "yes"). We are aware that this assumes an equal weight of all items, but recognize that the items are actually interrelated or interwtined. This new constructed variable is shaped by a rather normal distribution (mean = 5.6; St. Dev.=3.3). In conceptual terms, it can be regarded as a measurement of the organizations' IT maturity' (cf. Batenburg & Versendaal, 2008; Holland & Light, 2001; Ward & Peppard 2003).

Correlation analysis conducted next, supports that the 19-item IT maturity scale is positively related with the execution of all three IT skills sourcing indicators. The (Pearson) correlations are significant (p<.01) and vary between +.27 and +.39. This confirms our earlier suggestion that IT sourcing is especially needed the level of IT (maturity) of an organization is high (or increasing), which in turn is related to the size or scale of the organization.

DO IT SKILLS SOURCING POLICIES DIFFER BETWEEN COUNTRIES?

This leads us to the final step of analysis in which we relate the occurrence of the IT sourcing indicators to the countries and sectors that are represented in our subsample. This analysis is performed by general linear modeling, estimating the (marginal) means by country, sector and country/sector-combination, while holding the technological/usage level of IT constant as covariates. Table 5 presents the estimated main effects of country and industry, including their interaction effect. The main effects of technological and usage level of IT (as covariates) are also presented. According to the design of general linear modelling, all seven IT sourcing indicators serve as a dependent variable.

	Explanatory Effects (partial eta coefficients, F-test)				
IT sourcing indicator	IT level, technology	IT level, usage	Country	Industry	Country* Industry
1. Recruitment of IT staff in the last 12 months	.07**	.00	.01*	.00	.00
2. The company offers IT training by third parties	.14**	.00	.04**	.01*	.01
3. The company has outsourced some of its IT activities	.13**	.00	.08**	.00	.00

[a] 0 = no, 1 = yes; *p < .05 (F-test); **p < .01 (F-test).
Source: Commission, 2004: E-Business W@tch 2003 survey; N=1,464

Table 5: General Linear Modelling: Effects of Technological and Usage Level of IT, Country, Industry and Country-Industry Combination on IT Skills Sourcing Indicators

Table 5 clearly shows that the usage of different IT applications within the organization is the strongest determinant of all three sourcing indicators, probably neutralizing the effect of the level of IT usage. Given this influence, 'country' has an additional effect. 'Industry', as variable, only effects IT training sourcing policy, but has no interaction effect with country. We can conclude that—given the effect of the organizational IT level, as well as industry—country is indeed of direct influence on the probability that companies take IT skills sourcing measures.

If country has an effect as a context variable, the next challenge would be to understand or explain these cross-national differences. As we only have limited data at the national level by our dataset, we follow an explorative strategy in this. The next series of graphs describes the marginal ('controlled') means by country, by the result from general linear modelling. This is done for each of the three IT skills sourcing policy separately. It is stressed that the following results are descriptive, leaving the further explanation of country differences a subject for further research.
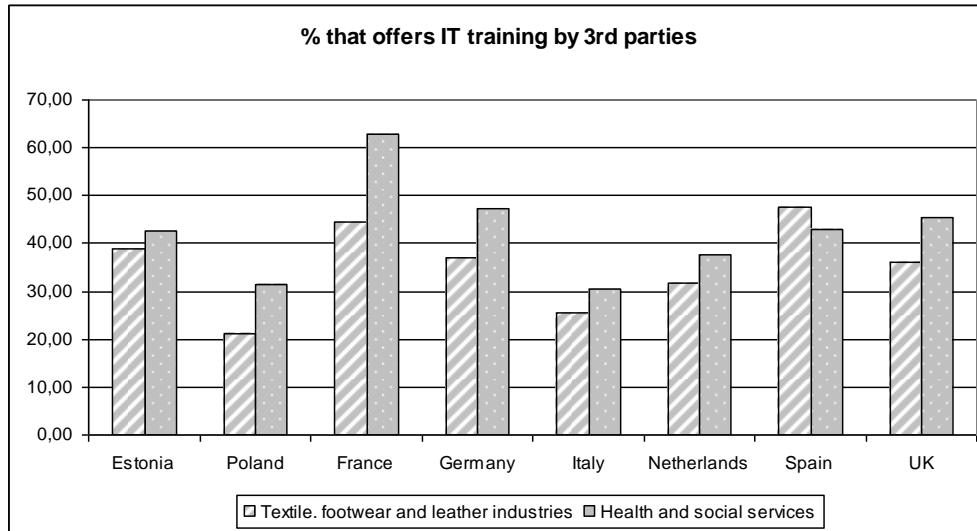
Recruitment of IT Employees
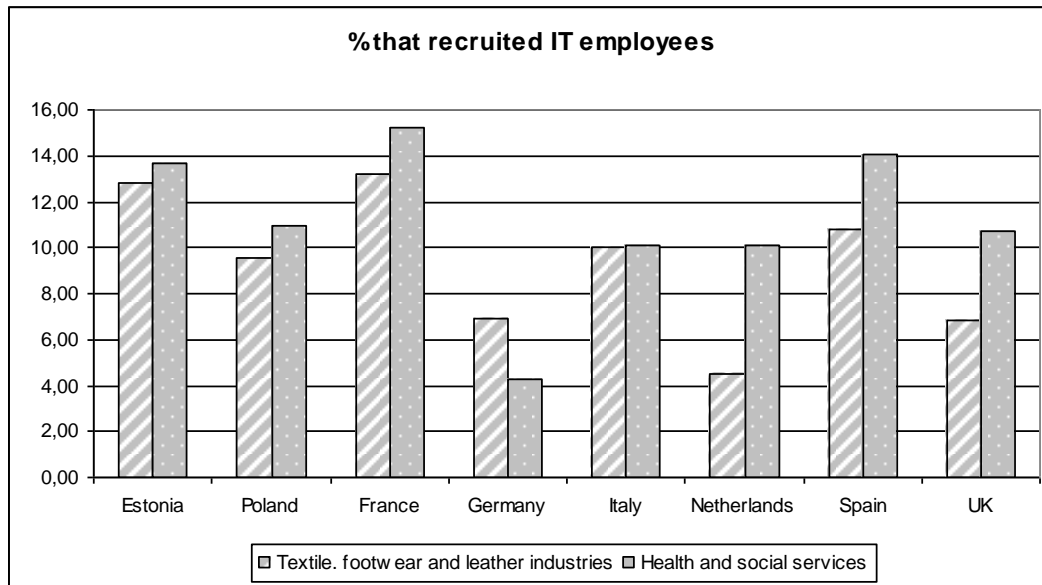
Figure 1: External Recruitment of IT Employees by Country and Sector in 2003

