10 TECHNOLOGICAL FRAME INCONGRUENCE, DIFFUSION, AND NONCOMPLIANCE

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Abstract *The technological frames of reference strand of social shaping of technology theory is used to overlay the issues arising from a case study looking at noncompliance with information systems. A recent review of the theory suggests that although frame content is often addressed, frame structure, the process of framing, and the characteristics and outcomes of frames are largely overlooked. This paper attempts to address this shortfall by applying the indicators identified by case study research to the frames of different groups and using them to highlight differing perceptions and attitudes. In this way, the author suggests that issues surrounding noncompliance should not be dismissed as resistance but instead should be further studied by managers and developers, leading to accommodation of differing views. Further examination of frame incongruence reveals dependence on inefficient or ineffective organizational situations and thus these indicators can be useful in future studies to identify and address procedural, acceptance and cultural issues leading to acts of noncompliance.*

Keywords Social shaping, technological frames, resistance, workaround

1 INTRODUCTION

This paper builds on work published in 2005/2006 that identified categories of noncompliance with information systems (Ferneley et al. 2005; Ferneley and Sobreperez 2006). This work identified antecedent conditions underpinning various types of non-

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compliant behaviors concluding that certain behaviors, perceived as resistance, occur for more positive and supportive reasons and that managers should not dismiss all non-compliance as resistance, but should look more closely at reasons for such behaviors.

In an attempt to understand why these occurrences of noncompliance continue to occur in organizations, we now tie in the technological frames of reference aspect of social shaping of technology (Bijker 1995;Orlikowski and Gash 1994) and apply this theory to data, not previously published, arising from the same case study to identify differing groups and their standpoints. A recent review of technological frames theory suggests that most applications fail to investigate the process of framing, the cultural and institutional foundations of frames, and the characteristics and consequences of frame structure (Davidson 2006). We attempt to address this issue by applying, in a single case study, the notion of technological frame incongruence across identified relevant social groups, and use indicators for noncompliance to construct contrasting technological frames. This action outlines clearly that groups of employees who interact with information have widely disparate views of the nature and purpose of the information they use, and that this can stifle congruence or commensuration of attitudes to information systems.

The issue of frame commensurability (Khoo 2001) is addressed and we believe this study clearly highlights the differing attitudes of groups across a commensurate framework structure. In addition, the application of technological frames helps to identify areas where management, supervisors, and developers take different standpoints and dismiss or minimize noncompliant behaviors and their subsequent negative impact on data integrity, accuracy of reporting, and organizational culture. Ibe organizational ideal is seeking technological frame congruence (Orlikowski and Gash 1994) and the comparison of stances across different dimensions helps to identify the differing attitudes, beliefs and viewpoints of the relevant social groups. In this way areas in which these differing standpoints have contributed to conditions that are precursors for noncompliant behavior are highlighted. This action may assist in categorizing, across other contexts, those behaviors that are harmless, hindering, or, vitally, essential to the completion of tasks, processes, or roles within an organization (Davis and Hufnagel 2007; Ferneley and Sobreperez 2006). Finally, the author identifies possible tools and techniques that may be useful in organizations to highlight frame incongruence and thus signal where adjustments should be made to perceptions, opinions, and mind-sets.

2 THEORETICAL AND RESEARCH BACKGROUND

Effective diffusion of innovation is considered essential to the adoption of information systems (Baskerville and Pries-Heje 1997) and any resistance or noncompliance is usually considered harmful, undesirable, and deviant, to be managed or minimized as a standard human reaction to change (Franz and Robey 1984; Lyytinen and Hirschheim 1987). In contrast, several researchers have noted that resistance can be seen as a positive force and should be studied more closely rather than dismissed as recalcitrance or reaction to fear of change (Hirschheim and Newman 1988; Levine 1997; Markus 1983; Mumford et al. 1978).

