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Employment Outsourcing

in Information Systems

IN recent years, information systems (IS) out-sourcing has become so pervasive it can no longer be ignored. An important question is *why* firms choose to outsource IS work. This question has been considered from a number of perspectives. Lacity and Hirschheim [14], for example, showed how the dynamics of internal politics led to IS outsourcing. Loh and Venkatraman [15] suggested that the outsourcing behavior of a prominent blue-chip company, such as Eastman Kodak, can lead to imitative behavior throughout the IS community. In contrast, our study examines the reasons for IS outsourcing from a somewhat different perspective—that of labor market economics. From this perspective, outsourcing is a result of how firms respond to the costs and benefits of employment arrangements with their IS workers.

In the classic economic view of labor markets, workers move freely and frequently between jobs to take advantage of better employment opportunities. According to Doeringer and Piore [8], the traditional long-term employment arrangement replaced the open labor market because it afforded principals (employers) greater control and influence over agents (their employees). More recently, however, firms have been moving away from the traditional, long-term employment arrangement (insourcing) to relatively shorter-term, market-mediated arrangements (outsourcing). Outsourcing reflects the increasing trend toward "taking the workers back out" [19], in which organizations alter the work relationship with their employees by reducing the duration of employment and their degree of administrative control over workers.

In IS outsourcing, taking the workers back out can occur in many ways. A firm can either contract directly with an IS professional for his or her services or contract indirectly with an employee leasing company, a consulting firm, or an IS service provider. Such practices can benefit both the firm and the IS worker. Although the Eastman Kodak outsourcing arrangement represents total IS outsourcing and has become a popular practice in industry, firms can also choose to selectively outsource for particular IS skills or jobs.

But why do firms choose to selectively or completely outsource IS? From a labor market perspective, outsourcing is the response of firms to the costs and disadvantages of the traditional permanent work arrangement that arise from dynamic changes in technology and the environment. Due to the increasingly rapid evolution of information technology (IT), IS work is characterized by skills deterioration and specific skills shortages [16, 25]. Thus, a firm's ability to find and acquire the necessary IS skills is paramount. Under these circumstances, relying on retraining a permanent work force may be cost prohibitive. In addition, because IT evolves so rapidly, by the time a firm invests in and trains its IS staff on a certain technology, that technology may be obsolete.

There are indications that firms face increasing turbulence in the environment. As firms become inte-

An indepth analysis of IS job advertisements over the last decade traces the emerging outsourcing phenomenon. This study examines why organizations choose to outsource and spotlights the pros and cons of this growing trend.

grated into the world economy, they experience increased competition in product, service, and labor markets with the result that there is relentless pressure to change and adapt to new markets and technologies. Outsourcing provides a way to increase flexibility. As firms focus on their core businesses to gain competitive advantage, they can use outsourced workers as a flexible buffer that can easily expand and contract to absorb fluctuations in environmental demand.

Thus, we form a model of the determinants of IS outsourcing (see Figure 1) in which dynamic changes in the environment and technology influence the economics of IS labor markets. We argue that firms decide to outsource IS based upon the costs and disadvantages of the traditional permanent employment arrangement. Environmental turbulence encourages firms to focus on their core businesses and to outsource noncritical workers. It also demands that firms be flexible and adaptable in structure, and outsourcing provides a means of increasing flexibility. Rapid evolution of IT creates certain dynamics in IS skills markets (such as skills obsolescence and shortages) that can be more economically addressed by outsourcing.