Figure 1 shows that within the textile/leather industry, Estonia and Spain are most likely to be upfront the other countries with regard to the recruitment of IT employees. Among the health/social organizations, France, Spain and Estonia show relative high proportions (12 to 15%). Companies from The Netherlands stay behind in attracting new IT personnel. Within the heath/social sector the proportion of 10% recruiting organizations is at an average level, but this proportion is much lower within the textile/leather industry. Recruitment as a sourcing strategy is not much the case in Germany, as only 4% of companies within the health/social industry indicated that they recruited IT employees in the last 12 months.

IT Training of Employees

Figure 2 first of all shows that French companies appear to offer IT training by third parties relatively often, especially within the health/social industry (60%). Together with Spain and Estonia, the French companies are also offering more often IT training within the textile/leather industry. The companies from other countries follow closely and do not differ much from each other; although Poland deviates by low scores in both sectors. Again, Estonian companies appear to be relative active in offering IT training, comparable with Germany and Spain. The Netherlands demonstrates to be a moderate country with regard to IT training as a sourcing policy. Sector differences are less prominent compared to the previous result on recruitment.
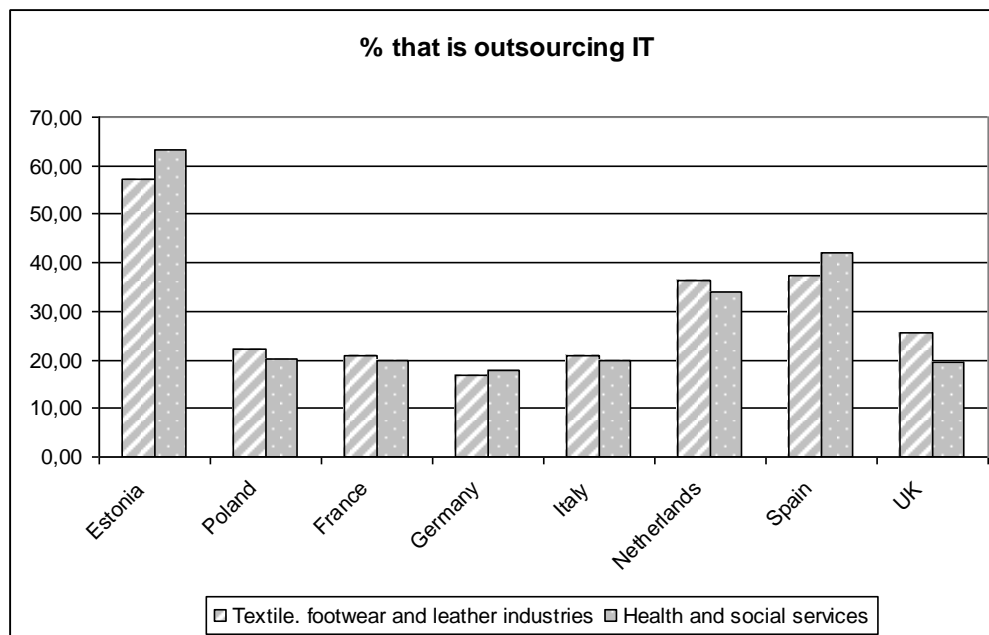
% that offers IT training by 3rd parties

