

MIT Open Access Articles

The illusion of accountability: Information management and organizational culture

The MIT Faculty has made this article openly available. **Please share** how this access benefits you. Your story matters.

Citation: Silbey, Susan S. and Tanu Agrawal. "The illusion of accountability: Information management and organizational culture." *Droite et Societe* (2011) 77.

As Published: http://www.cairn.info/resume.php?ID_ARTICLE=DRS_077_0069

Publisher: World Scientific

Persistent URL: <http://hdl.handle.net/1721.1/71696>

Version: Author's final manuscript: final author's manuscript post peer review, without publisher's formatting or copy editing

Terms of use: Creative Commons Attribution-Noncommercial-Share Alike 3.0



The Illusion of Accountability: Information Management and Organizational Culture

Susan S. Silbey
Tanu Agrawal

Massachusetts Institute of Technology

Droit et Societe 77/2011 p. 69-86

Whether we call it the regulatory state, the risk society, or the audit culture, we live in a world in which hazards are produced as often by complex organizations as by persons of flesh and blood, and where the scale of damage is often proportional to the size of the organizational actor. Rather than a phenomenal entity, however, these complex organizations are constituted through the interactions of long chains of loosely rather than tightly coupled action. Because these organizations pose such substantial risks to the health and welfare of employees and the public and to the larger national and global economy, they are highly regulated by state law as well as by organizational protocols and artifacts. How do laws and regulations govern the activities of these large, decentralized, and often geographically dispersed organizations? Under conditions of loose coupling in complex systems, how does the organization (a) coordinate action and (b) know what it is doing so that accountability, and conformity, to law are achieved?

Although these organizations are usually depicted in terms of hierarchical or networked lines of authority and delegation, sociologists have long observed the myriad unscripted, interstitial practices that produce unintended organizational outcomes. The techniques of late modern organizations developed through long practice over time and in response to experience and unintended consequences, as well as the observations and advice of professional observers, including sociologists. Rather than relying on interpersonal trust, direct observation, or bureaucratic review, large-scale complex organizations rely on diverse techniques of surveillance, review and revision to achieve organizational goals and fidelity to legal rules. These new techniques of surveillance engender their own, new types of interstitial practices.

This paper describes an example of the most common forms of internal organizational accommodation to legal rules: a management system. Specifically, the paper describes the collaborative creation of a database as part of a surveillance technology for managing environmental, health and safety hazards in university research laboratories. The database was created to comply with environmental regulations by making visible the presence and handling of hazardous materials. Based on two years of observation of the design and implementation of the database, to be the repository of information and intelligence for a comprehensive management system, we show how the desire for information and the fear of misuse of information produces a database that fails to record information essential to apprehending and correcting environmental hazards and accidents. In this observation, we confirm research that describes the inadequacies of databases; we demonstrate how conflicts of interest, hierarchical relationships, and fear of law become materially embedded in the electronic artifact. The research also confirms a long tradition of research documented how the implementation of regulations within organizations often produce modifications prompted by the regulations but also unexpected and non-compliant outcomes.

The Illusion of Accountability: Information Management and Organizational Culture

Susan S. Silbey
Tanu Agrawal

Massachusetts Institute of Technology

Introduction

The transformation of the modern workplace is a story long in the making. The techniques and strategies of management have shifted in parallel with the scope and scale of work. As 17th and 18th century workers toiled in the studios of master craftsmen, directly supervised by a personal overseer, 19th and 20th century employees moved from first small firms and then giant factories, where managers supervised in the interest of usually dispersed and invisible stockholders. While the 21st century employee also works in a corporation of yet vaster scale, inter-collated in a network of financially concentrated ownership, the work place itself - the organization of tasks and responsibilities - barely resembles its historic forebears. In the earlier times, employers could exercise personal control over all aspects of production, large scale industrial organization divided labor within carefully demarcated spheres, substituting bureaucratic control for direct supervision. The 21st century workplace, however, looks less like a Weberian bureaucracy than a set of dispersed clusters, teams of workers formed for particular projects, and reformed as new problems or opportunities arise. Problem-focused, context-driven and multi-disciplinary, new forms of workplace organization is coordinated in teams rather than silos, networks rather than hierarchies, dispersed rather than concentrated space, if not time (Gibbons, Limoges, Nowotny, Schwartzman, Scott and Trow 1994). If the organizational map has been transformed from a pyramid to a network, coordinated as much by silicon transits than co-present interpersonal transactions, conventional firms remain wedded to the idea of ultimate authority located in a personal head.

If the organizational phenomena are elusive, constituted through the interactions of long chains of loosely rather than tightly coupled action, where the links are flexible and ever changing, the consequences are nonetheless material and the scale of production – and of hazards - is often proportional to the vast scale of these virtual actors. Because these organizations pose such substantial risks to the health and welfare of employees as well as the public and to the larger national and global economy, they are highly regulated by state law as well as by organizational protocols and artifacts.ⁱ Although these organizations are usually depicted in terms of networked or hierarchicalⁱⁱ lines of authority and delegation, sociologists have long observed the myriad unscripted, interstitial practices that produce unintended organizational outcomes. Rather than relying on historically more prevalent forms of social control enacted through interpersonal trust, direct observation, or bureaucratic review, contemporary large-scale complex organizations rely on a diverse array of techniques of surveillance, review and revision to achieve organizational goals and fidelity to legal rules. This paper asks how laws and regulations succeed or fail to govern the activities of these large, decentralized, and often geographically dispersed organizations? Under conditions of loose coupling in complex systems, how does the organization (a) coordinate action and (b) know what it is doing so that accountability, and conformity, to law are achieved?