Factors Influencing the Choice to Outsource
Environmental Change
As the environment becomes increasingly dynamic, competitive, and uncertain, firms focus on their core businesses as a way to gain competitive advantage [21]. When a firm focuses on core businesses or *competencies* that add unique value to its customers, it outsources activities for which it has neither a critical strategic need nor special capabilities [22]. This implies that a firm is likely to outsource IS employment when IS does not relate to its core businesses. The core business of computer-related companies (such as hardware vendors, software vendors, and IS service providers) is in developing and offering IT products and services. The IT products and services in these companies are derived primarily from the skills and knowledge of their IS workers. In effect, the core competencies of companies in the computer industry reside in their IS workers. Thus, we would expect firms in the computer industry to adopt an insourcing employment strategy with their IS workers, with the intention of nurturing competencies within the firm to build revenue-generating IT products and services. Insourcing would also enable computing firms to recoup costly investments in building and upgrading the skills of permanent personnel.

Conversely, we would expect non-computer-related firms to outsource for IS skills rather than to invest in acquiring the competence, since IS is not their core business. For example, in the Kodak outsourcing arrangement, Kathy Hudson, the chief information officer who spearheaded the "total outsourcing" deal with IBM, DEC, and Businessland, was quoted as saying: "IS is not the business that Kodak should be in . . . . We're trying to get out of day-to-day, nitty-gritty technology choices" [12]. Even if non-computer-related organizations wish to build up internal core compe-

tencies in IS, they face fundamental problems of high staff turnover and severe competition for IS workers from computer-related organizations. As observed by Casey [6], organizations outside the computer services industries experience higher IS turnover than those within it because computer services employers have more flexible salary systems that make it much easier to pay the rate the market requires for the skills in question. In contrast, firms outside the computer services industry have salary systems tied to those for the industry in which they are operating. If that industry is not expanding, as the computer services industry is, overall salary levels, and hence those of the IS staff, are likely to be below those in computing services. This increases the difficulty of hiring and retaining permanent IS workers for non-computer-related firms. Thus, we argue:

Computing firms are more likely to insource IS employment than noncomputing firms.

Another factor driving the choice of outsourcing strategies is the need for flexibility to adapt to environmental change. One context where outsourcing provides flexibility is in the public sector. This derives from the constraints of manpower budgeting. According to Pfeffer and Baron [19], the constraints of manpower budgeting are particularly prominent in the public sector, including state and federal agencies, utilities, and universities, because of the acute concern for cost overruns and extreme budget deficits. Because of work rules and implicit employment guarantees that can hamper a public sector firm's ability to modify permanent employment levels, these firms are extremely cautious about expanding their human resource base. In the public sector, there must be an authorization to hire, and personnel lines are allocated to departments, which are not permitted to exceed those authorizations. However, those same departments often also have monetary budgets that are subject to fewer constraints. For instance, a government department that cannot hire permanent personnel to do a task may have the money to hire an outside contractor to perform the same task. Such practices keep public agencies under pressure to lower their permanent IS personnel allo-

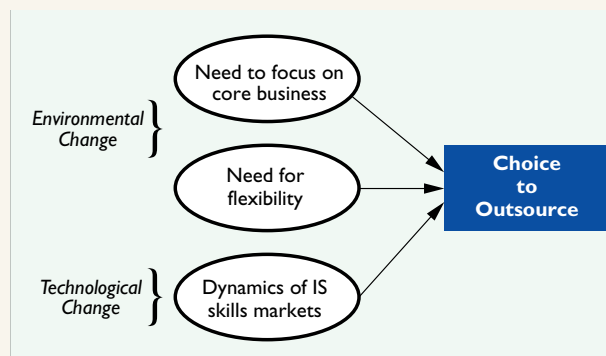**Figure 1.** Determinants of choice to outsource

Table 1. Number of employment positions in *Computerworld* ads from 1983 to 1994

Year	# Positions	% of Total	Cumulative %
1983	64	4.1	4.1
1984	95	6.1	10.2
1985	152	9.7	19.9
1986	155	9.9	29.9
1987	157	10.1	39.9
1988	129	8.3	48.2
1989	138	8.8	57.1
1990	139	8.9	66.0
1991	153	9.8	75.8
1992	155	9.9	85.7
1993	149	9.6	95.3
1994	74	4.7	100.0
TOTAL	1,560	100.0	100.0

cations, so that the costs associated with new positions do not simply become permanently incorporated into the base budget. Thus, we posit:

Firms in the public sector are more likely to outsource IS employment than firms in the private sector.

