Industrial Restructuring in the Pulp and Paper Industry: Relationships to Corporate Environmental, Health and Safety Risks

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Summary

Industrial restructuring has been occurring at various levels of organizational analysis. Industries, companies, departments and processes within organizations have all undergone major restructuring efforts within the past two decades. During this period corporate environmental management as well as safety and health components have also evolved and grown as a critical element for the long-term existence of organizations. This paper evaluates the implications of organizational restructuring such as downsizing, reengineering, and outsourcing on organizations within the U.S. pulp and paper industry, with a particular emphasis on environmental, health and safety management. The paper draws on results from a three-pronged research project, combining econometric, survey, and case-study analyses. After outlining some background issues, the methodology and findings are presented. The results are then linked to several elements of organizational and management theory. Implications for corporate practice and future research are also presented.

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0. SUMMARY

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1. INTRODUCTION

Since the early 1980's, restructuring of American corporations has become a prominent feature of industrial experience. In the past, such restructuring was typically the result of economic recessions and falling profits. Over the past decade or two, however, restructuring has become an ingredient of business strategy, for successful and unsuccessful companies, designed to help businesses cope with technological innovation, global competition, and economic downturns. Such changes hold a large potential for affecting corporate environmental, health, and safety (EHS) risk management.

Corporate actions taken in the late 1980s and 1990s have sought to restructure the workplace, the workforce, and the production process to achieve the increased flexibility and efficiency required in a period of greater economic uncertainty, rapid technological change, and intense global competition (Castells 1997; Storper and Scott 1989). Restructuring over the past 15 years constitutes a significant change in the way that corporations do business nationally and globally, yet the existing understanding of the short- and (especially) the long-term effects, both intended and unintended, is still limited. Also, the achievement of the outcomes sought during at least the early experience with these changes has been mixed. Thus far, the assessment of effects has largely addressed the economic, efficiency, and flexibility gains, as well as the unintended and often adverse human effects on the workforce and corporate morale (Bowman et. al, 1999).

The impacts of restructuring on corporate sustainability and environmental management have received scant attention thus far. This is a critical issue that has been overlooked by researchers, practitioners, and managers. To help address this major gap in understanding the issues of EHS effects of restructuring, we summarize the results of a multi-year study using a multi-pronged research approach. The study focuses on the U.S. pulp and paper industry. The methodological approaches include econometric analyses, an empirical survey analysis of the industry, and

detailed case analyses of five organizations. This paper presents the major findings of the study and relates them to organizational and behavioral theory.

2. DEFINING RESTRUCTURING

There are a number of ways in which industrial and organizational restructuring can be carried out. In this paper we focus on three categories of internal operational restructuring that have been prevalent in the existing discussion of restructuring. These categories are downsizing, reengineering and outsourcing. These restructuring policies of organizations do overlap at some level, but we believe that they each have some distinctive characteristics. We present a brief definition of each and discuss various implications of that restructuring that have been outlined in the existing literature, along with likely impacts of that restructuring on a company's EHS activities.

A. Downsizing

Downsizing refers to a reduction in organizational size through a set of actions aimed at improving efficiency, productivity, and/or competitiveness. It is distinguished by at least four attributes (Cameron 1994). Downsizing is (1) an intentional set of activities that involves (2) reductions in personnel and is (3) focused on improving efficiency through a targeted set of organizational changes while (4) altering work processes.

Downsizing has evolved to where salaried workers and middle managers in particular have borne the brunt of these reductions (AMA 1996). With the continued emphasis on improving profitability and productivity of workers, corporate America still sees downsizing as a valuable tool (e.g. by the end of 2001, Fortune 500 companies reported cumulative layoffs of 1,040,466 positions (Florian 2002a); by April 2002, more layoffs were reported, adding 255,260 lost jobs to the already staggering numbers (Florian 2002b). The recognition appears to be growing that successful downsizing must be associated with both top management "vision" for the future of the corporation and a corporate strategy for getting there, of which downsizing is but one piece (Davis et al., 2003).

Even when the US economy as a whole was adding jobs, during the mid-late 1990's, downsizing was still occurring. This points to an important attribute of current downsizing: companies are cutting staff during periods of growth as well as periods of economic recession.

The few studies that have examined downsizing and performance have either focused on worker behavior, the emotional states of workers, or on varying performance variables of individuals, Brockner (1992), Brockner, et al. (1993), Davy et al. (1991), Richey (1992) and Conner, (2003); other studies have focused on the implications of downsizing on corporate financial performance (Dewitt, 1998; Franz, et al., 1998; Lowe, 1998; Lewin and Johnston 2000; Chalos and Chen, 2002; Park and Krishnan, 2002) and knowledge management (Fisher and White 2000).

B. Reengineering

Reengineering refers to "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures such as cost, quality, service, and speed" (Hammer and Champy 1993, 32). The primary aim is to reduce work and functions in addition to, or in place of, reducing the number of workers. The strategy

consists of such actions as eliminating functions, hierarchical levels, groups, divisions, or products; redesigning work tasks; and consolidating or merging units. Wellins and Rick (1995), in their review on reengineering, conclude that these efforts have often failed to consider whether the culture of the organization and its supporting systems—communications, training, selection, compensation, and performance appraisal—are aligned to support the radical changes sought. The primary success criteria that have been evidenced in the literature state that alignment should be strategic and aligned with other strategic change programs (Altinkemer et al., 1998; Earl et al., 1995; Grover, 1999; Sung and Gibson, 1998; Teng, Grover and Fiedler, 1996). Within the significant work on understanding reengineering and its implications, little effort, if any, have investigated its relationship to EHS programs. This issue is currently coming to the forefront in the business process management field with recent calls for investigating environmental sustainability in business process management journals.

C. Outsourcing

Outsourcing refers to the use of outside vendors to perform previously in-house tasks or to take on product lines. From an environmental sustainability perspective, outsourcing activities are part of greening supply chains and supply chain decisions (Sarkis and Rao, 2004). There can be many types of outsourcing, three types include: (1) secondary: noncore areas are contracted to an outside vendor; (2) subsidiary: business units are spun off into smaller, quasi-independent entities that are more flexible, innovative, and efficient; and (3) collaborative: competitors work together on specific joint projects to distribute risk and take advantage of synergistic effects (Gupta and Zhender 1994; Kelley 1995). Outsourcing can provide greater flexibility for firms, allowing them to take advantage of changing technologies and new sources of knowledge or allow individual firms to make efficient use of scarce, highly specialized talent (Kochan et al. 1994). On the other hand, critics see outsourcing as depleting the firm of valuable in-house expertise, its knowledge base, and a committed workforce. Care needs to be taken in evaluating sustainable environmental performance in cases where outsourcing has occurred. Some organizations may have improved their own environmental performance by outsourcing their environmentally malignant processes, simply shifting responsibility for the problem rather than solving it. Thus, getting a complete measure of the impact of outsourcing on environmental performance requires performance measures and indicators that incorporate the firm's supply chain before and after outsourcing. Unfortunately, this type of information will only rarely be available.

3. Research Methodology and Findings

At the beginning of the project the research team carried out an extensive literature review of research done on restructuring, especially as it pertained to EHS risk management. We followed a three-pronged (triangulated) research process to identify and investigate the major issues facing operational restructuring and EHS/risk management of companies in the U.S. pulp and paper industry. The research methodology involved econometric, empirical survey, and case studies. Researchers for exploratory investigation and research have recommended the multi-pronged research approach (e.g. see Eisenhardt, 1989). The econometric analysis is based on a large sample of data, 424 pulp and paper mills, but only considers information that could be quantified from published sources. The survey analysis gathers a much wider range of information, both qualitative and quantitative, for the set of 30 companies that responded to the survey. The case

study gathers information in great depth for the 5 companies involved. Our results are based on a comparison of the results from all three methods – and more often than not, the results from one method tend to be confirmed by the other methods.

A. Literature Review Findings

Our literature review (Sarkis, et al., 1999) provided four major findings about the impacts of corporate restructuring on corporate environment, health, and safety (EHS) programs:

- **The impacts of restructuring on corporate EHS programs are little studied and poorly understood.** Little is known about either the specific pathways whereby organizational restructuring affects risk management systems, or about the relative frequency of particular outcomes.

- **Downsizing impairs the EHS performance of production workers when** staff shortages lead to stress and task overload, prioritization of production over safety, decline in worker training and experience levels, and reduced quality of staff communication and interaction. Adverse results directly affect risk management personnel and systems when EHS staffing levels are reduced and risk management responsibilities are shifted to less experienced or under-qualified workers, institutional memory is lost, and management attention to safety systems declines during organizational change. Certain downsizing strategies designed to minimize employee distress (e.g., early retirement and voluntary separation incentives) may exacerbate knowledge loss by disproportionately eliminating experienced workers.

- **Outsourcing and sub-contracting contingent labor impair risk management when** sub-contracting firms employ younger, less experienced labor and provide inadequate training, when conflict exists between regular and contingent labor, and when host companies fail to screen and monitor sub-contractor EHS capabilities and performance.

- **Restructuring can improve EHS outcomes when** there is strong corporate focus on risk management during restructuring; increasing levels of specialized knowledge and skill through contracting out hazardous, non-core functions; and integrating effective EHS training (and increased employee safety authority) in work process reengineering efforts.

We also received guidance from an Advisory Committee of industry experts, both at the start of the project to help develop our methodologies, and at the end of the project to provide feedback on our results. We now describe each of the methodological approaches and summarize the types of information they provided.