If we accept that technologies are prefigured by existing forms of work organization, at least in part, then the diffusion of technical change must be designed, developed, and

implemented with particular objectives concerning work transformation. The study of the implementation of technology has been seen as an important site for innovation. In this view, Fleck (1988) coins the term *innofusion* to describe "learning by struggling" and lends weight to the view of the user, who manages, through trial and exploration, to identify needs and requirements and to attempt to have these incorporated in future versions and configurations. In this way, technological development is a spiraling rather than linear process, as innovation takes place not only at design, but also at implementation and this feeds into future changes. This implies the abandonment of the notion of technology as *equipment* only and acknowledges influences on the adoption, diffusion, configuration, and usage of technologies.

This ties in well with studies of noncompliance or *resistance* as it is often these acts of struggling, trial, and exploration that are seen as resistant by those who are distanced from the user/technology interface (Lapointe and Rivard 2005; Marakas and Hornik 1996; Martinko et al. 1996). In addition, other groups interacting with systems or with information produced may have different views and perceptions. The concept of technological frames has emerged, capturing the interactions among members of a relevant social group (Orlikowski and Gash 1994). The term *frames* refers to the concept of frames of reference, borrowed from cognitive psychology, and defined by Gioia (1986, p. 56) as "a built-up repertoire of tacit knowledge that is used to impose structure upon and impart meaning to otherwise ambiguous social and situational information to facilitate understanding."

These frames include assumptions, knowledge and expectations expressed through language, visual images, metaphors, and stories. Frames are constructed as interactions around an artefact or process, and comprise shared elements such as tacit knowledge, objectives, organizational constraints, shared methods, procedures, and problems. In this way the relationships between relevant social group members are captured but made fluid and open to change where the elements change. Frames are flexible in structure and content and have variable dimensions that shift in relevance and content over time and according to changing context. According to Orlikowski and Gash (1994), frames typically operate in the background and can be helpful in that they reduce uncertainty of conditions, structure organizational experience, and allow common interpretations of ambiguity; they can also have constraining effects in that they reinforce established and possibly negative assumptions and knowledge, inhibit creative problem solving and distort information to fit existing cognitive structures. Orlikowski and Gash use framework dimensions across three domains common to most organizations to contrast their case study frames. These are *nature of technology*, *technology strategy (including motivation and criteria of success*), and *technology in use (including priorities and resources, training, ease-of use, and security and quality policies*).

There has been widespread application of technological frames theory to explain individual case-based phenomenon (Davidson and Pai 2004; Iivari and Abrahamsson 2002; Khoo 2001; Lin and Cornford 2000; Lin and Silva 2005; McGovern and Hicks 2004), but there is need for tools to help build a cumulative base of empirical findings or of cross-case comparisons (Chiasson and Davidson 2005). Davidson (2006) suggests that more emphasis on the process of framing, the cultural and institutional foundations of frames, and the characteristics and consequences of frame structure will add to this body of study and assist in cross-case comparisons.

Orlikowski and Gash suggest an ideal of frame congruence, where frames of relevant social groups related in structure and content are aligned. Congruence of technological frames implies similar expectations around the role of technology in business processes and incongruence implies important differences in expectations or assumptions around key technological aspects. The existence of incongruent technological frames suggests that differences in the view of division of labor, autonomy of employees, and status and position of individuals are consciously or implicitly built into information systems by systems planners and designers (Hirschheim and Klein 1989). In addition, Khoo (2001) suggests that the appropriateness or commensurability of frame structure is addressed. Where frames are incommensurate, the concepts in one frame cannot be addressed in other frames as there are no common meanings given to structural headings.

This paper attempts to add to the study of frame structure; in particular, the characteristics and consequences of frame structure are augmented under the *technology in use* heading by the application of three further subheadings. These are taken from the findings of the earlier study into noncompliance and are used to create a useful frame structure which clearly highlights the notion of frame incongruence as a starting point for looking at areas where the differing attitudes of groups of people have serious consequences on acceptance, progress, and confidence in organizational information systems.