Legend: □ Textile. footwear and leather industries ■ Health and social services

Source: Commission, 2004: E-Business W@tch 2003 survey; N=1,464

Figure 2: External Training of IT Employees by Country and Sector in 2003

IT Outsourcing

Finally, most prominent (i.e. significant based on the eta squared values per variable), are the cross-national differences with respect to outsourcing. As can be seen from Figure 3, this effect is largely due to the remarkably score of Estonia, indicating that more than 50% of the Estonian respondents ticked they outsource some of their IT activities. Other countries that are above average in outsourcing are Spain and The Netherlands (both sectors around 40%). France, that was relatively active in IT training and recruitment, holds a moderate position in this field. Again, industry differences are of non-significant in this chapter.

% that is outsourcing IT

Legend: □ Textile. footwear and leather industries ■ Health and social services

Source: Commission, 2004: E-Business W@tch 2003 survey; N=1,464

Figure 3: Outsourcing of IT by Country and Sector in 2003

CONCLUSION AND DISCUSSION

In this section we systematically recap and answer the questions that were introduced at the beginning of the paper. Finally, we reflect on these and discuss a number of implications and suggestions for further research.

How did European companies sourced their IT skills in 2003, just a few years after the dotcom crises?
The subsample of the E-business W@tch data used in this paper contains 1,464 companies from eight different countries and two different industries. These show the following median scores in IT skills sourcing:
-   8% of the companies have recruited (or tried to recruit) IT specialists to employ internally;
-   35% offers IT training by third parties to their employees;
-   35% has outsourced some IT activities to an external service provider.

These percentages are controlled for sector and the number IT applications within the organization. We conclude that most European firms, at the time of the survey, did not opt for an insourcing but an outsourcing policy. Expertise was sourced from outside the organization, either by purchasing external training and/or IT services.

How are insourcing, outsourcing and training of IT skills interrelated as policies within organizations?
Based on our subsample, it became clear that the three different policies to attain IT skills hardly coincide. Recruitment, training and outsourcing are executed as separate strategies. Perhaps more striking is the result that nearly 50% of all companies performed *none* of these three IT skills sourcing polices. This can have several reasons. One reason could be that companies simply did not feel the need to extend IT skills as they prefer a wait-and-see policy, given the uncertainty of the external and technological developments at that time. Another reason might be that the companies under investigation already have their IT skills in place sufficiently. The e-Business W@tch data shows that within the average organization only a small proportion (6%) of the workforce consists of IT personnel, and likewise the average organization has a limited IT maturity, using standard hardware, software and network technology. A final suggestion is that organizations apply other sourcing policies beside the three types that are central in this study. One can think of training on the job, or by exchanging resources between organizations. Still, this remains speculative as no data are available to validate these suggestions.

What differences can be found between countries and sectors with regard to the sourcing of IT skills?
With regard to country differences a number of results draw attention. First, it is an interesting outcome that cross-national differences are most prominent with regard to the outsourcing policies of organizations. This indicates that IT outsourcing is also related to national context, i.e. to traditions or cultural differences between countries (cf. Grimpe & Kaiser, 2010; Steenbeek et al., 2005; Willcocks et al., 2004)

First, the high proportion of Estonian, Spanish and French companies that recruit, train and outsource IT skills is remarkable. For Estonia, this might be related to the fact it was rapidly growing around 2003, investing highly in IT, forcing the recruit their IT skills in a fast pace. For Spain and France, other factors probably played a role. One reason could be that at that time, companies in these countries were confronted with high shortages of IT personnel. If the Spanish and French suffered more from a tight labour market for IT personnel (e.g. due to a low inflow in IT studies and a deteriorated image of the IT sector), this might explain why organizations in these countries invested more in IT sourcing than firms in other European countries such as Germany and the UK. It would take more international comparative data to test these types of explanations which, in our opinion, is an interesting route for further research (cf. Commission, 2007).

Although in this study we were not able to test all the assumptions, expectations and explanations stated, we believe the analysis and results are valuable for policy making at the organizational and national level. First, it illustrates that companies need to think about their IT sourcing policies in the context of changing environments. IT skills are not sourced overnight, hence firms need to anticipate on external threats such as labor market shortages, while at the same time decide on how to invest in their internal (human resources). These two sub-policies coincide, and therefore need to be integrated and based on a long-term vision. As we have seen in this study, many organizations did not feel the need to invest in IT sourcing in 2003, as they apparently rely on their existing capacities. The trends in the past decade showed however, that labor market environments can change rapidly (Lanvin & Passman, 2008), leading to inefficient competition between companies on the IT labor market in their sector and/or country. This requires strategic and agile IT sourcing of organizations.

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