B. Econometric Methodology and Findings

The econometric study (Gray, 2000) used data covering the 1985-1996 period for 454 U.S. paper mills. An industry trade publication, the Lockwood Directory, was used to identify a

large list of paper mills in the U.S. and which company owned each plant. Using directories back to 1960 provided us with an indication of the plants' age. The Lockwood data allowed us to identify the production technology in use at the plant, in particular whether the plant includes any pulping and the type of the pulping process. The capacity of the plant was also identified, both for pulping and paper-making. We used the Lockwood information to link plants into companies, and connected those companies to corporate financial information from the Compustat database, including the firm's return on assets and firm employment, along with the number of paper mills owned by the firm.

Information on corporate restructuring events was collected from a literature review focusing on the popular business press. We searched for a variety of terms that have been associated with restructuring (including downsizing, outsourcing, and reengineering), and identified cases where such events associated with one of the paper industry firms. Changes in plant ownership were identified from the Lockwood data to provide an alternative type of 'restructuring' for the analysis. Since restructurings was expected to affect individual plants with some time lag, we defined a "restructuring" plant as one that had experienced a restructuring in the previous three years. In this dataset, one-tenth of the plants had undergone a corporate restructuring and slightly fewer had undergone a change in ownership, so these are relatively rare events in our dataset.

The measures of environmental performance for the plants in our dataset were acquired from a variety of EPA datasets, including data on air pollution compliance, water pollution compliance, and toxic releases. A total of 454 plants that could be matched to at least one EPA database were used in the analysis. We examined a number of statistical models to explain a plant's environmental performance, including multivariate probit models for compliance and regression models for toxic releases. The models focused on testing whether the restructuring and ownership change variables have any substantial impact, controlling for the characteristics of the plant and of the firm that owns the plant.

The principal results from our analyses are presented in Table 1 for a set of six models examining the impacts of ownership change and corporate restructuring on environmental performance. Three performance measures are included as dependent variables: air pollution violations, water pollution violations, and toxic releases. For each dependent variable we present two models, one for each of the two types of restructuring events: ownership changes at the plant and corporate restructuring events at the firm that owns the plant. Plants with large pulp capacity tend to have significantly poorer performance on all three measures, while inspections (weakly) encourage compliance. Turning to firm characteristics, larger firms, measured by total employment or number of paper mills owned, have somewhat better performance. Being owned by a profitable firm, or one that is primarily focused on the paper industry, doesn't seem to affect a plant's performance. Neither does the compliance rate at the other plants owned by the firm.

Turning to the restructuring variables, we do not see any significant evidence that environmental performance is harmed by restructuring events (as we might have expected if the restructuring greatly reduced the resources available for the firm's management of EHS risks). In fact, plants which have recently undergone a corporate restructuring seem, if anything, to have better performance – significantly so for air pollution compliance and toxic releases. Having

undergone a recent ownership change doesn't seem to affect a plant's performance in any significant way. We also find no significant effect of the firm's compliance rate at its other plants. This lack of results for most firm-level variables, aside from firm size, suggests that corporate-level environmental policy is not a major determinant of a plant's environmental performance (otherwise there would be more similarity in performance across plants and more influence of firm-level characteristics that might affect corporate policy).

We also examined the performance of a given plant across all three areas (air, water, and toxics). The residuals from the three models identify the components of performance that are not explained by the models. We find weak positive correlations between air and water (.08), and between air and toxics (.06), indicating that a plant with especially good air pollution performance also tends to perform better on water and toxics as well. This suggests the importance of identifying other unmeasured factors specific to the plant that could be affecting performance (such as better management ability or greater local pressures).

C. Survey Methodology and Findings

Members of the research team developed the survey instrument collaboratively during the fall of 1999. The scope, content, and wording of the instrument was determined after lengthy discussion among team members, and following an extensive review of the literature on industrial restructuring as well as other related surveys that had been conducted previously. A draft survey instrument was reviewed by the project advisory panel in March 2000, and revised accordingly. The advisory panel included several representatives from the pulp and paper industry, as well as researchers familiar with corporate environmental, health, and safety policies and practices. Representatives at the American Forest Products Association (AFPA) and the Technical Association of the Pulp and Paper Industry (TAPPI) also reviewed the draft survey instrument.

The final survey instrument includes a mix of open-ended and scaled/categorical questions divided into five sections. The first section requests general background information about the respondent. The second section requests responses to the organizational "core competencies," sales, staffing, and environmental programs of the company. The third section asks a series of questions designed to characterize the nature, extent, and causes of restructuring activities within the company since 1990. Section four focuses on the impacts, if any, such restructuring may have had on the nature and operation of environmental, health, and safety practices. The final section asks about the corporation's willingness to participate in more detailed case studies that are another component of the parent project. The survey was designed to take approximately 45 minutes to complete.

Survey sample and dissemination

The goal of the team was to distribute surveys to every company with active pulp and paper operations in the United States. The names and addresses of the vice presidents for environment, health and safety (or their equivalents) were identified using sources such as the Miller-Freeman directory, phone calls, and the web. Initial contacts were made by phone. If a contact agreed to participate in the survey a copy of the survey instrument was mailed out along

with a cover letter explaining the purpose and nature of the survey, an abstract describing the project as a whole, and a listing of the project team and advisory panel members. A postage paid envelope was included for return of the completed survey. Participants were reminded two weeks later by phone or by e-mail to complete and return their surveys. The team had considerable difficulty reaching some contacts, which meant that the surveys were distributed over a 2.5 month period.

One hundred sixteen domestic pulp and paper companies were initially identified. The members of the team, however, were unable to reach appropriate contacts at fifteen of these companies even after repeated telephone calls (Table 2). Six of the contacted companies said they were no longer engaged in pulp and paper activities, leaving the total of 110 companies believed to have significant pulp and paper operations (the original 116 identified less 6 companies no longer engaged in pulp and paper operations). Three companies refused to participate in the survey. Consequently, 92 surveys were mailed and 50 were returned (54.3% response rate of mailed surveys and 45.5% of all total identified companies). After receiving the survey instrument, 3 additional companies refused to complete the questionnaire, 6 indicated that they had not engaged in any restructuring, and 11 additional companies indicated they were not currently engaged in pulp and paper activities. In sum, removing the 11 companies from the survey population, left 99 companies in the U.S. that were considered pulp and paper manufacturers. The final result was 30 complete useable surveys for the analysis or a 30.3% response rate for the entire identified population of pulp and paper companies. This is a reasonable return rate for a full population considering that many academic surveys are below that level.

The 30 completed surveys were then matched to data on pulp and paper companies that we had compiled from the Lockwood Directory during the econometric part of the project. This included data on the pulp and paper mills owned by the company and the production capacity of those mills. The 30 companies in our survey dataset cover a substantial range of sizes: 11 large producers (based on their plants having a total of over 5000 tons per day (tpd) of pulp and paper production in 1997), 7 medium producers (500-5000 tpd), and 12 small producers (less than 500 tpd). Because of the presence of some large producers in our sample, the response rate of 30.3% includes over 50% of all domestic U.S. production in 1997. We also linked the surveys to regulatory compliance data from EPA and OSHA datasets, in order to observe external measures of the EHS performance of the plants owned by each firm.

Survey Results

We begin by examining the pattern of corporate restructuring at the surveyed firms. Which types of restructuring were most common? Figure 1 shows the extent of restructuring at the surveyed firms since 1990. The three types of restructuring we focus on - downsizing, outsourcing, and reengineering - are the most common (fewest responses of "None"). Downsizing has the most common "Substantial" response and nearly all firms responded that they had done some outsourcing.

Which types of restructuring tend to occur together? Table 3 shows the results of a factor analysis of the eight types of restructuring. The analysis results in three factors being identified,

classifying the restructuring types into three groups: Downsizing(with Reengineering, Mergers, and Divestitures), Outsourcing (with ContractLabor), and PlantClosure(with PlantAcquisition). Do different-sized firms behave differently on restructuring? In Figure 2 we see a slight tendency for small firms to make more use of outsourcing than larger firms, relative to their use of downsizing and reengineering.

Next we consider what causes corporate restructuring, both the external drivers influencing restructuring and the internal goals of the restructuring. Figure 3 shows the importance of financial conditions and market conditions as external drivers of all three types of restructuring, especially downsizing. Changing regulations were important for outsourcing (a more detailed examination of the data showed this was primarily true at smaller firms), while the firm's strategic plan was an important driver of reengineering. Figure 4, showing the goals of restructuring, again emphasizes the importance of economic factors. Reducing production and overhead costs were the most important goals for downsizing and outsourcing; another economic goal, improving productivity, is more important for reengineering.

Next we consider the reported impacts, if any, of restructuring on a firm's EHS performance. Figure 5 shows the reported impact of restructuring on EHS staffing and activities. We see the largest negative impacts on the number and workload of EHS staff, along with some negative impacts on EHS expertise, budget, and planning. However, we do see an unexpected improvement in communication with other departments. Figure 6 shows the impact of restructuring on EHS business practices. The most clearly negative impacts were on consulting with communities and establishing voluntary internal standards. The impacts on monitoring and training were also negative, but several areas reported improvement, especially involving senior management and promoting EHS culture.