3 RESEARCH APPROACH: CASE STUDY

The case study described took place in 2004–2005 and a detailed description is found in Ferneley and Sobreperez (2006). To enable the reader to contextualize the research without recourse to the previous paper, a brief outline follows. The case study setting was a UK County Fire and Rescue Service and the original research objective was to identify, classify, and understand noncompliance with information systems. The case study setting was selected because it was a highly operationally controlled environment, with clear preset routines, procedures, and practices. The culture was historically quasi-militaristic in that rank uniforms are worn, military language is used, national flags are flown, and superior ranks are deferred to in conduct, speech, and dress. In all, these elements have created an environment where it might be supposed there would be an emphasis on conformity and little opportunity for deviation. The County Fire and Rescue Service is concerned with managing fire and rescue incidents with minimal damage to people and property and the information context was the recording and reporting of these incidents. As incidents are reported to the Fire Service, a centralized control office records details including location, reporting details, personnel and equipment dispatched immediately and subsequently, routes taken, dispatch and arrival times, and a log of all communications with the deployed teams.

A detailed electronic report (FDR1) is completed after the incident using an on-line form with semi-structured questions and any level of officer can be assigned the responsibility of completing the report. Structured attributes include cause of fire, location within the address, degree and speed of fire spread, number of casualties, other emergency services involved, specific equipment used, and arrival and departure times. In addition, there are free format responses for incident handling strategies and evaluation. Reports are summarized by a centralized office that then presents the abstracted results

to management for use in planning allocation of future human and physical resources. In addition, the summarized data is reported to the Office of the Deputy Prime Minister (ODPM) where it is compared with data from other regions. The national data is then published and national funding and policy decisions are made based on the data.

Data collection included participant observation based on watching and listening, individual and group semi-structured interviewing, and document analysis. Interviews typically began with generic questions allowing users to express their opinions on the use of technology before moving to more specific questioning. Semi-structured interviews of between 40 minutes and 1.5 hours were conducted with 3 senior managers and 8 middle managers chosen for their wealth of experience and the diverse range of roles that they occupied. In addition 3 data analysis personnel were interviewed representing staff responsible for collating and distributing the data under analysis. Within fire stations, 24 taped group semi-structured interviews of between 1.5 and 3 hours were conducted with groups of between 8 and 15 fire officers who worked together as a team or "watch." Group interviews revealed situations where information systems were unable to record the actuality of events and various work-arounds had been implemented. In addition, individuals were questioned as they were observed entering data, and were questioned closely on their reasons for responding in particular ways.

Key personnel outside the operational fire service also were interviewed including two interviews at the County Statistics Office and two at the Office of the Deputy Prime Minister (ODPM) in Watford. This was in order to follow through on the statistics produced by the consolidation of fire incident records by region and determine how distortions were handled. A total of four interviews took place at these locations with statisticians, data entry clerks, and technicians dealing with data from regional counties. The data was analyzed using inductive coding and grounded theory principles of categorizing and clustering data. The aim was to allow a conceptual framework to emerge during the course of study as the data was gathered. This detailed process is described in Ferneley and Sobreperez and underpins the original intention to identify different types of noncompliance.

In the case study, relevant social groups were identified as the firefighters themselves involved in a particular incident, the station officers using the information systems, developers, installers and maintainers of information systems, senior staff involved in debriefing, local statisticians involved in recording, compiling, and presenting information for the county, national staff consolidating, synthesizing, and presenting national information, and politicians and policy makers involved in designing, funding, and managing a national fire and rescue service.

4 DATA ANALYSIS

In their seminal paper on technological frames, Orlikowski and Gash (1994) identify three domains which characterize case work and context. These cover the technology, why it was introduced, and how it was used: *nature of technology*, which refers to understanding of capabilities and functionality; *technology strategy*, which refers to understanding of motivation and vision behind adoption; *technology in use*, which covers understanding of day-to-day use and associated conditions and consequences.

The context of this paper focuses on the technology in use domain as the initial case study purpose was to investigate reasons for non compliance with information systems by end users. Orlikowski and Gash subdivide this domain into *priorities and resources*, *training*, *ease of use*, and *policies for security and quality*.

In searching for explanations for noncompliance with information systems, the notion of frame congruence or commensurability provides a useful tool for identifying areas where different groups of users have differing beliefs and attitudes to workplace situations and where conflicts occur leading to systems usage, which is different from that expected by developers and managers. The case study data highlighted three subdivisions of technology in use in which perceptions of and attitudes about technology in use differed greatly. The quotes in this section have been deliberately selected from the wealth of data collected in the case study and have not been previously published. Instead, the data has been revisited and quotes that reveal or expose the attitudes of differing groups of stakeholders were chosen for their appropriateness, succinctness and clarity.