Specifically, we describe the creation of an information system and database for managing environmental, health and safety hazards in research laboratories, a particular

kind of workplace. Environmental health and safety (EHS) systems have become ubiquitous in large organizations, and especially so in high tech firms and laboratories, to help insure compliance with legal regulations and ostensibly to support continuous improvement and sustainability – to allow an organization to coordinate action and know what it is doing. We begin with the setting, laboratory workplaces, to show the coordination and knowledge problems embedded in complex work places. Section II introduces the notion of a management system and environmental management systems in particular, including a brief description of our research methods. Section III offers our observations concerning the design of the management system we studied and section IV our interpretations. Specifically, we show that organizational actors desiring information to comply with legal rules. However, the desire for information and the fear of misuse of information produced a cycle of contradictory impulses that ends up producing a database that fails to record information essential to apprehending and correcting environmental hazards and accidents, and thus fails to produce the informational feedback essential to create a self-correcting system. The research illustrates how the implementation of regulations within organizations often produce modifications prompted by those regulations but also unexpected and non-compliant outcomes.

1. The Laboratory Workplace

Laboratories are places of discovery; they are also places of danger (Huisin 2010).

Ultimately, laboratories are dangerous places because the consequences of scientific inventions are insufficiently understood and often misused. These long-term risks may be the most the significant scientific menace but they are not my subject in this paper.

Laboratories are immediately hazardous places because routine laboratory procedures employ substances and technologies that are in themselves threats to life of workers in the lab and elsewhere, as well as threats to the environment, substances such as biological agents and toxins, flammable and noxious chemicals, radioisotopes and technologies such as lasers, giant magnets, and high energy pulses.

There is, however, another kind of persistent laboratory hazard that derives not simply from the materials and machines with which scientists work, or the amalgams and technologies they make whose properties are not entirely understood.

This danger is embedded in the distributed labor that supports and enacts the work of the laboratory, work that is spread across several dozen persons, coordinated through invisible links that constitute the research university as a professional bureaucracy, a formal hierarchy not unlike thousands of other large, complex organizations.

Take the Jones lab, for instance. This lab occupies slightly more than 2000 square feet of space on the third floor of a biology building built with state of the art facilities 15 years ago. During the summer of 2006, there were two undergraduate students, supervised by two of the five graduate students; the five graduate students were in theory supervised by five post-doctoral fellows but often worked independently. A lab manager allocates lab benches and desks, work assignments; he also coordinates ordering and distribution of supplies, and general organization of the lab, and also oversees a technician who provides assistance for various procedures. Each students' and post-docs'

research project is developed in collaboration with or as specified by Professor Jones, the principal investigator. PI (for principal investigator) is the term used by funding agencies and thus by universities to refer to the scientist who designs the research, secures the funding and assumes responsibility, that is liability as well as authorship and reward, for what takes place within the laboratory. So, within the lab we have 12 persons working under one professor, who is also supervising an administrative, secretarial assistant who manages the correspondence, budgets, grant and publication preparations.

One of 50 faculty members in his department, Professor Jones's laboratory, research and teaching, falls under the authority of his department Head. The department Head is supervised by the Dean who reports to the Provost and the President, who are all, ostensibly responsible to the Board of Trustees.

What is visualized on an organization diagram of distributed and coordinated labor is not, however, what is necessarily salient in the routines of the laboratory.

The lab is a circumscribed world whose boundaries are relatively rigid. Members do not experience themselves as links in a chain or network. Professor Jones is the sole point of entry and exit; no one works in this lab that he has not chosen. Students, post-docs, technicians and lab managers may quit but they cannot move up - either through promotion or graduation without his approval. All material support, including salaries (with the exception of students on fellowships), experimental supplies, equipment, space exists because it has been allocated by the university, and funding agencies, specifically to Professor Jones for his use. Thus the laboratory - as a social organization and as a physical space, - is synonymous with Professor Jones. Indeed, the identification between the scientists and the physical space of scientific research is often acknowledged and expressed in the language that labels the persons and spaces with the scientist's name, e.g. the Jones lab. One researcher was heard to express this identification as follows, "some nights I just come out here stand before the lab to look at it. It is an awesome experience, the laboratory is great, and I am the laboratory."

When queried, most of the members of the lab, from students through post-docs to lab manager, know little about the rest of the university, or even the rest of the biology department. Certainly, they cannot provide a picture of their location in the hierarchies that can be schematically represented on an organization chart. The links between Jones and the department head, the Dean, Provost, President and Board of Trustees, are not merely indecipherable or opaque but for most of the lab members, completely unknown and invisible.