Labor economists suggest that organizations with highly variable or volatile employment needs are likely to be more dependent on outsourcing arrangements [20]. This is because each time employment needs increase, the organization must hire new workers, who are then fired when employment needs contract. Continual hiring and firing of workers make it more difficult for the organization to recruit permanent employees in the future. Individuals who desire permanent employment may be unwilling to work for an organization that has a history of unstable employment. On the other hand, if outsourcing is used, workers are often hired with the explicit understanding that their employment will be for a limited duration. Therefore, they can more easily be dropped from or added to the work force without jeopardizing the reputation of the firm as an unstable employer. More importantly, the use of outsourced workers buffers regular employees from fluctuations in demand and enables the firm to establish a stronger relationship with its regular work force than would otherwise be possible.

In the IS context, a firm's demand for certain kinds of IS activities is more sporadic than demand for other IS activities. For example, workload for systems development tends to vary more than workload for systems support. Accordingly, job positions, such as programmer, systems analyst, systems engineer, and consultant, are more likely to be outsourced than positions, such as database administrator, network administrator, and systems programmer, where workload is more stable and predictable. Thus, we would expect firms to outsource IS employment for positions with relatively high variability or uncertainty in demand and not for positions with stable demand. This suggests:

Firms are more likely to outsource for jobs that have volatile demand (e.g., systems development jobs, such as programmers, analysts, engineers and consultants) than for jobs that have more stable demand (e.g., systems support jobs, such as systems programmers or operators and managers.)

Technological Change

A final important factor influencing the decision to outsource is the supply of and demand for IS skills. Volatility of information technology has the effect of rapidly making IS skills obsolete and creating IS skills shortages. Firms may outsource because they cannot find and recruit sufficient numbers of permanent employees with certain skills. Outsourcing can help address labor shortages because temporary help agencies, part time work, and contract work may attract people into the labor pool who would not enter if they had to work as permanent employees.

Outsourcing can also help balance supply and demand for workers by more efficiently allocating the deployment of workers with scarce skills. To illustrate, if five firms each need scarce IS skills, such as client-server programming and each firm chooses to hire a permanent worker, then five programmers will be required. However, if firms opt for outsourcing employment arrangements, such as contracting, fewer than five programmers would be required. Accordingly, we would expect firms to outsource employment for scarce skills so these skills can be shared with multiple employers rather than residing in any single employer. Therefore, we suggest:

Firms are more likely to insource employment for IS skills that are relatively abundant in the marketplace (such as Cobol) than for skills that are relatively scarce (such as Unix, client-server, Assembly, fourth-generation languages, and CASE technologies).

Method

We conducted a content analysis [13] of IS job ads to examine our hypotheses relating to the choice of IS insourcing or outsourcing arrangements. Job ads reveal the type of employment strategies firms are using and the IS skills sets and job positions they are seeking [4, 24].

Sampling process: Ads for IS jobs from 1984 to 1994 were gathered from *Computerworld*—a premier IS trade journal with nationwide circulation where IS job opportunities are widely advertised.[1] The unit of analysis in this research is an employment ad for one job position. In other words, if two positions were advertised in a single ad, we considered it two separate units of analysis. We define the recording unit as the

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[1]*Computerworld* claims to reach more computer professionals each week than any other journal of its kind. For this sample, we used the *Computerworld* for the Eastern portion of the U.S., representing the largest number of subscriptions (40% of total).