4.1 Proceduralization

Proceduralization includes situations where systems enforce procedures contrary to effective working practices. For example, enforcing step by step chronological procedures where concurrent steps or different ordering is more efficient, either occasionally or regularly. Where procedures are enforced, employees tend to work around these, using activities such as incorrect job sequencing, retrospective data entry, and preemptive processing.

For example, one firefighter noted,

We have to complete the FDR1 before we have had chance to have a debriefing.

In other words, the whole picture of the incident is not synthesized but the FDR1 must be completed within a certain time frame which local statisticians see as a positive constraint.

The FDR1 must be completed while the incident is fresh in their minds.

In addition, local statisticians considered that the online FDR1 form gave ample opportunities for freedom of expression,

Allowing free text requires a level of interpretation which may require further investigation.

At the same time, they considered the form to balance free-from and closed questions well to improve standardization:

Standardization removes ambiguities.

Whereas firefighters felt constrained by the form, commenting,

The form doesn't let you describe what really happened, it's just making the fire fit the form.

The report I saw was not the fire I went to.

We sometimes request equipment we "may" need and then justify it later by describing the incident as though we needed the kit.

There were also differences between the firefighters and their senior officers in this issue. A senior officer was certain that firefighters were very careful over recording details:

Information is used in court for insurance, to refuse housing and occasionally to remove children from families. Fire officers are very careful how they enter data.

These examples show clearly that different groups of information users take different stances over proceduralization. Senior officers and statisticians believe that proceduralization is in line with and useful to the data collection process. Firefighters believe the system to be obstructive and do not consider information gathering to be important. They see their "real" work as fire fighting, rescuing, and protecting and lives and property, and information gathering as bureaucratic paper shuffling.

4.2 Acceptance

The issue of acceptance includes behaviors such as nonuse of system in favor of manual or earlier systems, and avoidance of system usage. This incorporates situations where users do not identify themselves to the system, time spent recording accurately is seen as a waste and is avoided, and personal attribution is avoided by misuse of user names.

Differing attitudes to these is encapsulated by remarks by the firefighters:

Once it's logged in it's logged in for the day, I have never seen anyone log out and back in under their own password.

Clearly this is not the perception of local statisticians, who note

Firefighters are trained to use computers to record incidents and recording is done accurately and immediately after the incident. The form is very precise and there is no room for ambiguity.

Every individual has their own login details and this drives funding and training programs.

National statisticians at the ODPM were fervent supporters of the recording systems, commenting

The system has been in use since phased implementation began in 1994 and works well to capture the data required by government.

Before 1998, local statistics offices brigades coded their own data and there were many anomalies and ambiguities and much data was unusable.

County fire brigades are accredited after 18 months of external measurements and are then allowed to perform their own internal quality checks.

The intention is that brigades provide routine FDR1 information as electronic data only, there are no paper forms.

In contrast, however, local statisticians were not so enthusiastic about the system and commented

At the end of the training we gave up and went back to manual systems.

They were, however, under the impression that their work was vital and important and were proud of their accreditation status.

Only accredited county brigades send their information directly.

Sending information to the ODPM is the most important work we do.

However national statisticians noted that some of their carefully collated work was unused.

Not everything collected is used; political considerations have changed at every level since the FDR1 was designed.

These quotes point out the different attitudes of groups to the acceptance of the system. Local statisticians considered it more important than did the firefighters, but national statisticians had an overview and awareness of future plans that was in contrast to local implementation, even pointing out that some of the carefully collected and compiled information is not used.

4.3 Culture and Control

Culture and control covers organizational culture and management supervision and control. Widespread deception, setting and ignoring of inappropriate targets, and falsifying of deliberate inaccuracies were observed and described. These behaviors are underpinned by a culture of collective noncompliance and a perception of systems that do not properly support the work done in terms of holistic overview, and opportunity to exercise professional judgement. This includes situations where systems do not allow collaborative recording, or where recording is overlooked in favor of contingent action in emergency situations.

