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Value conflicts in enterprise systems

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Abstract

Purpose – To identify, classify, and propose a preliminary theory of the value conflicts and social choices that arise in enterprise system use.

Design/methodology/approach – Ethnographic case study of a medium-sized manufacturing firm, using a participant-observer approach.

Findings – Three areas of value conflict are identified between functional areas: conflicts over work priorities, conflicts over dependency on the commitments of others, and conflicts over evaluation fairness. When participants perceived that the value conflicts were accommodated in a balanced and legitimate way, they chose to use information resources within the enterprise system. When the conflicts were perceived as too great, participants chose to ignore the enterprise system, or develop their own competing information resources.

Research limitations/implications – This paper reports on theory building from one intensive case study. It implies, however, that previous attempts to account for the difficulty of enterprise resource planning (ERP) use have not focused enough on the social relationships between the functional areas that are tightly integrated through enterprise systems.

Practical implications – The three value conflict questions (work priorities, dependency on commitments, and evaluation fairness) can be used to identify potential ERP problem areas, and to clarify the costs and benefits of different ERP choices for various functional areas.

Originality/value – For information systems researchers and practitioners, this paper offers another means for identifying value conflicts and social choices in computerization, hopefully bringing us closer to Rob Kling's dream that computerization choices be made in a more socially benign way.

Keywords Value analysis, Information systems, Sociotechnical change

Paper type Research paper

Introduction: conflict and choice in Rob Kling's work

Rob Kling saw computerization as a fundamentally human process, infused with value conflicts and social choices (Kling, 1996). The full implications of this simple and powerful point have yet to be felt across the field of information systems (IS) research, depriving those of us who study information technology and organizations not only of a useful tool for understanding the world, but also of an opportunity to develop ways of improving the lives of all people affected by computerization.

This paper examines one area of IS research where we believe value conflicts have been neglected: the research on enterprise information systems, such as enterprise resource planning (ERP) systems. Previous attempts to account for the difficulty and complexity of ERP systems use have not focused on the social relationships between the functional areas that are tightly integrated through enterprise systems. To someone working in a manufacturing plant, it would not be surprising to say that design engineers, purchasing managers, quality control specialists, and accountants do not always "get along" – each functional areas has specialized expertise, specialized tasks, and different affiliations and identities that extend beyond their immediate work

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environment (Lamb and Kling, 2003). Through an ethnographic case study of ERP use, we try to surface the value conflicts that participants believe are important, as they choose whether to cooperate across functional boundaries by using an ERP system.

In Rob Kling's work, computerization is a process that involves "a great deal of human behavior" (Kling, 1996, p. 4), always opening up questions of "*social and political* organization, in addition to *computer* organization" (Kling, 1996, p. 35). In Rob's view, too many of the claims about how computerization would happen, or should happen, were "based on overly rationalized views of organizations and markets, and relatively romantic views of technology and human behavior" (Kling, 1996, p. 4). Claims about how people and organizations should use computers, even if expressed as neutral "requirements" or "impacts", were always "*social* and *value-laden* claims" (Kling, 1996, p. 35), yet these claims were being made based on unrealistic and inappropriate theoretical assumptions. In his classic study of electronic funds transfer (EFT) systems, for example, Rob (Kling, 1978) identified five conflicting value orientations (private enterprise, statist, libertarian, neopopulist, and systems). Bringing these conflicting value orientations to the foreground made it immediately obvious that there would not be one best set of requirements for a nationwide EFT system. Identifying value conflicts not only helped explain many of the tensions being experienced in EFT design and use, but also clarified the social choices that must be made in any EFT design or implementation.

Rob envisioned that this kind of social analysis of computerization could become an integral part of the information and computer sciences. Social analyses of computerization "examine situations analytically, to understand what kinds of assumptions are made about social relationships between key participants, along with the support arrangements for appropriate technologies, the range of technological options, and how these may restructure social life" (Kling, 1996, p. 36). Rob hoped that, if computing could be "sufficiently well understood by many social groups early on", then the "important decisions about whether, when, and how to utilize computer-based systems" would be "more socially benign than would otherwise be the case" (Kling, 1996, p. 37).