Finally, Figure 7 shows the impacts of restructuring on EHS performance, as measured by the compliance rate at plants owned by the firm with regulations on air pollution, water pollution, and worker health and safety. Firms were categorized into three groups, based on their reported use of Downsizing-Reengineering, Outsourcing, or neither (little restructuring). No differences can be seen across the groups for air or water pollution. Firms doing mostly outsourcing do seem to have poorer performance on worker health and safety, but this may be an artifact of firm-size differences across the groups (smaller firms did more outsourcing, and plants owned by smaller firms tended to have poorer compliance with OSHA regulations).

D. Case Study Methodology

Five firms were selected for case studies according to specific criteria. Criteria included: (1) each firm has undertaken restructuring over the past five years or is currently involved in this process; (2) the firms overall experienced a variety of types of restructuring; (3) the firms range in size from large to relatively small. The key criterion was that the firms were willing to participate (which represented a substantial time commitment during our visits).

Selected firms included large companies with annual sales in billions of dollars to smaller firms with annual sales in hundreds of millions and tens of millions of dollars. All of the firms owned

multiple paper mills that operated in different communities. Some firms had Pulp & Paper operations in dozens of states in different regions of the United States and in other countries. Although the case studies focused on pulp and paper operations, all firms also had paper converting facilities and some manufactured other products as well. Firms obtained raw materials for pulp and paper operations from a variety of sources: from internal operations; from open markets; from wood or other fiber sources, both virgin and recycled.

Case study interviews involved a team of three researchers visiting each of the five firms and meeting with a number of individuals. Each of the three researchers was present at the "face-to-face" interviews. Some additional interviews were completed by telephone when key people weren't available during our visits. All interviews were taped and fully transcripted. Individuals were asked to participate based on their knowledge and experience related to various aspects of this study, and in each firm senior management of safety and environmental activities were interviewed. In larger firms, an additional number of individuals with specific responsibilities for safety or environmental work participated. In smaller firms, interviewees frequently also had responsibility for operational aspects of the business other than EHS.

In all, (16) interviews were conducted in two larger companies during two-day visits and (6) individuals were interviewed during single-day visits to three smaller companies. Most interviewees had over 15 years experience with the pulp and paper industry, and many had worked in multiple organizations, due primarily to mergers and acquisitions. Additional information on these firms was available from the restructuring survey form that was completed by 4 of the 5 firms that participated in the case studies.

The interviews were conducted as conversations designed to elicit information about the effects of restructuring on EHS practices. The structure of each conversation was a series of open-ended questions about scenarios that were described by the interview team. These scenarios were designed to probe for information about EHS management practices such as those related to hazard management, to regulatory issues, to emergencies, to compliance, to financial aspects. In discussing these scenarios, interviewees were invited to describe practices as they currently exist and as they had existed in the past. This gave the interview team information about practices over time, pre-and-post company restructuring. An overview of an example semi-structured scenario-based interview protocol questionnaire is shown in Appendix A.

This scenario approach to case study information gathering was described to each firm in advance of the interviews. If requested, the scenario questions were provided in advance of the interviews. All participants agreed to allow the taping of each interview, which greatly assisted the research team in the task of organizing this extensive information. Over 500 pages of single spaced pages of data were available for analysis in the transcripts of those interviews. Given the volume of this material we do not attempt to summarize it here, but will instead provide specific references as supporting evidence in the course of discussing our research findings below.

4. SYNTHESIS OF FINDINGS – TEN THEMES

After analyzing the data from these various research methodologies we arrived at a more complete picture of the relationships of restructuring on EHS practice in the pulp and paper industry. We summarize the overall results in terms of ten 'themes' or major findings. With each theme we provide supporting evidence from the various evidence acquired during the course of the project. Each of the themes was also presented to our Advisory Committee of industry practitioners in a meeting at the conclusion of the project. The feedback from the advisory board members, many of whom have been involved in the pulp and paper industry and environmental management for a number of years, generally supported our conclusions and helped us explain why some of these behaviors occurred.

1. Regulatory compliance and other core EHS functions have matured in most companies. EHS compliance considerations, especially at larger companies, play a broadly pervasive, instead of focused, strategic role. In the past, these issues were less settled and occupied more resources and attention and focus. The organizational maturation of EHS management functions in large companies begins with successfully establishing the EHS function within the firm by setting EHS goals and assigning responsibilities, and creating formal and informal processes of information management and sharing, reporting, employee training and the like. Once basic EHS systems are in place, they are expected, like other corporate functions, to adapt to business pressures, for example, by looking for efficiencies achievable through reorganization, contraction, and learning effects.

Our case study interviews with environmental managers at the larger companies provided the chief evidence in support of this finding, when they were discussing the evolution of EHS management at their organization. There had been a tendency in the early 1990s for additional resources to be added to EHS management (specifically on environmental issues). Later in the 1990s, after firms got a sense that environmental issues were under control, some reductions and reallocations of staff occurred, as part of regular corporate restructurings.

Business Unit Environmental Manager: In the early 1990s *"there was definitely a shift within the company to become a greener company.* [Company B] *wanted to become an environmental leader in the industry. They made significant changes … there were just a hand full of people when I came there … It was probably close to 70 folks corporate wide before the restructuring* [that had occurred a few years previously throughout the corporation]. *It actually went overboard* [before the restructuring], *just like most shifts, it went too far … if there was any problem, they just threw money at it. We hired consulting firms to set up some issues and set up the auditing program. I just saw money going out of there right and left…*"

Divisional V.P. of Human Resources: *The whole company went through a major reengineering effort; a very structured process (based on 'value analysis') with goals set for reductions in headcount, etc. At that time there were two or three positions eliminated … Three years later we had a division initiative to cut some overhead … Then last year, they had another divisional cost reduction effort. It wasn't just on functional or overhead areas; it was also all of the operating businesses.*

2. Restructuring has little impact on compliance, but does affect voluntary activities undertaken by the firm at the corporate level. Specifically, our studies showed that as resources become scarce, companies might cut back on programs like establishing voluntary standards, consulting with environmental groups, or promoting EHS 'culture'. This tendency may be tied to the finding that, in large companies especially, EHS departments are 'mature' with respect to meeting core regulatory compliance requirements (Theme 1). As such, EHS must compete for resources with other business units, based on the value that specific EHS programs add to corporate processes or profits. Voluntary programs are viewed as "extras" and may be greatly influenced by the availability of resources. Also, based on the case study interviews, there seems to be little enthusiasm for ISO 14000 as a source of 'additional value' for the EHS departments in the Pulp and Paper industry.

The finding that restructuring does not lead to compliance-related problems was a major result of the econometric analysis, as discussed earlier. If anything, it seemed that environmental compliance improved following restructurings, with significant improvements in air pollution compliance. The survey results (Figure 6) also indicated no adverse effects on "preventing accidental releases" or "controlling routine emissions". The same question indicated that "consulting with communities" and "establishing voluntary internal standards" were adversely affected by restructuring. The external performance measures (Table 7) indicated no adverse effects on air or water pollution compliance. On the other hand, Table 7 provides some evidence for reduced compliance with OSHA regulations at firms that experienced substantial downsizing, outsourcing, or reengineering. Our case study interviews also supported this distinction between compliance activities and voluntary activities, at least on the environmental side.

Large Company B – External Environmental Director
We used a value analysis technique to go through and determine what the higher value activities were – identify what things we should be doing and determine how many people it took to do that. We did a 20% cut in our costs but compliance/noncompliance was not on the table. What we had to do was reduce our costs and still have a 100% compliance with regulations, permits and our company policy. So we made that cut and that severely reduced what we did as far as supporting NGO's, what we did in research, and a lot of the long-range things got cut out of our budget at that time.

Our finding of no compliance-related problems runs contrary to existing case studies of the petrochemical industry identified in our literature review. These studies (e.g. Smith 1990; Wells, Kochan, and Smith 1991, 1992; Kochan et al. 1994; Rebitzer 1995) suggested that downsizing can impair EHS performance where resources are reduced, with effects on compliance-related activities as well as voluntary activities. The differences in results might be due to the different time periods or different industries being studied, and is a potential topic for future research.

3. "Product stewardship" (defined here as taking responsibility for the full environmental impacts of the product) and other, primarily voluntary, environmental considerations are increasingly **driven by external relations** with suppliers and customers. This is currently the major area of environmental management growth in organizations at the corporate level. Pulp

and paper companies are responding to concerns raised by customers, prompted by pressure from environmental activists, often focusing on forestry practices. Some of the resources to support this expanded 'external' focus of EHS activity seem to be coming from the existing 'internal' programs, which are being asked to operate with fewer resources after restructuring.

This finding came primarily from the case study interviews at the larger organizations. The current growth in product stewardship in some ways parallels the earlier growth in attention to environmental compliance – a new area perceived as of critical importance to the organization attracting substantial increases in resources while the organization is learning how to address the issue. These new voluntary activities, driven by pressures from customers and thus immediately linked to sales and profitability, are growing when other voluntary activities mentioned in Theme 2 (such as contributing to environmental organizations or developing new internal performance measures) are declining.