Firefighters' comments include

We record time of arrival early so as to meet targets.

If we say cause of fire is "arson" we have to liaise with the police; better to say "unknown."

There is active discouragement of IT use among the lads.

We cannot record what really happened if it is against guidelines or policy.

We work as a team, as a unit, it doesn't matter how incidents are recorded or who does it.

Senior Fire Officers loftily assured

We are encouraging greater use of information systems to support record keeping and to instigate knowledge sharing and knowledge management across the service.

4.4 Summary

Among firefighters, the recording of incidents using the computerized form was seen as "paperwork," bureaucratic and irrelevant to the work of firefighting. There was no feeling of ownership or possession of data and little interest in accuracy. Firefighters with the task of entering the data saw it as an imposition from regional and central statistics offices and not owned by the firefighters themselves. Regional and national statisticians saw the compilation, consolidation, and presentation of statistics as intrinsic and central to not only their own personal and individual work but to the work of the regional and national fire service in general, feeding into policy and procedure. The collection of management data for the purposes of monitoring and control is misunderstood, viewed with suspicion and deprioritized by a workforce frustrated by software applications that appear to obstruct what they perceive as their "proper work."

Staff at both the regional and national statistics office believed the database collecting information about individual incidents was malleable, flexible, and customizable, that they could manipulate it in many ways to produce their required information. However, the users, who did not use the same interface, thought it inflexible, overstandardized, clumsy and awkward to use, and even obstructive in its capacity to support true incident reporting.

The local statistics office workers clearly believe the system is tight and that firefighters are adequately trained. The perception is that the system is well utilized within the region and that accurate data is forwarded to appropriate government departments. This perspective was evident where visits to the local statistics office of the county force and the Office of the Deputy Prime Minister revealed quite different attitudes to the information systems and to issues such as acceptance, approval, confidence, and trust.

It is interesting to note that all senior officers have been firefighters at some time in their career, so have some awareness of the local and individual use of the system. They have an overview of the use of individual statistics rather than the collation of information seen by statisticians and display a management view of knowledge management across the service. The firefighters perceive that the recording system and the organizational circumstances force inaccuracies.

Local offices are very concerned with their own provision and were proud of their accreditation status. They had some criticisms of the system but had found ways to work around some elements through recourse to manual systems. The National Statistics Office had a nationwide overview and awareness of future plans not available to local offices. At the time of the interview, only three county brigades were accredited but a lofty intention was communicated. Interestingly, the National Statistics Office revealed that not all of the carefully compiled information was used, although local offices were not aware of this. From the case study, it is believed that there is a high degree of commensurability and that the members of relevant social groups are aware of and addressing the same areas. For example, in the case study, firefighters and managers share frames about incidents, but managers share frames concerning statistics with local and national statisticians.

The existence of incongruent technological frames can clearly be seen in the context of the case study, where views of the division of labor, autonomy of employees, and status and position of individuals are consciously or implicitly built into information systems by systems planners and designers (Hirschheim and Klein 1989).

5 DISCUSSION

Diffusion and innovation has been underdeveloped and has become stagnant across the case study organization. The Fire Service and other emergency services do not make use of collaborative, mobile, or workflow technologies that may be suitable in this specialized area. The entire information system is still following technology models from the 1980s—for example, the practice, undertaken by all regional offices, of posting a floppy disk in a padded envelope to the ODPM was referred to as electronic data interchange.

Rogers' (1995) theory of diffusion includes four main elements: innovation, communication, time and social systems. The innovation itself, more suitable technologies, has many advantages that are observable and trialable but there is little knowledge of the advantages of these within the Fire Service. The data from the case study revealed that social systems and communications were such that firefighters who generated information, and the only people who could verify or refute any implications drawn, had little interest in accuracy of detail or presentation. They felt, in particular, that information was owned by regional and national statisticians and was used for purposes outside their knowledge, understanding, and control. Firefighters and station officers had awareness of the implications of target benchmarks and performance indicators, but felt that data was twisted and manipulated at various stages to meet unachievable targets, and to provide regional and national policy makers with information they wanted to see. Senior personnel were not interested in innovation and senior information systems personnel

were concerned only with centralized data collection and not in supporting firefighters at the scene of incidents.

