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Freedom and Privacy in the Newly Integrated Work Environments

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CFP'93 - Freedom and Privacy in the Newly Integrated Work Environments

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Introduction

When we think of privacy violations in the workplace, we usually picture managers secretly listening to our phone conversations, reading our electronic mail, or, as data entry workers, monitoring our keystrokes. New computer technologies such as desktop video conferencing, "media spaces", and "active badges" are seen as the next ominous step towards letting companies spy on more and more worker activities.

The dangers of video cameras and "ubiquitous computing" that record our every move in the workplace are evocative and very real. But the major demand for routinization and control in the computerized workplace may not stem from the domineering manager watching us through a desktop video camera, but from co- workers "watching" us through a relatively mundane shared information system. The increasingly integrated information systems that schedule our factory activities, and regulate our office workflows, require increasingly detailed information about our work behavior. These integrated systems require sharing data and establishing agreement on many levels - from hardware standards to models of work processes - that make individual experimentation and changes very difficult and costly. As these shared information systems specify in more detail how work should be done, and become more difficult to change because the work activities of so many others are dependent on that information, workplace discretion becomes more difficult. Erosions of freedom and autonomy in the workplace that we value as a social goal, and as a fundamental principle of effective job design (Hackman and Oldham, 1980), may not require an evil manager trying to implement an electronic sweatshop - simply an uncritical pursuit of accepted systems design principles such as increased integration and data sharing.

Groups that are more tightly interconnected through the collection and dissemination of detailed workplace information not only have "views" of what other people and groups are doing, but are also more mutually dependent upon each other in order to get their work done. This mutual dependence can lead to demands from many directions - not just upper management - for work

procedures to become more regimented and disciplined in order to avoid costly disruptions and errors (e.g., Kling and Iacono, 1984). Researchers are now left wondering if individual autonomy is a meaningful goal in an era of tight interconnection and detailed process models, or whether it will have to be sacrificed in favor of other objectives (Klein, 1991). In this paper, I can only briefly review the ideological push towards more elaborate, integrated information systems, and their implications for workplace freedom and privacy in the manufacturing and service sectors. I argue that examining the assumptions built into shared information systems about how work behavior is modelled, and what measures are important, may suggest ways of ensuring that integrated information systems respect workplace freedom and privacy.

The Ideology of Integration

The field of Management Information Systems began with an ideal of a single, organization-wide information system as the model for workplace computing. Though this "total systems" approach very quickly ran into substantial problems (e.g., Dearden, 1966), "a weakened idea of a 'total system' is still visible in the ideal of integration." (Iivari, 1991)

The large-scale computer integration movements of the 70's and 80's, such as office automation (OA) and computer-integrated manufacturing (CIM), still saw a powerful attraction in the one information system, the one shared database, that would link the entire organization. Today, with a surge of activity in networking and open systems, electronic integration is not only valued in by computer technicians, but by management theorists. Talk of the virtual, flexible corporation of the future depends on a shared computer infrastructure. Practically every study of these shared systems agrees that both the amount of complexity and the amount of interdependence (mutual dependence) between workers increases with their use (e.g., Majchrzak, 1988). Zuboff (1988) and others promote the benefits of "visibility" and "transparency" that these shared systems provide. But what is it exactly that we are seeing? And how does mutual dependence on a shared information system that models aspects of what work has been done, and how work should be done, affect workplace freedom and privacy? The world of manufacturing, because of its long experience with tight interdependence and fine-grained work process models, provides some interesting examples.

Integrated Work Environments: Manufacturing

Manufacturing has always put a premium on the standardization and control of work processes, to enable tight, accurate scheduling and coordination of multiple activities. Many manufacturing work environments, however, leave substantial areas of discretion to worker and team activities (Klein, 1989; Klein, 1991). A factory worker might only have to meet a production quota for an entire day, for example, allowing them to decide how to pace their work during the day and in what order to perform work activities. Or they might be allowed to stockpile extra parts in their work area one day to do something else the next.