Large Company B - Business Unit Environmental Manager
[The customer relations manager] *is way out there, dealing with issues that the business unit environmental manager doesn't have to think about: ecolabeling, certification issues, packaging issues, life cycle analysis. That goes well beyond what the environmental managers do. There needs to be more attention paid to those issues.*

Large Company A - External Environmental Director
I acquired two additional functions [as a result of pressures from customers through the supply chain] *... as a result of the last major reengineering project 1-2 years ago* [this same reengineering project brought about a decrease of 20% headcount in internal environmental functions]. *There is no question that this function has grown. It was 2 people, than 3, than 4, and now we have a headcount of 7. We're threatening to grow by one more next year.*

4. EHS management generally reacts to, rather than shares in developing, corporate restructuring policies. Economic considerations were found to be the primary drivers of corporate restructuring decisions, and EHS departments, like most other company departments, are expected to implement restructuring goals and objectives established by senior management. Environmental issues *per se* rarely play a role in restructuring, though in implementing restructuring, EHS departments might poll internal customers on the 'value' of specific EHS functions or programs.

The survey results provide major evidence for this finding. Figure 2 shows that financial and market conditions are the major drivers behind downsizing, outsourcing, and reengineering at the surveyed companies. Figure 3 shows that most of the goals reported for restructuring are also tied to economic considerations: reduced overhead costs, reduced production costs, and improved productivity. Our case study interviews also identified many cases of restructurings that were done on a company-wide or division-wide basis, and only one or two restructurings that were specifically targeted at EHS – and even the EHS-specific restructurings tended to be more aimed at reducing costs than at improving EHS functions (a regular sequence of broadly-based restructurings is described in the second case study quote under Theme 1).

5. Outsourcing is more common in smaller companies. Our survey showed that small companies facing new regulations or responsibilities are apt to turn to external service providers, while larger firms may have sufficient economies of scale to justify 'insourcing' (moving operations in-house). In addition, smaller companies typically outsourced the management of safety information, while larger companies internalized this function.

The survey found a small tendency for smaller companies to do relatively more outsourcing, as shown in Figure 2. Our case study interviews also found evidence for small companies outsourcing regulatory activities such as permit-writing, while sometimes larger companies are moving in the opposite direction.

Small Company D – Environmental Manager: *Today I met with a consultant on persistent bioaccumulative toxins (PBTs). These require Tier 1 reports to EPA every year. Usually we don't have any, except for an odd type of chlorine or formaldehyde. Now, we are burning #6 oil which have PBTs. Even though the air permit already requires us to record every drop of oil we use, we now have another regulation to meet (another report to file). This is something we hired a consultant to do.*

Large Company B – Corporate Environmental Permitting Manager: *Permitting is something we brought in-house as a money savings idea during the reengineering process. One of the ideas we came up with was bringing permitting back in-house by setting up an internal air permitting group. This started up with two people, now it employs four full time people. Before that it was all outsourced. The plants individually outsourced, it didn't come through corporate. The plants still have the option of using this service or not, but they usually choose the in-house permitting experts because it is cheaper, faster, and better.*

6. Plant level EHS performance within companies varies widely, in part because companies rarely pressure plants to adopt uniform standards and practices. This tendency reflects a strong decentralized mill culture within the pulp and paper industry. Within companies and the industry, particular plants can be recognized as examples of best practice (e.g. plants participating in OSHA's Voluntary Protection Program). There may be some attempts to emulate better performance at other mills, but this is not forced by corporate-level pressure. Notwithstanding the overall tendency toward decentralized plant management, some companies sought corporate-wide commitment to certain EHS programs such as the AF&PA's 'forest certification' program, internal 'EHS university' training programs, and in certain kinds of environmental reporting, including the Global Reporting Initiative. Part of this reason for decentralized policies may be due to the large amount of mergers and acquisitions that have been part of the industry, where divergent business cultures and practices need to be integrated. Should the pace of acquisitions and mergers slow, companies may implement more standardized approaches to EHS.

The econometric analysis found relatively little evidence for a plant's performance being affected by corporate characteristics (aside from some differences related to the size of the owning firms). A plant's performance doesn't change after it undergoes a change in ownership.

One plant's performance is not strongly related to the performance at the company's other plants, while there is a tendency for plants which perform better on air pollution compliance to also perform better on water pollution and toxic releases. Taken together, these results suggest that plant-specific characteristics may be more important in determining compliance than any company-wide pressures for a consistent compliance strategy across all its plants. Case study interviews with both large and small plants pointed to a willingness to treat different plants differently:

Large Company A – Environmental Director
In the case of Environment, I'm not sure if we felt that one size fits all should be the way we look at [plants]. *There are facilities that confront different degrees of complexity in how they are put together, different regulatory scenarios, different types of scrutiny. Some have multiple regulatory agencies looking over their shoulders, where some barely have one. In the final analysis we made our best shot at grouping mills according to what we thought the appropriate categories were for us.*

Small Company D – Plant Manager
We keep the New England Plants separate because of the differing issues faced by each plant. The converting plant is a whole different animal than the paper making plant, with a different structure, all together [followed by a discussion of different reporting practices and different management responsibilities at the plants, based on the past history of the plants].

7. Mills are primarily responsible for handling community-relations issues, such as sponsoring community advisory panels. These activities seem to be part of the 'mature' activity of the companies, without much oversight from the corporate level. Thus, it would be local (rather than corporate) restructuring that influences each plants community-based activities.

The survey results (Figure 6) indicated some diminishing of corporate-level EHS activities following restructurings, in the area of "consulting with communities". Our case study interviews provided further details indicating that relations with the local community were considered a plant-level responsibility.

Large Company B - Regional Field Environmental Manager
On the P&P side most of that [community relations] *is managed by the communication managers at the facilities and the environmental manager. These plants get additional support from corporate as needed. The facilities on the P&P side are very involved with the community groups and do a lot of community interactions trying to educate people: keep the attitudes of the community positive towards the facility and let the community know what is going on environmentally.*

8. Little integration of EHS activity across country boundaries is seen in those international firms that have acquired some European operations. Rarely do such companies exhibit a "global" vision or approach to EHS across international boundaries. European subsidiaries tend to maintain their 'EHS culture', and are not necessarily looking for help from the US part of the

company on compliance or market-driven EHS issues – perhaps because those issues are very different in Europe.

Our survey and econometric analyses were focused on the U.S. industry. This finding came from our case study analysis, based on comments during our interviews at the larger organizations.

Large Company A - Director of Environmental Programs
There are some global issues, but Company A does not have a strong global environmental organization. It tends to be very decentralized: Europe manages their environmental affairs in Europe, South America manages theirs and the Pacific Rim has a very strong environmental program. Company A hasn't enforced corporate-wide methods on how to manage their environmental affairs programs.

9. Safety Management and Environmental Management are different with respect to management practices, management metrics, reporting levels, corporate priority, relationship to corporate, relationship to business units, and organizational sophistication. In some companies, these functions are organizationally separate. Even in companies where environment and safety management are under a single department, the functions are typically managed quite distinctly. Formalized measurement-based systems are more apparent at larger companies than smaller companies.

This finding arose during the process of collecting our survey and case study information. When doing the survey, we found that many companies had one department handling environmental matters and another department handling health and safety. In about half the companies for which we did case studies, the Human Resources department managed worker health and safety issues, usually tied to managing the company's workers compensation system. In the other half of the companies there was an EHS department that combined both E and HS functions.

10. Information Technologies used to manage EHS vary widely. Smaller companies use IT primarily for information gathering (e.g., searching the OSHA web site), while larger companies use it also for business process management, communication, and training. Sophistication in using the resource is much more evident at larger companies than at smaller companies, likely reflecting corporate resources and culture rather than EHS management, *per se*.

This finding was based on the case study interviews. The interviewees often noted substantial advances in productivity being achieved through use of IT. This might in some cases have been driven by the pressures to reduce EHS budgets and staffing noted in the survey (Figure 5). In comparing the responses we noticed very different IT applications at large and small companies.

Large Company A - Corporate Environmental Staff Person
[Company A indicated that its intranet system was used to supplant formal EHS training sessions, reducing the number of offsite EHS training sessions from 4 to 2]. *One example of an idea based on IT is a suggestion database for a 'reengineering' program, initially developed at*

one mill. Anyone can enter a suggestion into the database. Someone is assigned the task of looking at the database on a daily or weekly basis. Suggestions go to a project team that evaluates them on four or five different levels and respond to that person within a certain number of days. This was something that was adopted corporate wide.

Small Company C - Environmental Manager
[When asked "When new regulations arise, where do you get the information about these regulations?" one manager replied] *Information is received from mailings, within the Federal register, on the EPA's website, DEP's website. I am at these websites at least once a day. They have a whole section on what's new, things that are proposed. Such information is also distributed through the National Council of Air and Stream Improvement (NCASI) - a section on NCASI's website with this information can be received in book form or as an environmental handbook.*

5. Using Theory to Help Evaluate and Understand Themes

This paper is primarily an exploratory discussion of our empirical results. Still, we feel it is important to consider these results in the light of specific organizational and management theories that can supply further explanatory power for what is occurring and may provide insight into future developments in this area. We begin with a necessarily brief overview of three theoretical areas that we believe are relevant: legitimacy, structural contingency, and transaction cost theory. We place the review of our findings in the context of these theories.

A. Organizational and Management Theories

In *legitimacy theory*, organizations attempt to establish congruence between the social values associated with or implied by their activities and the values/norms of the social structure of which they are part. Legitimacy is gained when the congruence exists (Dowling and Pfeffer, 1975). Achieving a legitimate state requires that corporations pursue one or more legitimation strategies (Savage, et al., 2000). Most of the existing applications of legitimacy theory to environmental issues have focused on media planning and voluntary corporate social disclosure, especially environmental reporting (e.g. Deegan and Rankin, 1997; Savage, 1998).