Thus, while Jones is the critical node connecting the work in the laboratory to the legal responsibility that resides in the President and Board of Trustees, it is ironic and perplexing for those concerned about managing the hazards in laboratories and securing compliance with legal regulations as well as safe and scientifically productive labs that Professor Jones is never seen in the lab, and certainly has not worked at a lab bench for more than 20 years, despite his prolific scientific accomplishments. Like many executive officers, Professor Jones knows as much or as little about what goes on in the laboratory as his subordinates have told him. This information ranges from matters central to the scientific work for which he is known and responsible to the personal experiences of the workers on whose labor he depends. This is a weak link in a loosely coupled organization, in which Professor Jones is at least four steps below the ultimate authorities at the top of this organization.

Thus, if Professor Jones knows only what his subordinates report to him of their activities, what do the higher level administrators, the Deans, Provost, or University President, no less the Chairman of the Board, know about the activities in Jones' laboratory, the experimental practices that constitute the physical danger of scientific research? In this extended and loosely coupled hierarchy, how does the University, or any organization, know what it is doing? How can it govern itself and manage its own responsibility? What can accountability possibly mean?

II. A management system.

Calls for transparency and accountability that have become common parlance in recent years respond directly to instances of corporate misconduct, ungovernable entrepreneurs, as well as financial and scientific innovation. We might regard these events -- Enron, Global Capital, Tyco, the global financial implosion of 2008 -- as the canaries in the coal mine, signs of something much more fundamental. Although the increased attention to corporate governance and organizational accountability response to particular events, they may also express a more profound and widespread, if often unarticulated, recognition of the consequences of complex socio technological systems, living with and in systems of social action. Giddens (1991a,b) suggested that modernity was characterized by a shift from trust in person to trust in systems. We are suggesting that the energy behind calls for managerial accountability signals a weakening of confidence in systems, or perhaps more accurately an effort to rebuild our trust.

Recently, "management systems", consisting of distributed roles, standardized rules, and prescribed procedures, linked through information technology, have been promoted as a preferred means of containing myriad risks (e.g. financial, environmental, safety) and assuring regulatory compliance. Designed to make organizational functions and performances immediately transparent to managers as well as internal and external auditors, management systems purportedly enable responsible risk management at the ground level of action at arm's length from cadres of specialists and risk professionals. These management systems attempt to collect, standardize, and codify organizational and technical knowledge so that what had previously been the domain of experts -- professionally trained and situationally developed know-how -- can be distributed and made available throughout the organization. Thus, if management systems more easily circulate information, they also decentralize responsibility, transferring authority and decision-making away from the sources of specialized, possibly expert knowledge or experience. Inscripting the roles, rules, and routines in web tools and databases, management systems challenge while modifying the relevance of specialized expertise. At the same time, management systems make low-level actors responsible for organizational outcomes (Silbey 2009; Shamir* [Shamir 2008?]).

Environmental management systems are a prominent example of contemporary management systems. Promoted globally by the International Organization for Standardization under ISO 14001 and in the United States by the Environmental Protection Agency, these tools have become a ubiquitous means for managing organizational compliance (Kagan, Gunningham, and Thornton, 2003). Not only do environmental management systems distribute compliance responsibility, they also locate the design, standard setting, and implementation of regulation within the regulated organization itself (Coglianese and Nash 2001), creating a form of private management in

the public interest, or what students of governmentality call regulation at a distance (Foucault 1995).

These EHS systems are simply one *flavor or style* of management system that now pervades most large scale and many moderate size organizations such as those being installed in hospitals for medical records, organizations for personnel records, or publicly held corporations for compliance with financial reporting laws. The key word here is *system* with the distinctive features it marks. Thus far, we have referred organizations in terms of networked or hierarchical divisions of specialized labor, traditionally represented through nodes, boxes and lines on a flat plane. When one talks about a system, however, the term is used to highlight the liveliness and four dimensions in time and space of what is flat, rigid, and inanimate in the visualized organization chart. The language and concept of system puts the emphasis specifically on the transactional and informational constitution of the whole and has come to be used in efforts to describe continuity and change as well as vulnerability or stability in an organization or process over time.

The notion of system also draws critical attention to the role of informational conduits and feedback loops in the constitution and control of organized action over time. In effect, a management system is a means of routinely observing, recording, and self-reflexively responding to the organization as it performs its work. Management systems are, in this sense, control systems in which some proportion of the output signal of a system - or information - is passed or fed back into the input or decision making mechanism to control the dynamic behavior of parts of the system or the whole organization.

Although accounts of management systems (Hoffman 1997) claim that coordinated components – training, manuals, checklists, scripted procedures, digitized data bases, software and user interfaces– provide administrators possessing only general managerial skill with the resources and competencies necessary to work at arm's length from risk professionals, our empirical observations revealed a gap between a system's prescribed processes and enacted practice (Huising and Silbey 2011). While this should not be surprising to students of organizations generally (Orr 1996, Brown and Duguid 1991) or regulation specifically (Thomas and Hawkins 1984, Kagan and Axelrod 2000), the failure of the information system, in particular, was a surprise we had not anticipated. Although observers often remark on the frustrations of users unable to adapt supposedly agile systems to local needs and purposes, this system was being designed in collaboration with the ultimate users, purposively to overcome common deficiencies. Nonetheless, despite this participatory design process, the information system ended up being unhelpful to a diverse array of users.