Recent factory-wide initiatives, often in conjunction with factory-wide computer scheduling systems, are seeking to standardize and schedule activities at a more detailed level to "reduce variance" and "eliminate waste". Tighter specification of work activities not only reduces short-term variation in the processing time and quality of parts, but allows for more accurate standards to be included in the shared computer scheduling system. As more factory activities are

scheduled by the computer system, more of the factory is affected by changes in one work area, and more of the factory is dependent on the stability and relevance of the scheduling and inventory data. This can lead to a situation where workers and groups increasingly demand tighter controls over each other's work to avoid costly disruptions - a situation where the demand for mutual monitoring grows even without a grand managerial plan.

Substantial controversy surrounds the introduction of data gathering and sharing tools such as Statistical Process Control (SPC) and Just In Time (JIT) scheduling, as much for the organizational changes which accompany these techniques as the techniques themselves. SPC is a set of statistical tools for analyzing process quality. To meaningfully analyze the numerical quality data, the process must be (at least temporarily) "frozen", or standardized at a very detailed level. The time and performance data obtained from the standardized work process can then be used to schedule factory activities. JIT models the flow of inventory around the factory in such a way as to minimize the amount of partially assembled inventory waiting between manufacturing operations. As we saw above, workers can produce excess inventory as a "buffer" between work areas, allowing them to pace and schedule some of their own work activities. JIT seeks to eliminate this partially assembled inventory, which can become quite costly and hide quality problems. JIT techniques have been used to essentially reduce the production quota period from days or half days to hours or minutes.

These modelling and specification techniques do not necessarily imply that work organization will become increasingly rigid and standardized overall. Many advocates provide examples of how these tools allow factory workers to monitor and improve their own work processes without the help of outside analysts, and argue that only highly educated and highly skilled workers can use these techniques effectively (Schonberger, 1986). For some labor activists, however, these data collection and process modelling techniques are merely attempts to extend managerial control and monitor work more closely. People who think of manufacturing as a highly structured, regimented activity would "probably be surprised at how poor a visibility management has..." (Hobson, 1992, p. 44), a theme echoed in Juravich (1985) and Burawoy (1979). These techniques, in their view, provide managers with the visibility they have always strived for to monitor, schedule, and control factory activities at a level of detail previously unheard of.

Klein (1989, 1991) has documented how these more integrated factory environments can affect workplace freedom and autonomy, regardless of managerial intent to empower or control workers. To improve factory scheduling and "eliminate waste", factory workers and teams in these environments agree to conform to the fine-grained standards for producing and transporting parts established by SPC and JIT techniques. Klein notes that, for some workers and teams, this amounts to a reduction in freedom for deciding daily work pacing and activity scheduling. This individualistic autonomy is replaced by what she refers to as a "collective autonomy" to agree on shared work process standards. In theory, workers and teams should now have the discretion of deciding how the standards are created, rather than in how the work is actually done - autonomy in task design, as opposed to task execution. But in practice, she notes, the barriers to "collective autonomy" are considerable. Once the work standards and inventory flows promoted by SPC and JIT are "locked in", many other factory activities would be affected by changes in one area's standards. The "barriers to experimentation" and change of work activities were high in the

factories Klein studied because any variation from the process standards, even temporarily, would be so disruptive. Managers encouraged suggestions for improvements to the standards, of course, but to actually be implemented they had to go through a complex and time-consuming verification procedure.

What do these shifts in workplace freedom in integrated manufacturing environments have to do with computer systems? A large part of the early dream of computer-integrated manufacturing (CIM) was to standardize work processes and inventory flows in such detail that the "factory of the future" could be completely automated and remove all direct human labor. This dream has not been realized, and the ambitions of CIM now include skilled human labor in their factory-wide computerization plans (Melnyk and Narasimhan, 1992). But the factory scheduling and inventory management systems that are in common use today can make use of these work process and inventory standards to increase control over factory activities, and reduce the total amount of time and cost to produce parts. The models of fixed work processes and up-to- the-minute inventory flows for individuals and groups are then used to generate schedules for the entire factory. The clearest case of mutual dependence on a shared manufacturing information system is found in Kling and Iacono (1984), where dependence on unambiguous inventory data led to pressure from the entire factory, not just upper management, on the stockroom staff to tighten workplace "discipline".