Legitimation strategies can be categorized into one of two categories (Ashforth and Gibbs, 1990): (1) Substantive Activity (real material change to organizational goals, structures and processes) and (2) Symbolic Activity (no real change, but portraying corporate activities as compatible with norms). These two categorizations are similar to Laughlin's (1991) theories of morphogenetic and morphostatic change. In this study we focus on substantive activity, because our results focus on real changes to organizational practices. There are three major strategies within the substantive activity category:

1) Role Performance: This occurs when the organization adapts its goals, methods of operation, and/or its output to conform to society's critical resources that have certain performance expectations of the organization. Both society as a whole and other organizations can apply these pressures. DiMaggio and Powell (1983) characterize these inter-organizational and social

(network) resource based pressures as normative pressures. Resource theory of the organization (Pfeffer and Salancik, 1978) posits such external pressures by professional organizations and members of society. Resource theory can also be used to explain the following strategy (coercive isomorphism), in which organizations that are dependent on the continued success of other organizations may build behavioral dependencies with them to reduce risk. This often involves increased coordination and mutual control over each other's resources, where some of these resources may be coercively controlled. Under this approach, it is important that the role performance strategy be consistent with expectations for survival of the firm.

2) Coercive Isomorphism: This is a more evolutionary type of legitimation. It is based on DiMaggio's and Powell's (1983) coercive isomorphic institutional change. Under coercive isomorphism the organization makes changes relatively slowly, over time, as initially symbolic activity gradually becomes more substantive and the changes are matched with the organization's cultural environment. Again using resource theory, organizations will react both to pressures from other organizations upon which they are dependent and to cultural expectations from society. Some of these pressures may arise from governmental mandates others can be derived from contract law, while others involve large corporations having a strong influence on their subsidiaries.

3) Altering Socially Institutionalized Practices: This represents a more proactive change, where the organization can alter the societal definitions of legitimacy, so that the amended definition reflects the organization's activities. Dowling and Pfeffer, (1975) argue that this is the most difficult strategy to implement.

Under *structural contingency theory* (SCT) there is no one best way to structure groups or organizations (Burns & Stalker, 1961). This is one of the oldest and most (empirically) supported organizational theories (Donaldson, 1995). SCT states that individual organizations adapt to their environments. Organizations and managers do this by selecting contingency factors such as strategy, size, processes and technology. These contingency factors dictate the specific type of structure that would lead to optimal performance. Strategic fit (Zajac, et al. 2000) is an application of this theory, where the assertion is that an appropriate match between environment and strategy has significant and positive implications for business performance. The fit between organizational structure and technology is also important, and a structural change to restore the fit between an organization's contingency variables and its structure may sometimes be needed for enhanced performance. Such alterations of the organization are defined as adaptive change, the basic foundation of contingency theory.

Transaction Cost Economics (TCE; Coase, 1937; Hart, 1988; Klass, et al., 1999; Williamson, 1996) offers a useful framework for understanding the conditions under which certain operational restructuring activities (e.g. outsourcing) is likely to benefit organizations. Coase (1937) notes that firms should conduct internally only those activities that cannot be performed more cheaply in the market or by another firm. Thus a firm will expand precisely to the point where "the costs of organizing an extra transaction within the firm becomes equal to the costs of carrying out the same transaction by means of an exchange on the open market." TCE further argues that in acquiring inputs, firms choose between alternative governance structures. When firms rely on outside suppliers, they are relying on markets and contracts as a form of

governance. When they rely on internal employees, they are relying on organizational hierarchy as a form of governance. Transaction costs considered under this theory include unit price, the expected costs associated with forming and maintaining contractual and employment relationships, the costs associated with monitoring performance and quality, and costs generated by opportunistic behavior.

B. The Relationship between the Themes and Theory

Theme 1, the maturing of core EHS functions, is related to the first two legitimation strategies, Role Performance and Coercive Isomorphism. The initial rapid expansion of EHS activities, in response to external pressures from government regulators fits the Role Performance strategy, which focuses on an explicit adaptation by the organization. In more recent years, the Coercive Isomorphism strategy has dominated, as the EHS function has evolved to be a pervasive part of the culture of these organizations. Theme 3 is also representative of the Role Performance strategy, but instead of governmental regulatory pressures we see partner, customer, and other societal actor pressures affecting the organizational structure. Given the parallels with the organizations' initial response to regulation under Theme 1, we would expect that firm structures would eventually evolve to handling these product stewardship pressures using a Coercive Isomorphism strategy.

Theme 5 points clearly to TCE, with its emphasis on defining the boundaries of the firm. Certain aspects of EHS activities, especially those aspects associated with preparing and filing complex environmental permits, can be most efficiently handled by external consultants for smaller firms. Larger firms may achieve sufficient economies of scale, with many permits being written for many facilities, to justify bringing their permitting activities into the firm. Theme 4 is also somewhat related to TCE, at least as far as it reinforces the importance of economic factors in the firm's decision about the best organizational structure and the degree to which corporate functions can be outsourced.

Themes 6-10 are consistent with the SCT view of organizations' adapting to their environment. These themes describe a sizable degree of decentralization leading to substantial differences in strategies and practices within the same organization. These differences appear across different plants owned by the firm (Theme 6), across different countries in which the firm operates (Theme 8), and between the management of environmental risks and workplace hazards (Theme 9). Different activities are handled at different levels of the organization, as managers seek a good fit between structure and environment – e.g. relying on mills to handle local community-relations issues (Theme 7). The growing use of Information Technology (Theme 10) provides another example of a shift in the decision-making environment, In this case, IT has changed the relative costs of different mechanisms for communicating information within and outside the organization, affecting the organizational structure and processes related to EHS training programs and keeping EHS staff informed about external events affecting the organization.

Our results also show some of the limitations on the power of external pressures to influence a firm's legitimation strategies. Restructuring decisions are generally driven by the economic self-interest of the firm and market pressures, rather than by external pressures for better EHS

performance (Theme 4). Even the expanded attention being paid to product stewardship (Theme 3) is being driven by pressures on the firm's customers, and is thus primarily a market-related factor. Certain aspects of EHS performance have been identified as 'optional', at least in some restructurings driven by economic pressures (Theme 2). In that respect, the maturing of 'core' EHS functions such as regulatory compliance has also served to inform organizations about the relative importance of different external pressures.

6. SUMMARY AND CONCLUSIONS

This paper has presented the results from a research project examining the impacts of organizational restructuring on corporate management of environmental, health, and safety risks. The project used a three-pronged research approach, combining results from econometric, survey, and case-study analyses to develop a set of ten research themes. Organizational and management theories were summarized and used to help understand and explain, at a very high level, these themes.

The research indicates that restructuring has had some negative impact on the resources available for EHS management, but core EHS capabilities, in particular a corporation's ability to maintain regulatory compliance, do not seem to have been seriously compromised. This is a key result of our research, supported by all three methodologies. If anything, the econometric results suggest some improvements following a corporate restructuring, and the survey results show improvements in communication. The overall picture is that of a mature corporate function, capable of absorbing some reductions in resources without major reductions in performance.

In recent years there has been a shift in the industry's environmental attention towards product stewardship activities, driven by external pressures through the industry's customers. This new set of concerns has been gaining additional resources, much as traditional environmental management did in the early 1990s. Based on our results for traditional environmental concerns, we anticipate that the management of these new environmental areas will also mature over time, and eventually be expected to achieve greater focus in their use of corporate resources during future corporate restructurings.

These results also suggest some potential areas for future research. Other industries have faced environmental pressures, both from government regulators and from environmental groups, and gone through restructurings. Do these industries show similar (lack of) impact of restructuring on their EHS performance in terms of regulatory compliance? Do other industries face similar pressures in the area of product stewardship, and how have they responded? Do other industries show a similar degree of autonomy for individual production facilities in their responses to regulation? Research answering such questions will be especially valuable in strengthening the link between organizational and management theory and our research results, since different industries facing a different external environment might well respond differently in these areas.

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Table 1
Econometric Analysis of Environmental Performance
(t-statistics in parentheses)

	Dependent Variables					
	Air Violations		Water Violations		Toxic Releases	
Independent Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
OwnerChg	0.024 (0.14)		0.410 (1.08)		-0.021 (-0.11)	
Restruct		-0.605* (-2.96)		-0.509 (-1.20)		-0.398* (-2.01)
Inspect	-.038 (-0.41)	-0.58 (-0.61)	-0.012 (-0.06)	-0.104 (-0.51)		
PulpCap	0.127* (6.68)	0.130* (6.82)	0.036* (1.98)	0.036* (1.97)	0.354* (7.49)	0.356* (7.54)
FirmViols	0.088 (0.58)	0.054 (0.35)	-0.392 (-1.33)	-0.392 (-1.33)		
FirmPaper	–0.006 (-0.04)	-0.057 (-0.41)	-0.165 (-1.13)	-0.158 (-1.06)	0.033 (0.20)	-0.042 (-0.25)
FirmProf	-0.043 (-0.06)	-0.013 (-0.02)	0.974 (0.81)	0.989 (0.82)	0.314 (0.27)	0.209 (0.18)
FirmMills	-0.001 (-0.16)	0.003 (0.60)	0.008 (1.39)	0.008 (1.33)	-0.035* (-4.85)	-0.030* (-3.92)
FirmEmp	-0.083 (-1.40)	-0.109 (-1.80)	-0.038 (-0.55)	-0.038 (-0.56)	0.021 (0.26)	-0.005 (-0.06)
N	4097	4097	3455	3455	4602	4602

*=statistically significant at 5% level

Dependent Variables:
AirViolations and WaterViolations are 0-1 dummies indicating whether the plant was in violation of air or water regulations; ToxicReleases is the log(pounds) of TRI releases reported by the plant. Since TRI is a voluntary program, there are no inspections or violations (hence Inspect and FirmViols are not included in Models 5 and 6). AirViolations and WaterViolations are estimated with two-stage, random-effects models; ToxicReleases is estimated with a one-stage, ordinary regression model.