Over the course of two years, we observed a group of academics, staff and information system professionals collaboratively designing the information database component of an EHS management system at Welldon University. We worked among the designers on a daily basis, interviewing them individually and observing their meetings and discussions. We also attended all meetings at which the system was being presented to the wider community of future users and high level administrators in the university. We took copious detailed field notes to describe the work of the designers and recorded the one on one interviews.

The information system was being designed to support a new distribution of roles and responsibilities for greater accountability up and down the hierarchy of the

university. The database system was a key instrument - the tool - for four main tasks: to allow the organization to observe itself, recognize gaps in its performance, improve organizations capacity for support of research, create greater accountability and responsibility for individual actors, and help Welldon as whole to become not only more compliant with environmental, health and safety regulations but to become a safer place.

It was an enterprise wide system that would capture information on various laboratory activities, especially those regulated by Occupational Safety and Health Administration (OSHA), the Environmental Protection Agency (EPA), as well as other agencies such as the Nuclear Regulatory Commission (NRC) and local health and safety boards. The information system supporting the management system would have four primary modules or subsystems: (1) a module to record information on inventory – what chemicals and other hazardous materials had been ordered; (2) a module on training – who was required to be specially trained to work with materials in the labs, who had taken required training and who had been required but had not completed training;ⁱⁱⁱ (3) a module to capture information on any accidents, injuries or spills; and finally (4) there would be a module on inspections – whether labs were in fact complying with legal and institutional regulations.

In the remaining sections of this paper, we will try provide several examples of how pieces of the data base were being designed and what it produced. In this short space, we can provide only a sketch. Then, we will use this data to suggest that the fundamental ambition of management systems may be a Sisyphean effort. Rather than a mechanical tracking tool, apparently tracking action by recording information, management systems are being used to make transparent what is actually invisible - *the threads of sociality that constitute human organization* as well as the inescapable but unintended consequences of social action. This effort has its own unintended consequences.

III. Debating Data Fields

Data and dates. Because the information system is experienced through interactive screens, we should illustrate the information problems with the images as they appeared on the screen. Consider Image 1. This was a form that Welldon was creating to capture results of semi-annual inspections, inspections undertaken as part of the effort to improve environmental, health and safety practices in the laboratories. A team of university EHS personnel would visit the lab, review its conditions and report its findings using the appropriate screens for inputting the data. The form would note if something in the lab was out of compliance, not as it should be. This was the cover sheet of a more detailed inspection form that appeared on subsequent screens. Data entry cells would record first, the name of the inspector, the name of the department being inspected, the specific laboratory name as well as the principal investigator's name and the team members on this inspection. This is all entirely standard and non-controversial, although it is worth mentioning that the laboratory was identified not as a set of rooms but by the principal

Inspection form at Welldon - 1

inspections Today's date: 4/15/05

Name: Celia Doe [Hi](#)

Review and Edit Inspection Information

[Return](#)
[Submit with no Finding](#)
[Save and Continue](#)

To create a new inspection, verify or edit information below and save and continue to the next screen.

| | | | |
|------------------------------------|--|---|--|
| Department | Biology | Inspection Team | <input checked="" type="checkbox"/> Celia Doe <input checked="" type="checkbox"/> Angela Smith <input checked="" type="checkbox"/> Karen Hausman <input checked="" type="checkbox"/> Charles Lee Add new team member: <input type="text"/> |
| Lab | Jane Lab | | |
| Principal Investigator | Mary Jane | | |
| Inspection Date | 4/15/05 | | |
| Inspection Round | 2005 - Round 1 | | |
| Required Email Recipients | Celia Doe, Coordinator | Follow up by Inspection Team Required? | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Additional Email Recipients | <input checked="" type="checkbox"/> Mary Jane, PI <input checked="" type="checkbox"/> Minam Trout, EHS Rep Add new recipient: <input type="text"/> | Overall Inspection Findings | <input type="text" value="None"/> |

investigator's name, as we discussed above. The form also asked for the email addresses of those to whom the information must be sent, as well as additional persons to whom it might be sent. It also included a box to add new names to the form. It was expected that when an inspection was initiated in each round, this screen would come up with the basic identification information in the data boxes already filled.

Three data boxes became a source of continuing negotiation in group meetings among the designers and users: the date box, whether a follow up inspection was required, and overall findings. During the design process, the box for the date of the inspection was eliminated. This may seem like a small change but omitting the date would take away the heart of the matter, both the matter of risk and the matter of law. Without dates, Welldon staff would not know how long a lab has been, let us say, exposed to radiation – 1 day, 1 week or six months? Without the date, regulators would have no evidence for the duration of the violation, thus having difficulty imposing the possible \$25,000/day fines for non-compliance. Importantly, the omission of the data field for the date wasn't something that was accidentally omitted. This was a well

thought out decision that the system designers deliberated about for months and finally decided to eliminate the date field.