Social shaping theory suggests that a process of action and interaction involving communication and collaboration between groups form and shape technology (Porac et al. 1989; Van Maanen and Schein 1979). The different levels and areas of expertise in many overlapping fields, and the different objectives, priorities, and concerns of these groups, suggest that there is considerable potential for poor communication, discord, and conflict. For example, from the case research, there is conflict between the political expediency of recording short arrival times to fire incidents by firefighters, and the accuracy of recording required by statisticians.

The particular issue of innovation within organizations also includes issues of structure including the degree of centralization, organizational complexity, level of formality, interconnections between departments and resources, and size.

Rogers suggests that a high degree of centralization and a high degree of formality are negatively correlated with innovation and that high levels of interconnections, high levels of complexity, and large size of organizations are positively correlated with innovation. Clearly, and as outlined earlier, there is a high degree of centralization and formality within the Fire Service

Rogers also adds a stratum of leadership and posits that the attitude toward change held by leaders will influence innovation along with system openness and interactions with those in the same industry using innovative technologies. All senior firefighters, including those in management, will have been junior firefighters earlier in their careers and thus perceive that they know and understand the systems used. Any innovations will be outside of their knowledge and they may wish to ensure knowledge and power relations by keeping things as they are. In addition, although there are similarities with other emergency services, the Fire and Rescue Service is unique in the nature of its business and is unlikely to come across other information systems that meet requirements, although international collaboration in these matters might be a useful starting place.

Rogers suggests that organizational size and complexity are positively correlated with innovation due to the possibility of access to higher knowledge and expertise. However, others have highlighted the complexity of interactions between groups as a probable cause of even further problems where complex human action, not necessarily understood in depth by developers and technical specialists, is to be supported using information systems. (Fincham et al. 1995) This is particularly true in the Fire Service where firefighters, both individually and as a group, bring a large amount of tacit experience and knowledge to any situation. Each incident is extremely idiosyncratic and must be dealt with so dynamically that there can be no "right answer" to the way it is handled. Approaches are and must be contingent on the location and severity of the incident; the speed of occurrences, events, and responses; the skills and expertise of those present; and the response of the control center and senior officers present or not. As each incident is unique, it becomes difficult to apply rules and guidelines and superficially similar incidents may be dealt with entirely differently in response to a variety of factors too complex and problematic to identify. In view of this, it becomes increasingly challenging to create information systems to match and support workforce action or to manage knowledge across an organization involved in highly complex individualistic, distinctive incidents that need to be grouped and consolidated in a variety of ways to be presented to policy makers and managers.

Rogers also draws attention to types of innovation decisions and identifies three types: optional, collective, and authority. The description of the quasi-militaristic culture in the research approach section informs us that Fire Service decisions are likely to be authority based.

The characteristics and consequences of framing (Davidson 2006) are addressed in this paper through the selection of three indicators developed from the case study data. These may be reconciled with the technology in use structural elements of Orlikowski and Gash (1994), but are less quality, security, and policy oriented and more aligned to the issue of noncompliance. These may prove useful as a way of cutting across organizational boundaries to find common perceptions in information systems usage and to reach accommodation of parallel but differing requirements rather than compliance with an imposed system.

Within the Fire Service, firefighters and local and national statisticians never met each other and had little direct interaction. Use of the three indicators underpinning noncompliant behavior were contextually relevant to all social groups and were recognized and acknowledged as areas of concern. Use of these conditions takes a step closer to acknowledgment of these issues and forms a framework for identifying and addressing the differing attitudes and perceptions and noting where noncompliance is harmless, hindering, or essential (Ferneley and Sobreperez 2006). This distinction is important in determining which behaviors to study further and identify as critique. "The seeds of innovation grow out of resistance and defensive patterns that suppress resistance, suppress innovation" (Levine 1997, p. 167).