Figure 2. Coding scheme

Variable	Categorical Value
Employment strategy (ES)	1 = Insourced employment (permanent employment) 2 = Outsourced employment (direct contracting, employee leasing, placement agencies)
Computer related (COMP)	1 = Computer related firm 2 = Non-computer-related firm
Industry sector (PUB)	1 = Public sector firm 2 = Private sector firm
Job position (POS)	1 = Analyst programmer 2 = Support/Operations: systems programmer, database administrator, network administrator 3 = Systems analyst 4 = Management (general and project management) 5 = Engineering and consulting 6 = Sales and educators
Unix/Client-server (Unix)	1 = Unix/Client-server skills 2 = non-Unix/Client-server skills
2nd-Generation Language (SGL)	1 = Assembler language skills 2 = Non-Assembler language skills
3rd-Generation Language (TGL)	1 = Cobol language skills 2 = Non-Cobol language skills
4th-Generation Languages and CASE technologies (FGL)	1 = 4GL and CASE technologies skills (CASE, C/C++, Smalltalk, Telon, Clipper, Nomad, Focus, Powerhouse, etc.) 2 = non-4GLs

type of employment strategy (insourcing or outsourcing) chosen for the job position. The total population of these units of analysis was estimated at 20,000, based on an average of 40 employment positions in each weekly issue. As it was not feasible to examine the total number of units in the population, we used a stratified sampling strategy in which ads were sampled each quarter beginning July 1983 and ending June 1994. All ads appearing in the second week of each quarter were sampled. This systematic sampling over time is appropriate because we are studying the phenomenon of outsourcing that began to emerge over the last decade. With this sampling design, we expected to sample 1,600 units (40 employment positions * 40 issues) from the population of 20,000 units. The sampling ratio was therefore 8%. Table 1 shows the total number of job positions found in the 40 issues of *Computerworld*.

Coding process: IS job ads were coded for their employment strategies (insourcing or outsourcing) using latent coding techniques.[2] Insourcing employment is coded for a job position that requires the potential job applicant to work in the internal IS department and assume a permanent employment relationship with the advertised firm. In contrast, outsourcing employment is coded for a job position that requires the potential job applicant to work either directly for the advertised firm on a short-term contract basis or indirectly for a client of an employee leasing, outsourcing, or temporary employment agency. In the latter case, the job applicant enters into a contractual relationship with the agency but offers his or her services on a short-term, contract basis to the clients of the employee leasing or employment agency. In addition to employment strategies, each job ad was also coded for type of job, type of firm, and skills required (see Figure 2). An example of a coded job ad is shown in Figure 3.

Coding reliability: We employed two independent coders to content-analyze the job ads. The coders were chosen for their indepth knowledge of the IS field, so they were able to identify IS terms and acronyms and categorize IS skills accurately. To ensure consistency between the two coders, a trial data-coding process was performed before commencing the actual coding of the sampled issues. In the first round of trial data coding, the two coders independently coded 10 of the same employment ads from issues of *Computerworld* not included in the sampled issues. After the independent coding, the Cohen

Figure 3. Example of coded job ad

Put Your Years of Computing Experience to Work for You!

Central Bank, a dynamic financial services firm, has current contract programming requirements for one-year projects in a variety of financial applications. Excellent opportunities exist within the following state-of-the-art environments:

Unix, C & C++, Powerbuilder, Object Vision

Central Bank offers competitive rates and excellent benefits. Please send 2 copies of resume

to:

Central Bank
DP Recruiting
P.O. Box 23409
Chicago, IL 60605

Coding: Outsourced employment (ES=2)
Non-computer-related firm (COMP=2)
Private sector (PUB=2)
Programmer (POS=1)
Unix, client-server (Unix=1)
Non-Assembler (SGL=2)
Non-Cobol (TGL=2)
4GL, CASE technologies (FGL=1)

Source: *Computerworld*

[2]We selected the latent coding technique over the alternative manifest coding technique. Latent coding is appropriate for this study because we are interested in inferring the employment strategy based on the characteristics of each job advertisement rather than on the appearance of certain words or phrases in the text.

coefficient of agreement for nominal scales [7] was computed to assess the relative agreement between the coders. Differences in coding were resolved, and the coders independently coded another set of 10 ads. After the second round of independent coding, agreement between the coders was 100%, as the coding was straightforward. Subsequently, ads from the July 1983 to July the 1994 issues of *Computerworld* were divided equally between the coders, and the ads were coded independently.