Inspection form at Welldon - 2

inspections today's date: 11/11/05

Name: Celia Doe

Review and Edit Inspection Information

To create a new inspection, verify or edit information below and save and continue to the next screen.

| | | | |
|-----------------------------|---|--|--|
| Department | Biology | Inspection Team | <input checked="" type="checkbox"/> Celia Doe <input checked="" type="checkbox"/> Angela Smith <input checked="" type="checkbox"/> Karen Hausman <input checked="" type="checkbox"/> Charles Lee Add new team member: <input type="text"/> <input type="button" value="PI"/> |
| Lab | Jane Lab | | |
| Principal Investigator | Mary Jane | | |
| Inspection Round | 2005 - Round 1 | | |
| Required Email Recipients | Celia Doe, Coordinator | Follow up by Inspection Team Required? | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Additional Email Recipients | <input checked="" type="checkbox"/> Mary Jane, PI <input checked="" type="checkbox"/> Miriam Trout, EHS Rep Add new recipient: <input type="text"/> <input type="button" value="PI"/> | Overall Inspection Findings | Major |

M.I.T.

Metrics and menus. Consider a second example: metrics and menus. In order to assess the performance of the EHS system, the staff functions or the laboratory practices, the administrators of the system at Welldon wanted quantified information so that they could make efficient comparisons across laboratories and persons. They wanted the database to have built-in metrics. This process is familiar to any one who has attempted to code or quantify data, to abstract from a complex phenomenon, a name or label that will permit its use in subsequent analyses and yet still make sense. In management systems, however, metrics provide not only a set of parameters and procedures for quantifying phenomena - specifying units of measurement, but they also include evaluative criteria, thresholds and objectives as well as estimation calculations.

The way to achieve easily used, standard, comparable information across the more than 500 laboratories which would be inspected minimally twice a year would be to use quantifiable data in “drop-down” menus instead of text-based descriptive fields. For instance, the inspection system of the database would contain a question about whether lab personnel were using appropriate personal protective equipment (PPE). The drop-down options would include a) ‘Appropriate eye/face protection not worn’; b) ‘Appropriate gloves not worn’; c) ‘Appropriate foot protection not worn’; d) ‘Appropriate body protection not worn’; e) Other. Depending on the number of options clicked, the database would indicate the number of instances of non-compliance with

regulations about personal protective equipment. With the drop-down options, EHS staff would have not only a total for protective personal equipment related violations in a lab but also a number for violations related to appropriate gloves not being worn.

It was also proposed that the faculty researchers – those principal investigators who had formal ostensible responsibility for what went on in each lab – should not receive the details of an inspection but should instead get a summarized inspection report, listing the kinds of violations and giving a summary score for the overall status of the laboratory. If there were 45 points or targets of observation, or questions posed on the inspection form, and 40 were unproblematic, that is compliant, and 5 were not, the report would indicate a score, just like on an exam.

Immediately in the course of an inspection, inspectors could determine a score for the lab but ultimately they could aggregate scores for comparisons across labs to discover what were common, repeated problems that seemed to require university wide responses. They would also be able to distinguish issues that were relevant to only some or few labs. These “scores” could then be incorporated into a score for overall safety status of an individual laboratory – the overall findings box, or even for the university as a whole. These metrics could be used to assess need for change and criteria for future performance, exactly what a system is designed to provide. That is, information about the state of the organization communicated through feedback loops to direct future action. The metrics would provide a tool to facilitate the feedback and future action.

While text boxes require time to complete, drop-downs are timesaving. With a simple check, the record creator could generate information. Of course, Garfinkel (1967) long ago reminded us that economic efficiency is one of the ‘normal’ incentives that produce “bad” records and Wendy Espeland (1998b, 2007) has recently reminded us how commensuration ends up creating rather than recording organization practices. Nonetheless, drop-down menu options became a solution to accommodate the staff members' complaints that filling out all these forms would take a lot of time and that data entry would be as time consuming or even more time consuming than the inspection itself.

However, other participants in the system design process, some department EHS coordinators (rather than central administrative staff, and laboratory members), voiced fears that an over reliance on drop-down menus would result in the loss of much important detail.

Debate ensued about whether, for example, the inspection report should just show that a violation was found in a lab space about researchers not wearing safety glasses or should it also say something about under circumstances under which the glasses were not being worn and especially by whom. If the database relied entirely on drop down menus without textual identifying detail, as one academic administrator argued, "The nuances, the culture of the lab, etc will be lost by the formula." More importantly, if the report did not include the details, how would the reader of the report, in this case the professor whose lab was being inspected, know where the problem was located, with whom, specifically which student or post-doc was not wearing her safety glasses? How would the supposedly responsible party know whether the violations in his laboratory were coming from one student, two students, all the students? And what about positive information? Where would the record indicate what was particularly positive or good in this lab? Where would they learn about better or best practices? What information would travel the conduits from workbench to principal investigator, to department chair, Dean

etc. up the hierarchy if all that was being reported was a summary score. The debates eventually settled on a summarized score for lab, a discretionary score (along with contextual details) for each violation, and an automatic score for certain violations involving the most serious hazards.

Just as elimination of the data box omitted essential information concerning the prevalence and pattern of behavior, the metrics example illustrates the constant struggle between standards and variance in the use of numbers. Ultimately, in trying to have it all, the metrics – numerical values and drop down menus - in the EHS database created neither the convenience some of the personnel sought nor the detail others requested. It created a risk of having too much detail to consume as well as a risk of missing the sometimes very egregious context.

Consequences. Alongside the summary score, it was also proposed that the database record the consequences for non-compliance. Consequences are penalties issued to individuals for non-compliance with environmental, health and safety rules and guidelines. Without negative consequences, it was believed that there would be no accountability, no responsibility and ultimately no behavioral changes or improved compliance.