This paper brings the notion of incongruent or incommensurate technological frames of reference into the study of resistance and its underlying motivations. From the perspective of the firefighter, systems hindered working practices; from a management perspective, any noncompliant behavior had negative ramifications as data integrity was destroyed and workplace routines and regulations were regularly flouted. Again, viewed through a different technological frame, noncompliance may be regarded as a positive force and may also highlight a dynamic organizational culture and willingness to innovate and improvise (Petrides et al. 2004). Noncompliance with a system that does not properly match and support work practice may lead to development of new and better systems that improve this aspect. This can only be true if systems specifiers and information users are aware of system shortcomings and are willing to appraise, assess, and review systems in the light of knowledge about the motivations for noncompliance.

The cultural and institutional foundations of differing frames (Davidson 2006) can be distinguished by the differing educational backgrounds, career paths, workplace, and data usage of the relevant social groups, which are very clear in this case study and which may account for incompatible attitudes to data collection and utilization. Understandings, interpretations, and expectations of information systems are framed and reframed through the exercise of power (Lin and Silva 2005) and the case study shows that in the context of data collection and usage, operational firefighters are in the least powerful position. Similarly, there are power issues between local and national statisticians in that local statisticians must feed data through for consolidation and comparison with other regional services and clearly would not wish this to reflect badly on their local service. In this way, then, power is exercised through the enforced denial of actual events, which may be contrary to guidelines by firefighters, and the acceptance of information known to be inaccurate by statisticians and senior firefighters.

The framing and reframing process facilitates frame congruence. Lin and Silva's (2005) study details the process by rephrasing and renaming issues, artefacts, and purposes so that common ground is carefully reconstructed. The Fire Service case study is built upon commonly accepted terminology within the organization and stakeholders refer to these elements using common language and understanding. The characteristics and consequences of frame structure may be addressed by the acceptance of these conditions as recognizable by relevant social groups.

The three indicators are brought together from this case study but are also found in other empirical studies. Enforced and inappropriate proceduralization is notably found in a study of the print industry (Bowers et al. 1995), where a new system required printshop workers to take tasks in job number order when more appropriate groupings would use same paper size or type to avoid paper loading time overhead.

The acceptance issue is found not only in this case study but across other studies such as Timmons' (2003) study of nursing, which found that much electronic record keeping was simply not done. In addition, and in common with this case study, on many occasions users did not identify themselves for fear of attribution of errors and inaccuracies.

Culture and control issues are recorded in other case studies, in particular, studies call centers where the perception is that workforces are closely monitored (Bain and Taylor 2000; Callaghan and Thompson 2001; Lankshear et al. 2001; Sewell and Wilkinson 1992). It may be that all workplaces ignore this type of behavior up to a point to allow some breathing space, but within this case study there was a definite management attitude of "as long as we get our data…" and the reflection of actuality was not considered important or perhaps too difficult to confront.

In all cases, managers and developers have specified a system that is counter-efficient and continue to insist it be utilized by a workforce that has been perfunctorily consulted because it meets management's requirements but does not adequately match and support the actual work undertaken. This seems particularly true in situations where the system does not support or allow collective recording, or where the recording is ignored in favor of emergency actions such as firefighting or nursing. Emergency actions that contravene policy or guidelines are routinely undertaken but not recorded and such actions are found across other case studies such as work-arounds in a medical context (Kobayashi et al. 2005) or nursing (Timmons 2003).

Due to the shortcomings of the imposed system, and the unequal power relations between the designer/manager and end user, it is the end user who must typically work around the system to try and get the job done. This is in line with the notion of frame incongruence and Davidson's (2006) view that the shift toward congruence must be made by those lower in the power relation stakes.

Where incongruence is shown, the implication is that one or several relevant social groups will need to shift or modify their frames of reference in order to resolve incongruence. Davidson concludes that this change is likely to be required by the user or operator and not by the designer, consultant, manager, executive champion, or financer of the project. This view highlights power relations and it becomes difficult to see how interpretive processes are separate from political influences. The very idea of communicating and cooperating with users undermines the status, power, and privilege of managers, developers, and those who "know best" how to organize work activity. The groups involved in information technology often have different priorities and goals and this creates the potential for conflict and controversy (Dunlop and Kling 1991).