Data analysis: After all of the sample units were coded, the data was entered into a database and checked for accuracy. Incomplete or incorrect observations were recoded. Our final sample contained 1,560 job position observations. Because our variables for employment strategy, firm type, job position, and skills inventory are categorical (not continuous) in nature, we used a loglinear probability model [2, 9] for the analysis. Loglinear models are similar to multiple regression models, but have been formulated for the analysis of discrete data. Specifically, we used a special class of loglinear models called the *logit*.[3] The logit involves a transformation of the dependent variable. In our model, the dependent variable is dichotomous (insourcing "1" or outsourcing "0"). The logit transforms this variable by taking the natural logarithm of the ratio of the frequency of insourcing to the frequency of outsourcing for a particular category of the independent variable.[4]

The independent variables include the various categories of job positions, industries, and IS skills. Our model relates the choice of *employment strategy* (ES) where IN represents insourcing and OUT represents outsourcing to *firm type* (COMP to distinguish between computer-related and non-computer-related, PUB to distinguish between public and private sector), *job position* (POS), software system (UNIX to identify Unix and client-server skills), and *language skills* (SGL, TGL, and FGL to distinguish among skills in second-, third- and fourth-generation software languages, such as Assembler, Cobol, and Focus, respectively).

The loglinear form of our logit model is expressed

$$\ln(F_{ijklmno}IN/F_{ijklmno}OUT) = \omega_{ijklmno} = 2(\lambda_{IN}^{ES} +$$

$$\lambda_{iIN}^{ES*COMP} + \lambda_{jIN}^{ES*PUB} + \lambda_{kIN}^{ES*POS} + \lambda_{lIN}^{ES*UNIX} +$$

$$\lambda_{mIN}^{ES*SGL} + \lambda_{nIN}^{ES*TGL} + \lambda_{oIN}^{ES*FGL})$$

as:
[for i = 1, 2; j = 1, 2; k = 1 through 6; l = 1, 2; m = 1, 2; n = 1, 2; o = 1, 2]

where ln is the natural logarithm, F is the frequency of occurrence of insourcing and outsourcing for a particular category of the independent variables, and the letters i through o represent the number of discrete categorical values for each of the variables. The λs represent the coefficients to be estimated for each category of the independent variables. We estimate the coefficients in our model by maximum likelihood using the Newton-Raphson algorithm.

Results

Table 2 reports cross-tabulations of actual occurrences of observations for employment strategies and the explanatory variables for the 1,560 job positions. Estimation of the logit model provides a test for the individual and joint effects of the explanatory variables on the choice of employment strategy. The values of the Pearson chi-square and Likelihood Ratio chi-square goodness-of-fit statistics indicate that our logit model has a good fit to the data.[5] Based on the analysis of dispersion or spread in the dependent variable, it is possible to calculate statistics similar to R^2 in regression that indicate what proportion of the total dispersion in the dependent variable is attributable to the model. These statistics include Shannon's entropy measure and Gini's concentration measure, which both suggest that significant dispersion in employment strategy can be explained by our model [10]. Thus, both goodness-of-fit and dispersion statistics indicate that our model is appropriate for the data. The estimated coefficients and their significance levels are shown in Table 3.[6]

• Computer-related vs. non-computer-related firms. The positive estimate for the coefficient of the interaction between insourcing and computer-related firms suggests insourcing is more likely in computing companies and outsourcing is more likely in noncomputing companies. These results are consistent with the idea that firms insource or outsource workers as a strategy to focus on core competencies. In such labor-intensive industries as computing services, the competitive advantage lies in the skills and abilities of the IS employees [18]. Thus, hardware vendors, software houses, software vendors, and computing service providers tend to employ permanent workers to internalize and build expertise they can leverage to develop the IT products and services necessary to sustain and advance their competitive position. In non-computer-related firms, retaining IS skills internally may not be critical, since the core business is not providing IS services. In fact, attempts to retain and retrain workers with technical IS skills may prove futile for these firms. Operating in narrow windows of stable technological environments, non-computer-related companies with a static work force