Enterprise-wide systems and value conflicts

One important form of computerization over the past decade has been the use of systems that reach across the entire organization. As enterprise information systems such as ERP have become commonplace, a substantial research literature has focused on the challenges of making these complex systems operate in an organizationally effective way (Parr and Shanks, 2000; Al-Mudimigh *et al.*, 2001; Sia *et al.*, 2002; Bagchi *et al.*, 2003). ERP offers the promise of a single, integrated system that provides a common view of all the basic logistic and financial information an organization needs to function.

As Kallinikos (2004) observes, a managerialist outlook dominates the ERP literature, with its focus on successful ERP implementation guidelines. This literature tries to explain ERP implementation outcomes through critical success factors such as "top management support", "project team competence", and "clear goals and objectives" (e.g. Akkermans and van Helden, 2002). In Kling's terms, this literature tries to claim in a neutral, rational fashion that organizations, and their many

participant members, should use enterprise systems in this way; any departure from full or "successful" ERP implementation is a dysfunction to be avoided.

Other ERP research has been critical of this managerialist outlook, examining tensions in the relationship between local management and corporate headquarters (Hislop *et al.*, 2000), management and the employees they are trying to control (Sia *et al.*, 2002), or management and technical staff (Skok and Legge, 2002). If there is one dominant theme in this critical ERP literature, it would be the issue of control and adaptability. Kallinikos (2004, p. 19) expresses this theme by saying that "ERP packages are basically concerned with dissecting the complex texture of organizing into discrete steps with the ultimate purpose of raising the manageability of organizations". This has prompted concerns that ERP will make local adaptations and learning too difficult, leading to excessive institutionalization (Chae, 2001) or an excess of panoptic control (Sia *et al.*, 2002). Others raise the possibility that systems as complex as ERP might be fundamentally uncontrollable by managers, creating organizational drift and unintended side effects (e.g. Hanseth *et al.*, 2001).

This critical ERP literature challenges the "neutral" claim of the rationality of ERP systems use, opening a potential area of value conflict between management and employees. The ERP literature has not focused, however, on the social relationships between different functional areas that are tightly integrated through enterprise-wide systems use on a daily basis. A central theme of the ERP vision is integration. Many have noted, along with Akkermans and van Helden (2002, p. 36) that "surely, ERP systems are really about closely integrating different business functions; this is what sets them apart from many other IT efforts" (Al-Mudimigh *et al.*, 2001). Kallinikos (2004, p. 9) highlights this fundamental assumption of ERP by claiming that, "in the world ERP systems help bring about, there are no isolated acts". This vision of integration assumes that key participants are willing to cooperate in the kinds of tighter work interdependencies brought about by ERP use, freely sharing and faithfully acting upon detailed information. But what value conflicts will these (frequently unmentioned) key participants experience – the shop floor supervisors, the quality control engineers, the database technicians, the parts buyers, and others – as they try to use an ERP system? What role, if any, do value conflicts between functional areas play in helping us better understand the complicated ERP story?

The ERP case study at Peak

We examine the value conflicts between functional areas through a case study of ERP use at a computer equipment manufacturer (we use the pseudonym Peak). Peak is a medium-sized (approximately 400 employee) producer of relatively high-volume parts for computer input and output devices, including mice, high-end keyboards, and printers, located in the western United States. Peak is an award-winning manufacturer that has been featured in professional publications for their world-class manufacturing practices. At the time of the study, Peak had been using their ERP system for two years, mostly for production planning, purchasing, accounting, and sales.

The research objectives of the Peak case were to:

(1) find out which information resources provided by ERP were being used across functional areas, and which were not; and

(2) to capture the interpretations people offered for why they did, or did not, engage in cross-functional cooperation through ERP.

In the tradition of symbolic interactionist sociology (Strauss, 1987), this research sought to understand the way that participants themselves viewed the ERP system. "Understanding the social repercussions of any technological system requires that we be able to see it from the perspectives of the people who are likely to use it and live with it" (Kling, 1996, p. 9).

The case study examined the use of 21 different kinds of information resources, divided into four broad types: scheduling, inventory, design, and quality information. The research used a participant observation approach, which studies everyday life through the performance of participant roles (Jorgensen, 1989). Participant observation attempts to gain access to the "insider's" world of meaning and action through prolonged and wide-ranging access to a situation (Lincoln and Guba, 1985) using multiple forms of evidence, including direct observation, interviews, and documents (Altheide and Johnson, 1994).