Independent Variables:
OwnerChg and Restruct are 0-1 dummies indicating a change in the plant's ownership or a corporate restructuring event happening in the past three years. Inspect is the predicted probability of an inspection (air or water) at the plant. PulpCap is log(tons/day) of the plant's pulping capacity. FirmViols is the fraction of the firm's other paper mills in violation of regulations. FirmPaper is a 0-1 dummy indicating the firm owning the plant is primarily in the paper industry. FirmProf is the firm's return on assets. FirmMills is the number of paper mills owned by the firm. FirmEmp is the log(employment) for the firm.

Table 2
Survey sample breakdown

Pulp and paper companies in database		116
Unreachable by phone	15	
Companies contacted by phone		101
Refused to participate	3	
No P&P operations	6	
Surveys mailed		92
Surveys returned		50
No P&P activities	11	
No restructuring	6	
Refused to participate	3	
Completed surveys		30

Table 3

Principal Components Analysis of Types of Restructuring (Question 12)

Type of Restructuring	**Component 1**	**Component 2**	**Component 3**
Downsizing	0.65429		
Reengineering	0.52878		
Mergers with other corporations	0.79825		
Divestitures	0.80309		
Outsourcing		0.76187	
Increased use of temporary or contract workers		0.71347	
Plant closure			0.55465
Acquisition of plants			0.81480

Figure 1:
Restructuring in the U.S. Pulp and Paper Industry, 1990-2000

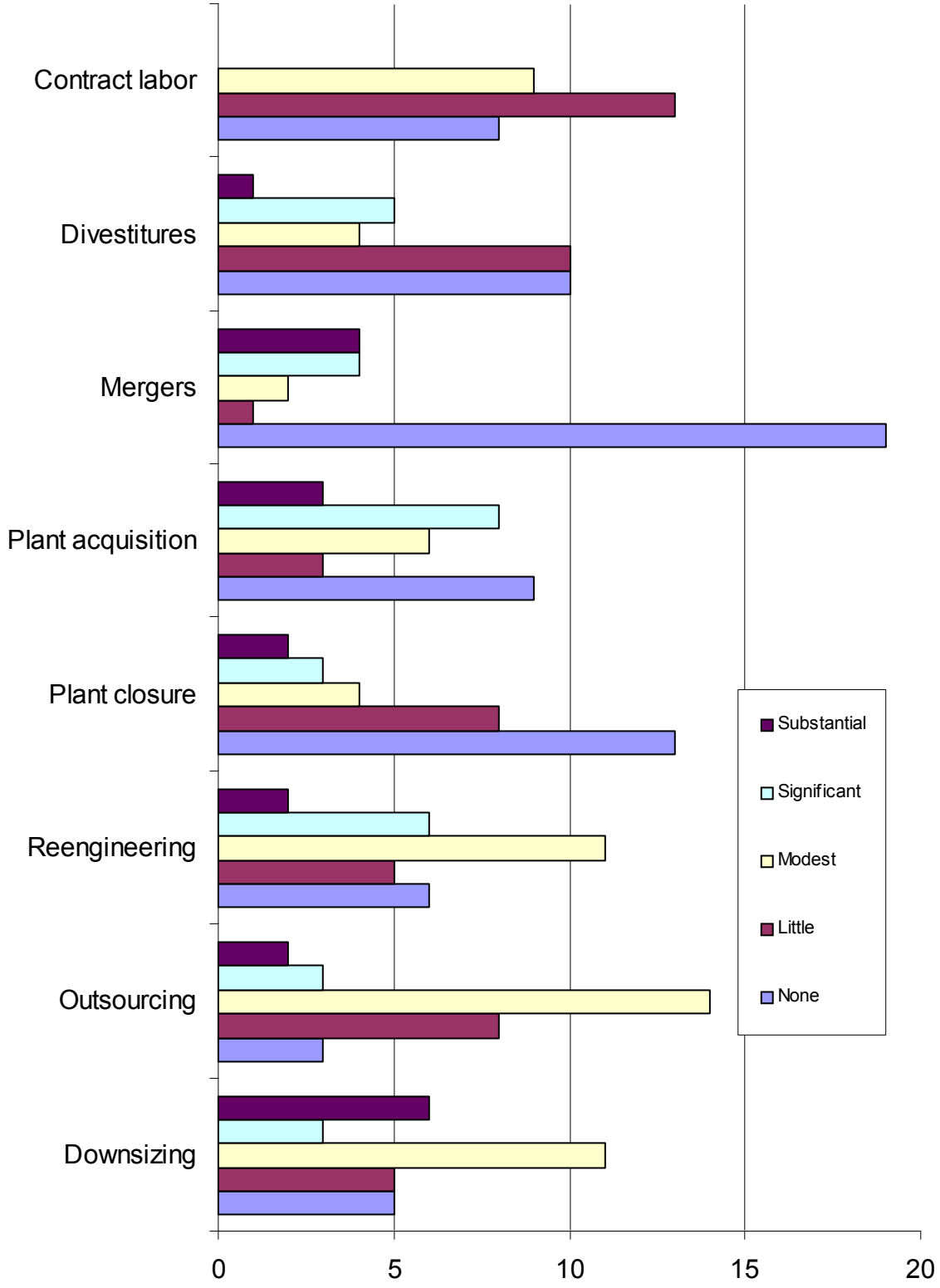


Figure 2:
Types of Restructuring by Firm Size

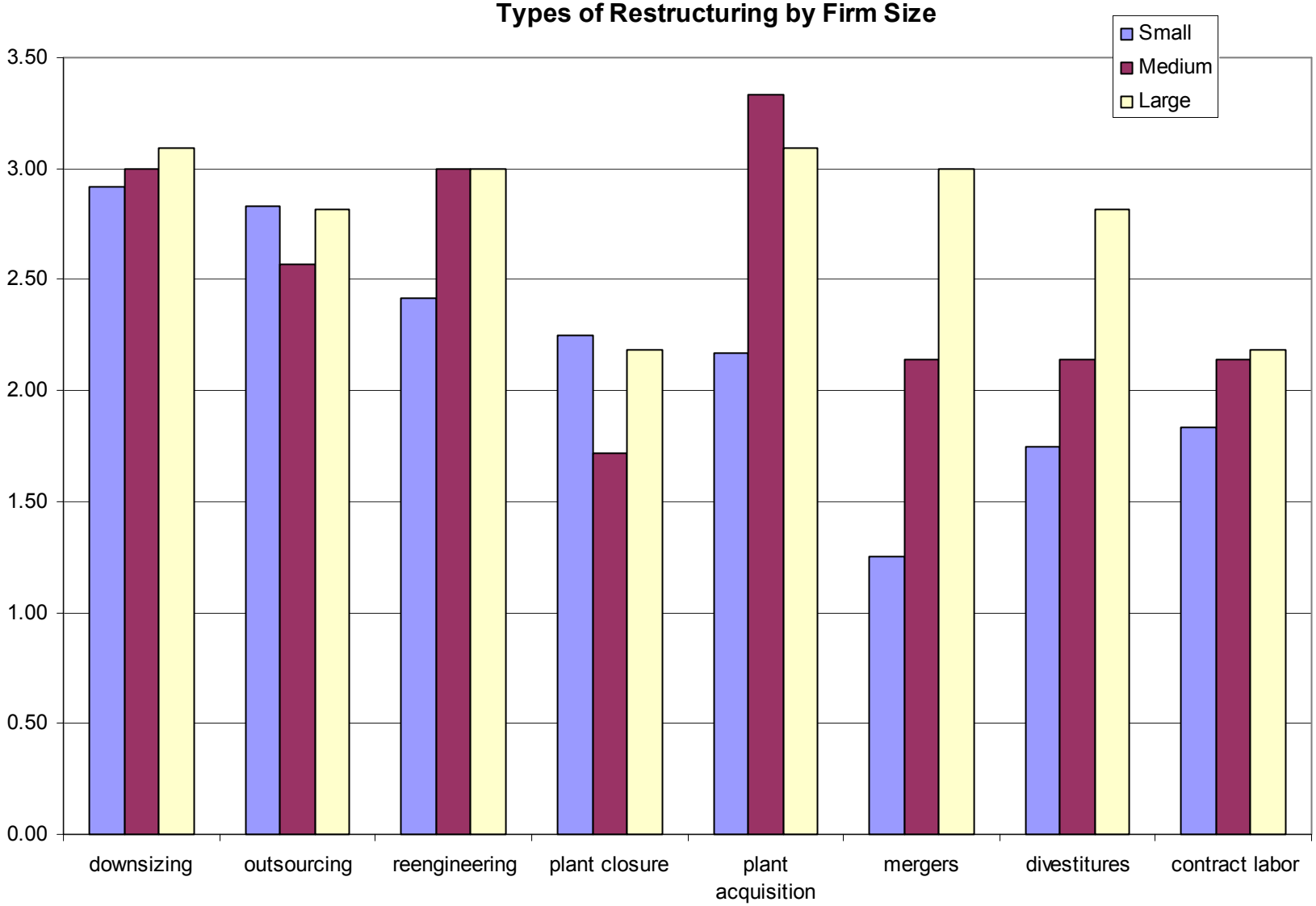


Figure 3:
Driving Forces Behind Restructuring in the U.S. Pulp and Paper Industry, 1990-2000