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[3] The logit is used to examine the relationship between a dichotomous variable thought to depend on one or more categorical variables. Regression analysis is not appropriate because the observations are not from populations normally distributed with constant variance. A chi-square approach is inadequate, because although it can indicate the strength of individual relationships, it does not indicate the direction of the relationships. In addition, for more than two variables, it requires multiple tests that may not be independent.
[4] We estimate an *unsaturated* logit model. The model is unsaturated because it excludes higher-order interaction effects between the independent variables.
[5] The null hypothesis for the goodness-of-fit test is that the proposed model fits the data. The degrees of freedom for the goodness-of-fit test are equal to the number of nonzero fitted cells minus the number of parameters estimated.
[6] Positive (negative) values of λ occur when the number of occurrences for a combination of categories is larger (smaller) than the number expected based only on the frequency of each category in the data. A test of the null hypothesis that λ is 0 can be based on a Z value. Coefficients with Z values greater than 1.96 in absolute value can be considered significantly different from 0 at the 5% level.

Table 2. Cross-tabulations of employment strategy, firm type, job position, job skills

Computing vs. Non-Computing Firms:

Employment strategy	Computing	Non-Computing	Total
In	349	646	995
Out	150	415	565
Total	499	1061	1560

Public vs. Private Sector Firms:

Employment strategy	Public	Private	Total
In	215	780	995
Out	302	263	565
Total	517	1043	1560

Job Position:

Employment strategy	Programmer	Operator	Analyst	Manager	Consultant	Sales	Total
In	287	265	113	120	167	43	995
Out	163	87	83	38	187	7	565
Total	450	352	196	158	354	50	1560

Job Skills: *Unix, Client-Server*

Employment strategy	Unix	Non–Unix	Total
In	118	877	995
Out	116	449	565
Total	234	1326	1560

Job Skills: *2nd-Generation Software Language*

Employment strategy	Assembler	Non–Assembler	Total
In	49	946	995
Out	54	511	565
Total	103	1457	1560

Job Skills: *3rd-Generation Software Language*

Employment strategy	Cobol	Non–Cobol	Total
In	268	727	995
Out	145	420	565
Total	413	1147	1560

Job Skills: *4th-Generation Software Language (e.g., Focus, C/C++, Case Technologies)*

Employment strategy	4GL	Non–4GL	Total
In	237	758	995
Out	203	362	565
Total	440	1120	1560

increases the available pool of labor and skills that would otherwise be fixed at the existing level of permanent employees. In effect, the outsourced staff can supplement permanent workers.

• **IS job positions.** The negative signs of the coefficients for the interactions between insourcing and programmer, systems analyst, and consultant job positions imply that, as hypothesized, these positions are more likely to be outsourced; the positive signs of the coefficients for the interactions between insourcing and jobs in support, management, and sales imply that these positions are more likely to be insourced. This suggests that organizations can choose outsourcing to improve organizational flexibility by regulating the volatile demands for skill sets embedded in job positions. Assigning tasks to outsourced workers during periods of peak demand makes it possible for firms to hire a smaller regular permanent work force and to keep the core work force more fully utilized during periods of lower demand.