For example, all chemical waste must be stored in designated containers with clearly marked labels within the lab for no longer than three days, after a container is full. At that point, the waste container must be moved from its home "in situ," or what is called a satellite accumulation area, to another locale in which it may stay for no more than 90 days when it must be shipped off campus. Should a chemical waste container in a laboratory be lacking appropriate labeling, this constitutes a serious infraction of EPA regulations and local EHS instructions and process. An inspection of the lab would identify this as a violation of the rules. When the violation is noted in the database, a consequence may also be noted. If a problem is fixed on the spot, it is likely that no consequences would be recorded.

Information about consequences is particularly desired by the EHS office as a way to create histories of actions taken against individuals who flout rules. According to the EHS staff, sanctions are necessary for the sustainability of the EHS management system, indeed essential to the notion of a self-monitoring, self-correcting system.

However, the academic staff and researchers were apprehensive about storing information on local sanctions in a central, university-wide database. They felt that consequences would become a tool of the central administration and EHS office to limit the labs' own local control, freedom of action, while at the same time holding the labs responsible for activities that were the domain of the central EHS staff. If consequences required by law or regulation were to be included in the database, it should contain minimal information. If it was not required, omit it. Importantly, the system manual was unclear, purposively so, about consequences. There were no clear consistent guidelines for what consequences should follow what violations. In earlier deliberations concerning the writing of the system manual, decisions had been made to allow extensive discretion with regard to consequences; this was achieved by inserting adverbs into most statements, so that the manual reads that such and such will normally or usually happen, or refer to most rather than all circumstances. Thus, it was not possible to have a clear correlation between inspection observation and consequences in the rules and thus to embed this correlation in the data boxes seemed contradictory. Finally, some argued that

if the lawyers insisted on recording consequences and punishments, then there should be text boxes rather than drop down menu choices so that consequences could be individually fashioned. After several months of heated debate, the data field for consequences was struck from the data base.

IV. Desire for Information and the Fear of Transparency

These examples of absent data fields and opaque metrics are not peculiar to this specific project. We encounter databases that are problematic all the time, databases that don't give us enough information for decisions, give us too much information, have no capacity for overrides when an exception arises or are simply comparing apples and oranges. In fact, "much of the information that is gathered and communicated by individuals and organizations has little decision relevance" (Feldman & March 1981, p.171).

Moreover, problems with misinformation are not new or endemic to computerized databases. Sociologists have been writing about recordkeeping and misinformation for many years. Sometimes people take short cuts that compromise the quality of data; other times they massage or manipulate the data to represent themselves more favorably. Most of the previous research has focused on data entry after a record form or database has already been designed. However, the fields, functionalities and the features of the records in the database also has important implications for what data can actually be captured, analyzed and possibly interpreted. Thus, these observations on the design of a data base provide a backstage view of the creation of mis-information.

If information systems are the material device through which we are governing complex organizations - making transparent the links in chains of coordinated action, holding accountable the participants in these intricate divisions of labor, how shall we understand or explain the fact that organizations not only misreport or manipulate data but at the outset create databases that are not as useful, sufficient, or even reliable as expected or hoped?

The Welldon EHS database is not a unique or unusual example. For instance, when doctors want to prescribe certain drugs to patients, they are prevented from doing so because the formulary has no overrides. In another example, Wendy Espeland describes in *Struggle for Water* (1998a) a bridge construction that left out the cost of a displaced park from its projected costs simply because nobody could find a way to capture that benefit in the analytic tools they were using. Or, in 2008, the media in the reported that the US army sent requests for re-enlistments to several past soldiers, including those already dead.

The problems are more than mundane inconveniences and misguided policies. The daily, repeated ordinariness of computerized information systems constitutes the transcendent accumulation through scale and irreversibility which is how the mundane day to day becomes the long duree.

First, misinformation concretizes invisibility under the guise of transparency. Unlike verbal communication, written communication, especially that which is meant to be stored and recorded, has permanence. The words once inscribed, can be easily invoked. At an organizational as well as an individual level, the permanence of records

helps as a memory aid; it also freezes history as recorded, more difficult to reinterpret and revise.

Second, while this concretization is true of inscription historically and generally (Ewick and Silbey 1998, 99-106), computerization expands exponentially the scope of what is misrepresented because it collapses the temporal lag in the effects. The cost of transferring information, at least in its physical format, is minimal. This means that records can be consumed not only at another time but also at another place.^{iv} Moreover, records can be combined in multiple ways – combined with each other or with other pieces of information - giving them whole new meanings and dimensions. The transferability and combinatorial attributes enable the use of records as a justification and legitimation of organizational existence. For profit making organizations, balance sheets reflect their health to the investors. For a university like Welldon, EHS records signal to the rest of the community, and especially to government agencies, the seriousness of the commitment to environmental citizenship and sustainability.

Although management systems are justified as a tool for creating accountability, it is the embodiment of anything but accountability. Records are faceless. The person who authors a record is usually far removed from the consumer of that record. In fact, once the record is created, it takes on a life of its own, burying the traces of its authorship, and there is little control on how it will be interpreted.