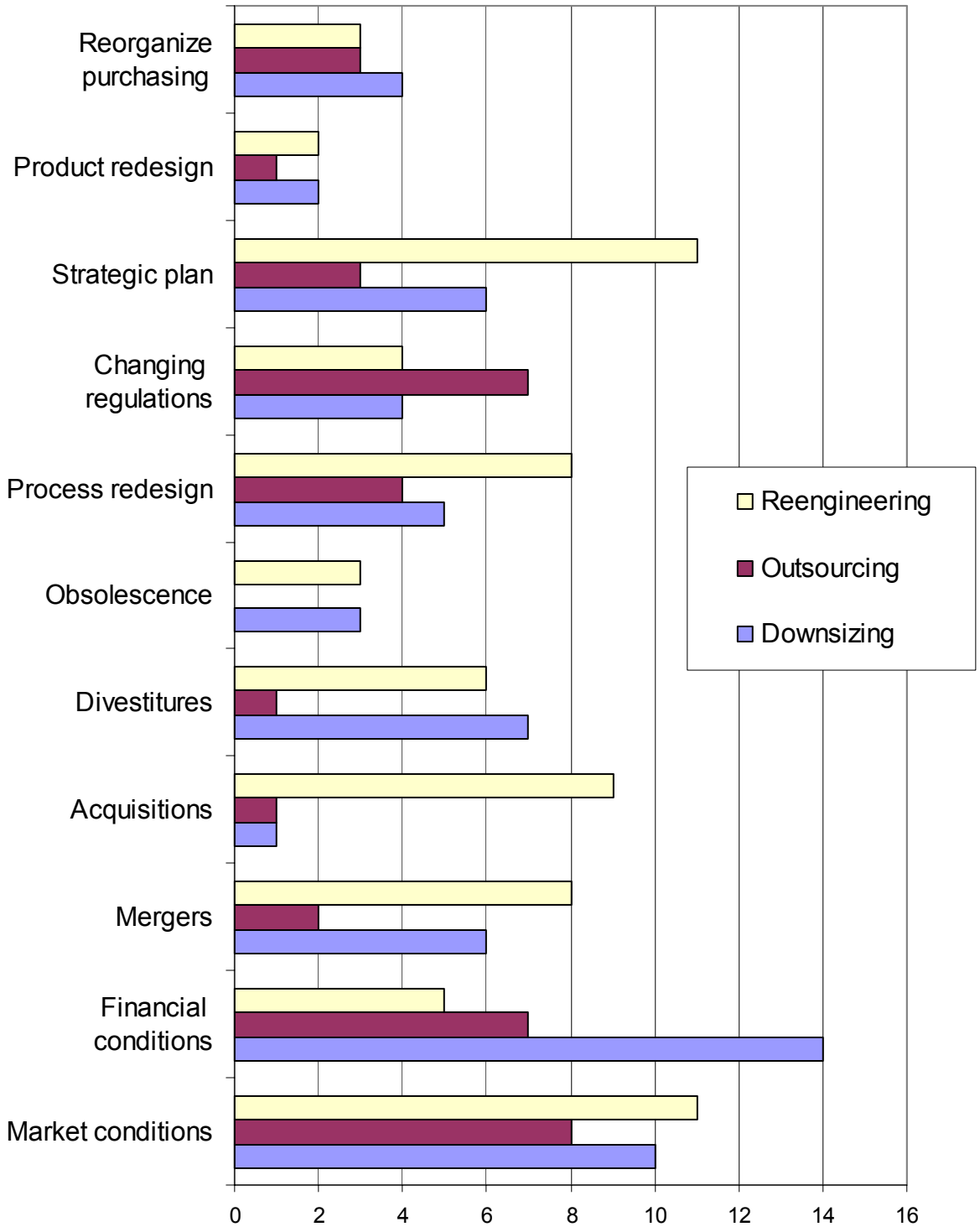


Figure 4:
Goals of Restructuring in the U.S. Pulp and Paper Industry,
1990-2000

Figure 5:
The Impact of Restructuring on EHS Staffing and Activities

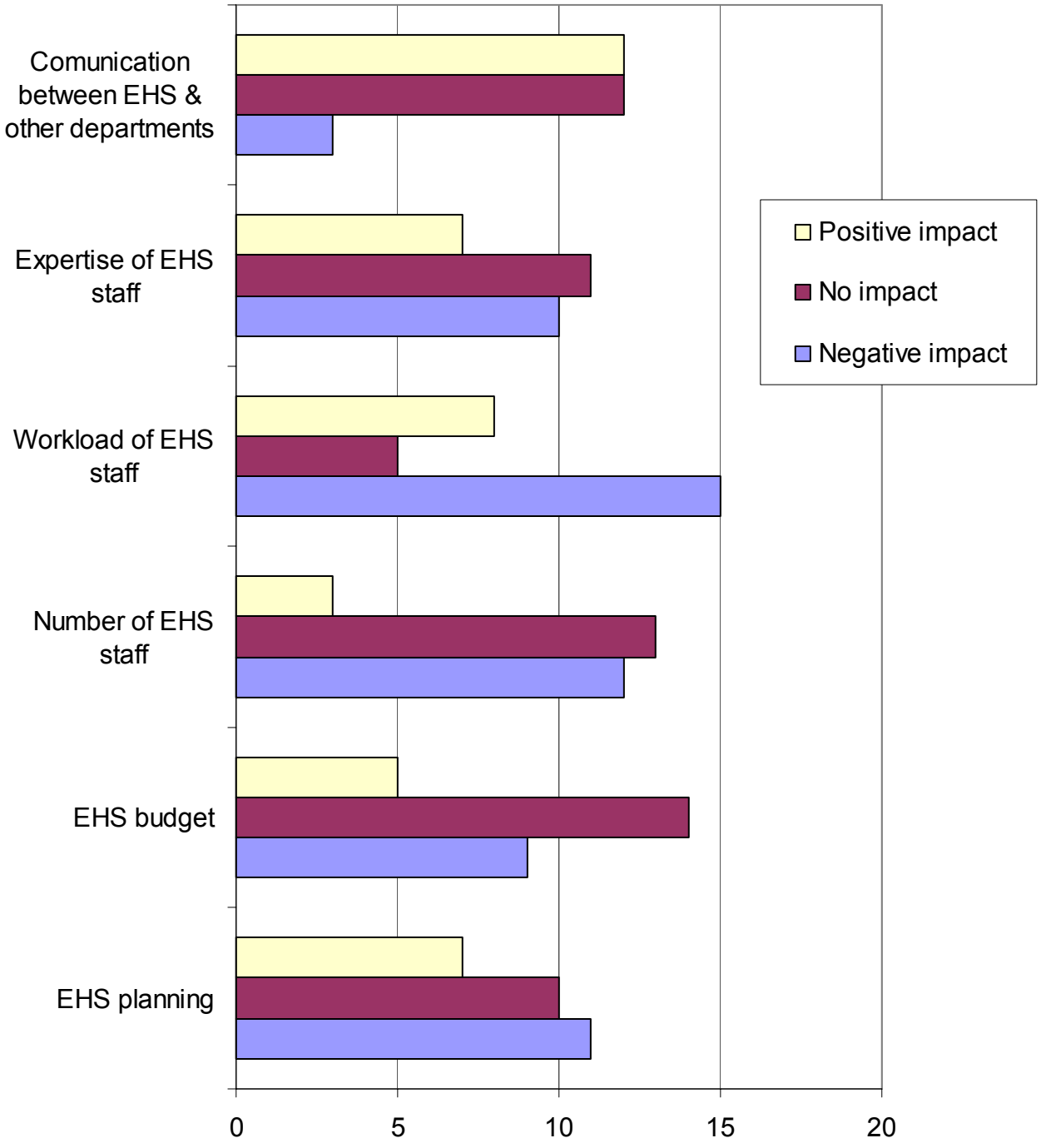


Figure 6:
The Impact of Restructuring on Business Practices Related to EHS

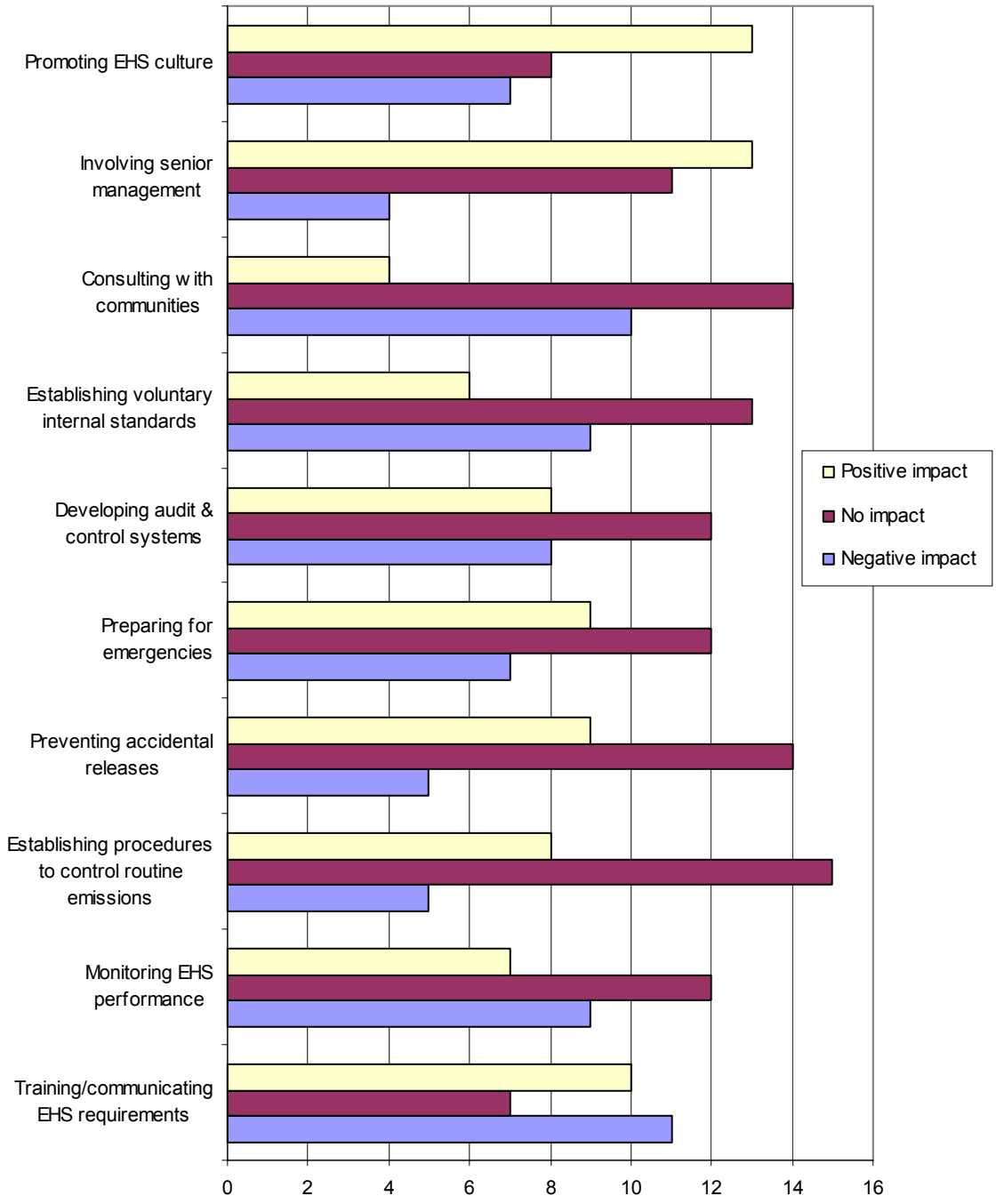
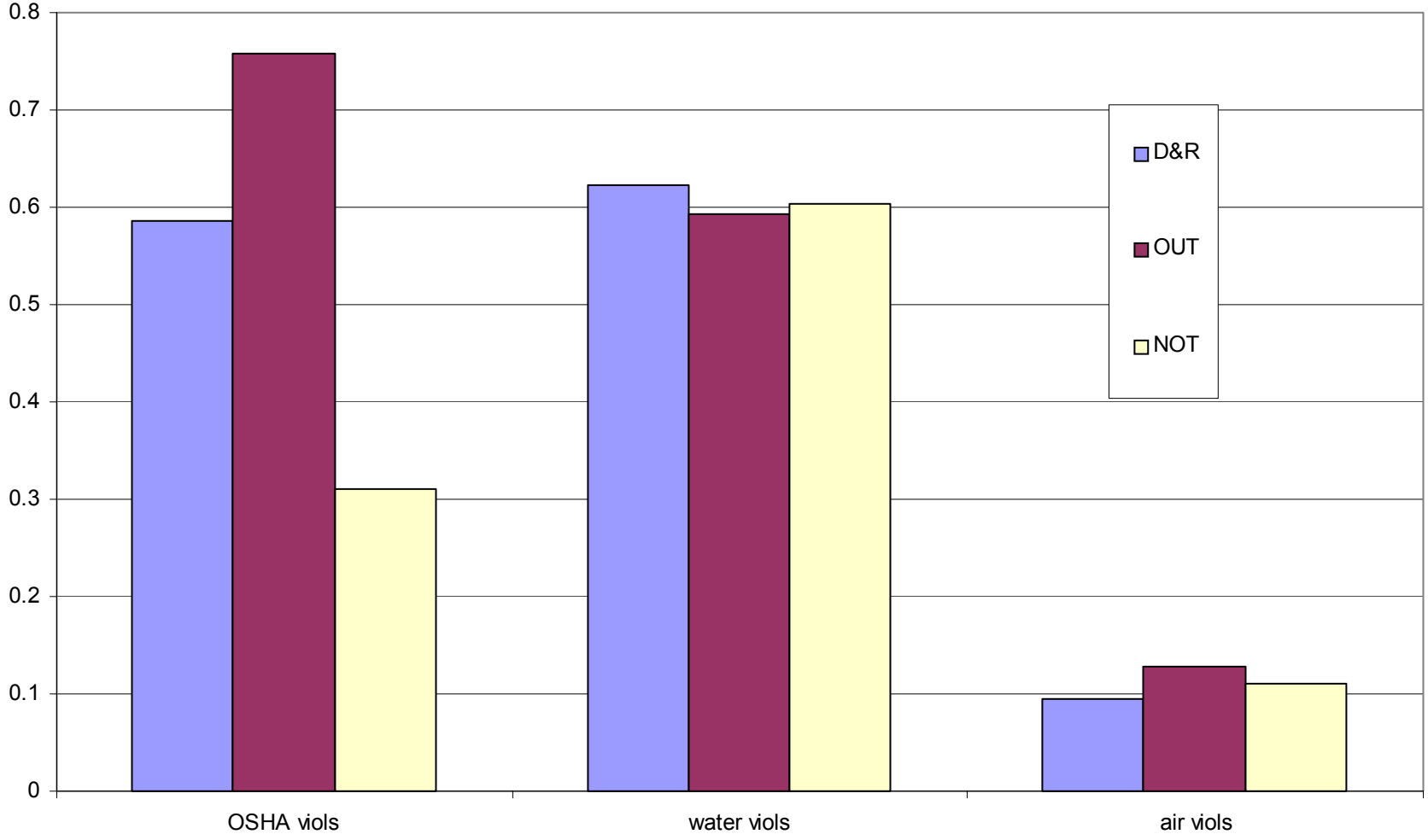


Figure 7:
External Performance Measures
Regulatory Compliance by Restructuring Type



APPENDIX A

Corporate Restructuring and EHS Risk Management Processes
Case Study Overview of Interview Protocol

1. Interviewee - EHS responsibilities, time in position, past positions in company, brief timeline of restructurings at the company (to provide context for later questions).

2. EHS Practices – We're interested in thoroughly understanding the company's EHS management system. To initiate discussion, we will be asking questions about specific hazard scenarios – examples of these are given below. These are illustrations, and will be tailored to the individual being interviewed (in particular, some scenarios may be rephrased in terms of either environmental or health/safety hazards). For each scenario, we will ask about current company practice, then ask about practices from 5-10 years ago, to identify changes and reasons for changes – especially impacts of corporate restructuring, if any.

A. Hazard Management – How are safety problems identified in the company? How do you learn about these safety problems? How are safety problems evaluated at the plant and company level? How are safety problems resolved? How is information regarding safety problems communicated? How are new employees trained about safety?

B. New Government Regulations – Consider the recent EPA Cluster Rules. How does the company first hear of potential new environmental regulations? Do you (or others) get involved in the standard-setting process? How does the company decide what compliance measures are needed? How is information about new regulations communicated within the company?