• **IS and language skills.** For Unix and client-server skills, the negative estimate for the coefficient of the interaction between insourcing and Unix suggests that these skills are more likely to be outsourced. Results are similar for Assembler language and for fourth-generation language skills, such as Focus, C++, and CASE technologies. The positive coefficient for insourcing and Cobol implies that insourcing is more likely to be associated with Cobol language skills. The results suggest that organizations can choose outsourcing to combat severe shortages of some skills. Currently, there is a shortage of IS workers with systems and language skills in Unix, client-server, and CASE technologies [4]. Our results show that these skills are positively associated with outsourcing strategies. By outsourcing, scarce skills can be shared among a greater pool of organizations needing those skills rather than being confined within any single firm.

continually face the problem of needing to upgrade the skills of their work force. Thus, in an increasingly volatile environment where there is an economic imperative to quickly acquire the necessary skills at the lowest cost, outsourcing can provide more rapid and economical access to relevant skills.

• **Private vs. public sector firms.** The negative estimate of the coefficient for the interaction between insourcing and public sector firms suggests that outsourcing is significantly more likely in the public sector. These results are consistent with the notion that outsourcing is more likely to occur when bureaucratic constraints prevent an organization from expanding its base of permanent employees. Using outsourcing strategies

Implications

Our study demonstrates that firms choose to outsource as the costs and disadvantages of the traditional permanent employment arrangement become prohibitive due to increasing technological and environmental turbulence. Outsourcing provides firms with increased flexibility to adapt to changes in products and markets, enables firms to focus on their core businesses, and helps firms to more economically manage the dynamics of the IS skills market. This has a number of implications for research and practice. For organizations that have decided to outsource,

designing an effective process of managing outsourced workers is crucial to realize benefits from outsourcing. Managing outsourcing arrangements requires a different set of skills than managing the same services internally. Most important, when implementing alternative work arrangements, organizations need to consider and manage the legal aspects, their ability to control or monitor performance, and the impact on workplace attitudes.

In terms of legal ramifications, any deviation from the traditional employer-employee arrangement means that the legal obligations and risks for both the employer and employee become ill defined. Generally, for permanent employees, the employer withholds federal income taxes, pays for workers' compensation, provides unemployment and disability insurance benefits, and complies with the Labor Management Relations Act protecting employees' rights. The employer is also liable to third parties for the employee's negligence [4]. In return, employees under the law of agency are restricted in their ability to benefit at the expense of their employer and have a duty to protect their employer's trade secrets or confidential information.

On the other hand, in the absence of a written restrictive agreement with their employers, independent contractors have considerably more leeway in exploiting business opportunities. Employers of independent contractors must therefore ensure that trade secrets and useful business knowledge, such as algorithms, documentation, flowcharts, and even customer lists, are not misappropriated.

Ownership or copyright of software and software modification also varies depending on whether the worker is an employee or an independent contractor. Under the Copyright Act (Section 101), copyright in a work vests initially in the author of the work with the exception of the doctrine of "work made for hire." In cases of work made for hire, the hiring party or employer is deemed the author or initial owner of the work. In other words, if the software was developed by an employee within the scope of employment, ownership resides with the employer. However, if the software was developed by a freelance programmer or an independent contractor, ownership or copyright resides with the independent contractor, unless there is an expressly written agreement that classifies the work as a work made for hire. Thus, when firms hire independent contractors to develop or modify software, both parties must sign an agreement that the work shall be considered a work made for hire so the copyright belongs to the firm. According to Hoffman [11], many firms enter into outsourcing software development without the benefit of a written agreement that clearly addresses the issue of ownership of the software produced. It then comes as a rude shock to the company to discover it does not own the software it paid for. Although the company can continue to use the software, it does not prevent the outside programmer from also having the right to sell or license the software.

From the freelance programmer or software contractor's point of view, a complete assignment of all rights in the software to the hiring party may be overly restrictive, and may curtail their legal right to sell their know-how and expertise to other firms. Thus, in practice, it is common to provide copyright ownership to the hiring employer, while reserving enough rights to the outsourcing contractors so that they can use their know-how or any portions of general utility software code for other clients. Rights must be carefully worded and negotiated at the outset of contract.