Integrated Work Environments: Workflow and Office Automation

How is this discussion of autonomy and interconnection in factories relevant for networking and integration in white-collar settings? The limited research on integrated information systems suggests that the increased complexity and mutual dependency brought by sharing data and work process assumptions at this level can affect worker autonomy and freedom in a similar way. Workers and groups must reconcile their differing demands for data security, functionality, response time, and costs they can afford (Kraemer and King, 1979). Integration at this level can make users afraid of even the smallest errors, such as a misplaced decimal point, which might have tremendous repercussions for all users (Henderson, 1991). And the ability to participate in, and experiment with, new local systems design can be impaired if many other parties are dependent on the existing system (Allen, 1992).

The dream of detailed process modelling and data sharing in the office that began with the Office Automation movement is being revived by the availability of cheap and reliable networking. Excitement in the research and commercial world is building for "groupware" applications of all kinds, but especially for "workflow automation" systems that seek to model work processes and inventory flows (in this case, document flows) at a comparably detailed level to the factory. Evidence on the use of groupware, and its effects on workplace freedom and privacy, is still scarce, but the early reports are not encouraging. The talk in the business and information systems press concentrates on increased efficiency and labor reduction (e.g., Kirkpatrick, 1992). One particularly paranoid, yet approving, description of a "killer groupware" application used at Cypress Semiconductor that automatically shuts down all computer systems if certain computer-measured daily or weekly performance measures are not met says, "employee activities are monitored so closely, performance is measured in such detail, and data is shared so widely that the electronic wall, which at most companies isolates desktops, is practically transparent."

(Govoni, 1992). There is enough evidence out there to warrant a careful look at computer integration and and its implications for workplace freedom and privacy.

Freedom, Privacy, and Integrated Work Environments

I have tried to argue that workplace freedom and privacy in the new computer integrated work environments is not only a matter of protecting against intrusions on our personal lives while we are at work, but of protecting against excessive and needlessly rigid controls over the way we do our work. Is data sharing and process modelling - the use of increasingly integrated systems - something to crusade against?

Not necessarily. Comparing the virtues of personal privacy and publicly available information isn't helpful in these work environments, because companies will usually be seen as having a legitimate interest in collecting and sharing any workplace information. Under some circumstances, users have found computerization to be helpful and satisfying even if work is more regimented or controlled along certain dimensions (e.g., Bjorn-Andersen et al, 1986). And treating all integrated information systems as fundamentally the same is much too vague to be useful. In addition to examining the organizational situation in which particular systems are used more carefully, we need to focus our attention on how the particular measures and models - the representations - included in a shared information system affect questions of workplace autonomy and freedom.

Whenever we try to represent some thing, or some activity, in an information system, we have many choices, even for something as straightforward as a name and address (Kent, 1978). Many of these choices - such as whether a "Jr." and "Sr." can be two different people, or whether a street address must include a number - are arbitrary, or artifacts of technical choices. When there are individuals or groups who have different interests in how an object or process is represented, representations become as much an issue of fairness as accuracy (Gerson and Star, 1986). Argyris (1987) describes the "fundamental contradiction" between the dynamic, context-specific information needed to support actual work activities, and the more stable, abstract data needs of a person monitoring performance from a distance. He argues that as companies try to tighten control by making activity-support information and performance monitoring information the same, the inherently different needs of the two activities will make the representation of work performance more unfair, and the representation of activity less useful. We have many different choices of how we make the organization "visible", or "transparent". The models of the factory scheduling systems described earlier assume that work on a particular piece should take a fixed amount of time, every time, without considering variations for taking breaks, performing other work tasks, or even time to think about how to improve work processes. It is these kinds of assumptions in our integrated information systems that we must identify and hold up to scrutiny, because the tendency towards mutual dependence may tightly fix our work activities to these assumptions as never before.

Research on these integrated work environments is still very much an open issue. At this conference, I hope to make contact with a number of you who are beginning to accumulate some experience with these technologies. Let's work together and help make the real opportunities and dangers of these systems clear, before they are as entrenched as file cabinets and MS-DOS.

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