C. Emergency Procedures – Suppose there is a toxic chemical spill at one of your plants. How would the information be reported to the appropriate regulatory agencies, and to the rest of the company? How would the company follow up on the incident? What plans are in place to deal with such emergencies? Is the community informed about the plans?

D. Routine Regulatory Events – Suppose a plant's water pollution discharge permit comes up for renewal. Who is responsible for working with the regulators to negotiate permit conditions? During the negotiations, what is the relationship between local plant management and corporate staff? Are outside consultants or legal advisors involved?

E. EHS Investments – Suppose a plant's air pollution problems required a substantial investment in pollution abatement equipment. Who initiates the request for the investment? How is it reviewed at the plant and corporate level? Is it coordinated with other investment decisions, or treated separately?

3. Summary - We will try to summarize and generalize the company's EHS current risk management practices and changes over time, based on the information provided in specific scenarios (e.g. the relative responsibilities of plant-level vs. corporate-level staff; the impact of downsizing on responsibilities, the impact of ISO 14000 or EMS). We will invite comments from the interviewee, both about the accuracy of our summary, and its applicability to the management of other EHS risks (e.g. differences in managing workplace safety and air pollution). We will also ask for examples of any major changes in EHS risk management practices not uncovered by the scenarios, especially any changes related to restructuring.

4. Followup - After the series of interviews we will spend some weeks writing up a draft report on our findings, possibly using phone calls to clarify any remaining puzzles, and circulate the draft for comments and suggestions before producing a final report.