Walsh (1995) has also suggested that studies of structure would be more useful than studies of content, as effective frame structure may differ during early planning, requirements definition, implementation, and operation of a new IT application. Clearly, frames of reference may also change with the changing organizational circumstances such as diversification of products, markets, or distribution channels, or changes in organizational structure such as mergers and acquisitions, which may bring aboard enormous and quickly moving changes to hardware, software, communications, and data sets that must be quickly accommodated and for which existing software was not written or specified.

Orlikowski and Gash provide limited guidance on the question of frame structure and include only categories or domains of knowledge, highlighting frame incongruence as differing frame content. If the frame structure is included, then frame incongruence becomes a process of development among diverse stakeholders changing as a project moves through different stages of diffusion and may facilitate the change process, lightening the interpretive burden and revealing patterns of association that clarify positions. In this way, frame incongruence may not always be problematic but may provide signposts to areas for further investigation.

The first step in identifying differing viewpoints is to gather data and an interesting technique from the case study has been the use of focus groups to extract deeper, richer, and group centered meaning from accounts of incidents. Participants shared experiences and reflected on incidents, often gaining additional knowledge of cause and effect, or reasons why certain actions were taken. Significantly, some details only emerged when those in attendance were given the opportunity to discuss the incident as a group. Individual interviews would not have given this opportunity and observation would not have revealed attitudes and beliefs. Thus, the full picture of the incident only came into being as a result of the focus group activity. As stories were generated collaboratively, they progressed, frequently over the course of a single focus group session, from fragmented and fractional elements, to a complete story where reasons for actions and decisions, not clear at the time of the incident, fell into place. Participants were able to complete their partial view of the incident and the background to particular behaviors, evaluations, and judgements became clear, forming a more complete view in the minds of participants. The implications for future research might allow this technique to be used in other scenarios where group collaboration is vital for completion of a dynamic, real-life incident or project. Examples include an operating theater, a marketing presentation, a sales convention, any type of performance event including artistic or sporting events. A five-step model is outlined by Leonard and Swap (1999) to facilitate group activity and lead to the clash of ideas, or "creative abrasion," innovation opportunities, generation of novel options, convergence on a solution, and creation of a creative ecology. These tools open channels of communication and groups are made aware of differing viewpoints, thus a foundation for congruence is made possible.

6 CONCLUSION

Information from different groups across a single case study has been examined and reveals differences in attitudes and perceptions about information systems. The tech-

nological frames construct is used to contrast thoughts, opinions, and mind-sets of different groups toward noncompliance with information systems. Three indicators are employed to provide structure for the frames of reference and these were identified within the case study as precursors for noncompliant behavior. The emergence and understanding of these precursors were understood and widely discussed throughout the organization and thus commensurability was ensured. The overlaying of technological frames theory and the application of case study findings points out very clearly the differing attitudes, perceptions, and expectations of the diverse groups, both to systems usage and to any noncompliant behavior.

The use of these dimensions in the structure of the frames led to a more meaningful comparison than more general structures such as how technology is used. This approach is useful in bringing issues to light and raising awareness of those concerned with implementation of the contradictions between the beliefs of organizational members and actual system functionality. The characteristics and consequences of the selection of frame structure components highlight concerns in that noncompliant behavior becomes a result of indicators within the control of managers, supervisors, and developers. The differing technological frame views of relevant groups indicate issues that are within the control of managers and developers and that could be addressed in future planning and implementation. In this way nonoperational groups take responsibility for cultural attitudes, control of data entry, proceduralization, and systems acceptance.

We suggest that issues surrounding noncompliance should not be dismissed as resistance but should be addressed by managers and developers and become a skeleton or framework for understanding problems and developing organizationally aligned solutions. The contribution of this study, then, is to point out that case study findings can interlock and intersect across theoretical areas and the use of the technological frames of reference provides a useful way to clearly demonstrate the existence of relevant social groups and the congruence or otherwise of their technological frames, thereby clearly highlighting areas of concern.

The framework used by Orlikowski and Gash (1994) is augmented by three further subdivisions of proceduralization, acceptance, and culture and control, which serve to focus more clearly on issues of noncompliance and seek understanding and accommodation of viewpoints rather than dismissal of issues important to users and to successful implementation of information systems across an organization.

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