These attributes - permanence, transferability, anonymity - can incite both a desire for and a fear of records. The same attributes that make records desirable also make them feared. Records have the ability to “abstract events” and allow them to exist in a “formal, timeless, [and] institutional context” (Ewick and Silbey 1998, 101). As our examples illustrate, there is usually a murky process that exists behind the clean numbers that are in a database. Information is coded according to the standards of the day and aspects are left out or included for a variety of reasons. The actual phenomenon may just be too complex to fit into a database. Or it may require too much effort to include in a database. Or it may be purposefully hidden to create a rhetorical image of a particular event (Van Maanen et al. 1994). Databases can also be deceptive because they typically present aggregates of elements that are ontologically different from one another. At Welldon, for instance, the proposed database may present the cumulative results and violations of a laboratory inspection without mentioning the nature of those violations or the excellent innovative practices in the lab. Even if a diligent person feeds in several details about each inspection violation and an astute reader pays attention to those details, the data field would not capture the actual event in all its texture and personality. This is because the power of the database to capture the “metadata” – the details on the data-production process - is limited and paradoxical (Desrosieres 2002). Users must be given enough details to make sense of the data but they also do not want to be bothered by these data production processes.

Arguably these fears and desires are most salient at the time of database creation because design is a highly speculative exercise. Designers, and their collaborators, can only imagine the uses of the database; and based on what they imagine, both fears and desires grow. At one point in time, they think that the metrics and the dates are going to be used exactly the way they think they should be, discounting the possibility that the database system may not be used exactly for the purposes imagined. At another time, they imagine only the misuse of the data, recognizing that users will find ways of making the system work for their purposes, which is also why the system features are feared. At

no point in the design of the system, were the participants willing to consider the possibility that their basic objectives could not be served by the database, that mechanisms other than the database could achieve some of their purposes, or that through work-arounds some of the anxieties and concerns could be blunted. Once people start using a database and start feeding data into it, they are more familiar with how it is being used and ordinarily devise ways to show only favorable representations (Ball et al. 2000). But this benefit of hindsight is missing during the period of database creation when the uncertainty about the possible uses of data incites active imaginings among the database creators. As they envision ways in which the data could be ultimately used, they argue for inclusions and exclusions based on their fears and desires. That's why the features become desired and systems, which we learn to love, become unmanageable as functionalities are added.

Simultaneously seeking efficiency, accountability as well as comparability - facets of the same effort, produces contradictory forces, and then, because participatory processes produce compromise, undermining ambitions of those who would manage or govern through information systems. Complexity increases also geometrically because every piece of data considered during the design process reflects multiple interests, possible uses, and can incite multiple fears.

Each of the desired objectives - accountability, efficiency and standardization and comparability generates a parallel, perhaps symbiotic, fear in a reinforcing cycle. This is a dynamic process in which the desires for and fears of information escalate, in reflexive recursivity, strengthening the bars of the Weberian the iron cage, now made of silicon.

Although accountability is an aspect of social control, it invites attention to the transactional, relational nature of control in a Simmelian sense. That is, accountability systems, by shaping routine actions and beliefs, formally and informally, by making us answerable for our actions, require performance by the subject of control. Records and databases participate in systems of accountability by allowing lines of responsibility to be verified and by creating new or reinforcing existing responsibilities. In the first instance, information systems create transparency in social links by requiring the subject of control to provide accounts of her actions in an existing relationship of control. In the second instance, by virtue of their visibility and usual accessibility, database records invite both authorities and the subjects of control to produce records that portray their performance in advantageous ways. Once part of a record, data can potentially establish a norm and create a new benchmark for normalcy (Garfinkel 1967). In addition, the increased visibility of lines of responsibility leads to potential control by diverse others viewing the record. However, the increased visibility also encourages individuals to provide accounts of their own lines of responsibility, leading to further desire for data.

The overall goal of the system is accountability through information feedback and behavioral response. Efficiency, also a central organizational goal, demands standardization but nonetheless impedes accountability. The database may provide consistency by stripping away the details of an inspection to achieve standardization but it will impede decision-making and responsiveness and possibly safety. Standardization permits comparability and consistency thus some form of fairness but absence of detailed information encourages

The negotiated database system



misinterpretation and existential incomparability. However, attentiveness to variation is time consuming and impedes efficiency.

These contradictions become apparent as the fields and functionalities in a database are discussed. Notably, at the outset of the design process, everyone had agreed that this database would be used to record good practices as well as violations. But when it became apparent that additional fields would be needed to record the range of good practices, concerns about efficiency, comparability and standardization surfaced again, fueling additional competitions and compromises among the various fears and desires. This is a dynamic process in which the desires for and fears of information escalate, in reflexive recursivity.

The overall goal of the system is accountability through information feedback and behavioral response. Efficiency demands standardization but nonetheless impedes accountability. The database may provide consistency by stripping away the details of an inspection to achieve standardization but it will impede decision-making and responsiveness and possibly safety. Standardization permits comparability and consistency thus some form of fairness but absence of detailed information encourages misinterpretation and existential incomparability. Nonetheless, attentiveness to variation is time consuming and impedes efficiency.