Another concern relating to employment outsourcing is the erosion of the organization's ability to control workers. Generally, an independent contractor is engaged to perform a specific task for a specific price, and the employer does not exercise control over the manner in which the work is carried out. Moreover, when independent contractors are hired, they may not work on the hiring party's premises. Therefore, independent contractors have considerably more autonomy in the manner in which they carry out tasks than employees. However, in software development, lack of control over the details of the work is problematic. Without ongoing supervision by the client, errors in the system may not be detected until the entire system is completed. In software development cost dynamics, the cost of correcting errors is always far greater at the time of completion than during the early phases of software development [1]. Control structures, such as explicit authority relations, standard operating procedures, and incentive systems must be put in place to ensure that software development outsourcing proceeds smoothly [3].

Finally, the social and psychological effects of alter-

Table 3. Estimated coefficients and goodness-of-fit for model

Effect	Coefficient	Estimate	Z-Value
Insourcing	λ_{1IN}^{ES}	+0.0347	0.4551
Insourcing*computing firm	$\lambda_{1IN}^{ES*COMP}$	+0.1001	3.4517**
Insourcing*public sector firm	λ_{1IN}^{ES*PUB}	−0.4119	−11.4334***
Insourcing*programmer	λ_{1IN}^{ES*POS}	−0.1157	−1.8566*
Insourcing*operator	λ_{2IN}^{ES*POS}	+0.1467	2.0879**
Insourcing*analyst	λ_{3IN}^{ES*POS}	+0.2401	−3.0445**
Insourcing*manager	λ_{4IN}^{ES*POS}	+0.1573	1.7065*
Insourcing*consultant	λ_{5IN}^{ES*POS}	−0.4121	−6.2441***
Insourcing*sales	λ_{6IN}^{ES*POS}	+0.4639	7.3541***
Insourcing*Unix/client-server	$\lambda_{1IN}^{ES*UNIX}$	−0.0889	−2.1151**
Insourcing*SGL	λ_{1IN}^{ES*SGL}	−0.1737	−3.0303**
Insourcing*TGL	λ_{1IN}^{ES*TGL}	+0.0650	1.9242*
Insourcing*FGL	λ_{1IN}^{ES*FGL}	−0.1142	−3.3056**

*   indicates significance at the 10% level
**   indicates significance at the 5% level
***   indicates significance at the 1% level

Measures of association:
Entropy = 0.140401
Concentration = 0.176765

Goodness-of-Fit Statistics: Likelihood ratio chi-square = 256.478, DF = 257, P = 0.492; Pearson chi-square = 226.235, DF = 257, P = 0.524

native work force arrangements on the existing permanent work force in an organization must be examined to ensure smooth coexistence of the two separate classes of workers. Recent literature examining contract workers in organizations reports that contract workers are less committed to the organization [17]. Supervisors also trust contract workers less because of their relatively short tenure, assign contract workers to simple jobs of narrow scope, and rate performance of contract workers lower than that of employees.

In terms of their impact on existing employees in the firm, contract workers often cause permanent workers to perform training, supervision, and quality control tasks not part of their original job descriptions. In effect, there is a work spillover; permanent employees have to undertake more complex jobs and bear expanded responsibilities of managing inexperienced contract workers unfamiliar with the company's philosophy and procedures [23]. The work-spillover effect is compounded by the relatively short tenure of contract workers, requiring continual socializing of new contract workers. Thus, the presence of contract workers may lead to a downward spiral in the organization; use of contract workers generates expanded job descriptions for the permanent workers and a sense of inequity, which in turn leads to high intention to turnover. As turnover increases, organizations may rely even more on contract workers.

We have argued that outsourcing adds needed flexibility to IS work arrangements. However, although the variety of alternative work force arrangements offers IS managers considerable flexibility in focusing on their core competency, and in addressing bureaucratic constraints, work fluctuations, and labor shortages, these arrangements are potential negative impacts on organizational climate and work relations. The rapid expansion of outsourcing requires further investigation of the organizational impacts to understand the full range of the economic, legal, and organizational benefits and costs. ▣

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