V. Conclusion.

This paper has described an example of the most common contemporary form of organizational accommodation to legal rules: a management system, specifically, the collaborative creation of a database as part of a surveillance technology for managing environmental, health and safety hazards in university research laboratories. The database was created to comply with environmental regulations by making visible the presence and handling of hazardous materials. We described how the desire for information and the fear of misuse of information produced a database that fails to record information essential to apprehending and correcting environmental hazards and accidents. In this observation, we confirm research that documenting the inadequacies of databases; we demonstrate how conflicts of interest, hierarchical relationships, and fear of law become materially embedded in the electronic artifact. The research also confirms a long tradition of research documenting how the implementation of regulations within organizations often produce modifications prompted by the regulations but also unexpected and non-compliant outcomes.

Compromises – such as we have illustrated in the examples of eliminating the field for a date, or the consequences for violating regulations – were used to mitigate although unable to resolve the contradictions inherent in information collection and storage. These compromises lay a foundation for the system achieving only the bare minimum of transparency or accountability. At the same time, reinforcing and strengthening the bars of the Weberian iron case, now made of silicon, soon to be made of DNA in biobased computers.

References

Ball et al. 2000

Brown, J.S. and Duguid, P. 1991. "Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation." *Organization Science* 2(1).

Coglianesi, C, and Nash, J. (Eds.). 2001. *Regulating from the Inside: Can Environmental Management Systems Achieve Policy Goals*. Washington: Resources for the Future Press.

Desrosieres A. 2002. *The Politics of Large Numbers*. Cambridge, MA: Harvard University Press.

Espeland, W. 1998a. *The Struggle for Water*, Chicago: University of Chicago press.

_____. 1998b. "Commensuration as a Social Process." *Annual Review of Sociology*. Vol 24, pp. 313-343.

Espeland W. and Vannebo, B. I. 2007. "Accountability, Quantification and Law". *Annual Review of Law and Social Science*. Vol 3, pp. 21-43.

Ewick P. and Silbey S. 1998. *The Common Place of Law: Stories From Everyday Life*. Chicago: The University of Chicago Press.

Feldman M.S. & March J.G. 1981. "Information In Organizations as Signal and Symbol." *Administrative Science Quarterly*, Vol 26, No. 2, pp. 171-186.

Foucault, M. 1995 "Governmentality." In *The Foucault Effect: Studies in Governmental Rationality*, edited by G. Burchell, C. Gordon, and P. Miller. Chicago: University of Chicago Press, 31-50.

Garfinkel H. 1967. *Studies In Ethnography*. Prentice-Hall Publishers.

Gibbons M. , Limoges C., Nowotny H. , Schwartzman S. , Scott P. and Trow M. 1994. *The new production of knowledge: the dynamics of science and research in contemporary societies*. London: Sage.

Giddens A. 1991a. *Modernity and Self-Identity: Self and Society in the Late Modern Age*. Palo Alto: Stanford University Press.

_____. 1991b. *The Consequences of Modernity*. Cambridge: Polity Press.

Hoffman, A. J. 1997. *From Heresy to Dogma: An Institutional History of Corporate Environmentalism*. San Francisco: The New Lexington Press.

Huising, R. 2010. "No Consent? Manufacture Problems: Reorganizing through the Construction and Management of Problems. Working Paper, McGill University, Montréal, Canada.

Huising and Silbey 2011 "Governing the Gap: Forging Safe Science through Relational Regulation", *Regulation & governance*, (forthcoming March 2011)

- Kagan, R.A., Gunningham, N. and Thorton, D.. 2003. "Explaining Corporate Environmental Performance: How Does Regulation Matter?" *Law and Society Review* 37(1):51-90.
- Kagan, R.A. and Axelrad, L. 2000. *Regulatory Encounters: Multinational Corporations and American Adversarial Legalism*. Berkeley, CA. University of California Press.
- Orr, J. 1996. *Talking about Machines: An Ethnography of a Modern Job*. Ithaca: ILR Press.
- Shamir R. 2008. The age of responsabilization: on market-embedded morality. *Econ. Soc.* 37:1–19
- Silbey S. S. 2009. "Taming Prometheus: Talk of Safety and Culture," *Annual Review of Sociology*, Volume 35, pp. 341-369. September 2009.
- Thomas, J., and Hawkins, K. (Eds.). 1984. *Enforcing Regulation*. Boston: The Hague and London: Kluwer Nijhof.
- Van Maanen et al. 1994

Endnotes

ⁱ Of course, simply because an organization or form of production poses a risk – whether physical, e.g. environmental, or financial, does not mean that regulation is automatically forthcoming or effective. The 2008 world-wide financial crisis provided evidence of the consequences of removing from 1980s-through 2000 the financial regulations put in place following the financial crisis of 1929 and the depression that followed. Furthermore, the BP oil well disaster in the Gulf of Mexico where ** [??] gallons of oil spewed from an uncapped well for * [??] months from April through September 2010 provide notable examples of the failure to regulate effectively.

ⁱⁱ Despite the preference for network and team organization, firms remain hierarchical with management authority increasing upward to a small cadre of executive officers and boards of directors.

ⁱⁱⁱ Many social scientists are familiar with similar training processes for conducting research with human subjects. In the United States, the National Institutes of Health (NIH) supports training materials and certification online.

^{iv} We write this paper, December 2010, just as Wikileaks has made public millions of US military and diplomatic documents, a feat made possibly by computerization. Hand or photographic copying would have been years of work, nor would all the documents have been accessible from a single location.

References