Case selection. Peak was chosen as a case study site because it offered extensive access (including seven months of physical presence), and because it had been using an enterprise-wide ERP system for enough time (over two years) to overcome technical implementation problems. But perhaps the most important reason is that Peak was an award-winning, high performance, profitable manufacturer in an extremely competitive industry. For rhetorical reasons, it is important not to have instances of non-adoption explained away as "poor" or "dysfunctional" management.

Data creation. The researcher in this study (the author) and Peak management agreed that the researcher could work at Peak as an unpaid employee for up to one year, but would be identified to study participants as an academic working on special IS projects. This created a role somewhere between complete insider and outsider (Patton, 1990). Over seven months, the researcher spent between 10 and 20 hours on site per week. Data for the case study consisted of daily observation notes (totaling 150 pages), 58 interviews, and all internal newsletters issued during the study. Interview text in *italics* is an exact quote, while plain text is a close paraphrase written immediately after an interview (tape recording was not permitted). One prime informant from each of the main functional areas was interviewed multiple times, while other employees were targeted for interviews as a check on the prime informant (Table I).

Data analysis. Participant observers "seek out multiple indications (or indicators) of what an idea means, including how it is used" (Jorgensen, 1989, p. 35). While a range of data analysis techniques is consistent with participant observation, the grounded

Functional area	Interviews with prime informant	Interviews with other informants	Total
Accounting	5	2	7
Buyer/Planners	5	7	12
Design engineering	7	2	9
IS	10	5	15
Production	2	1	3
Quality	2	1	3
Materials	5	4	9
Total	36	22	58

Table I.
Interviews at Peak

theory approach (Strauss, 1987) shares this basic model of concepts and indicators. The grounded theory process is described in more detail in Strauss (1987) and Patton (1990).

Managing risks of participant observation work. Ethnographic field work carries with it a number of risks (Klein and Myers, 1999) which include: the risk of confirming preconceived theoretical ideas, even in the face of contradictory evidence; the risk of creating a single interpretation of a situation, when in fact there are multiple interpretations held by different groups; and the risk of uncritically accepting the biases and systematic distortions of informants. Grounded theory techniques were used to engage in constant comparison, and a deliberate search for negative instances of any emerging theory. Attempts were made to engage with multiple interpretations of the ERP implementation by developing prime informants in each of the seven functional areas, interviewing and observing across organizational boundaries, and by cultivating a role that was perceived as independent of any particular functional area. A critical stance towards informants was maintained by trying to independent verify, whenever possible, claims about ERP information resources being implemented successfully or unsuccessfully, or about how other functional areas were using the system.

The case study is presented in three parts. The first part identifies which information resources were shared across functional boundaries at Peak through the ERP system, and which were not shared. The second part discusses three cross-functional value conflicts that participants revealed in their accounts of ERP use. The third part discusses how the case findings compare to the theory of Information Behavior and Values presented by Marchand *et al.* (2001).

Case study Part I: information sharing through ERP at Peak

This first section of the case study describes which ERP information resources were used across functional areas, and which were not used. We discuss four different types of information resources implemented in Peak's ERP software package: scheduling, inventory, design, and quality. The patterns of cross-functional ERP information sharing are summarized in Tables II-V. At Peak, ERP information resources were adopted selectively – many resources were used regularly, while others were ignored or replaced with more local information resources.

Scheduling information. An integrated ERP system is designed to hold scheduling information for all production and purchasing activities, usually broken down into weekly or daily time slices. Peak made extensive use of ERP-based scheduling resources. Monthly production targets were entered on to a master production schedule (S1). Most customer orders (S2) were entered into the system, and could be used to automatically generate purchase orders and requisitions for materials (S3), which could then be checked against receipts and shipments (S4).

Information type	Shared through ERP	Not shared through ERP
Scheduling	S1 – Monthly production scheduling S2 – Routine customer orders S3 – Purchase orders and requisitions S4 – Most receipts and shipments S5 – "Projected" customer orders	S6 – Detailed assembly line scheduling S7 – Receipts for "daily delivery" items S8 – Local sales forecasts

Table II.
Scheduling information resources implemented at Peak

At the same time, there were important scheduling tasks that were not implemented in the ERP system. While the system is technically able to schedule activities in weekly, daily, or even hourly time slices, the buyer/planners at Peak only kept a monthly production schedule in the integrated system (S1). The daily details of assembly line scheduling (S6) were kept on a mixture of Excel spreadsheets and printed forms. Why? The buyer/planners responsible for production scheduling explained it in terms of their own need for flexibility. "*We tend to front load the master schedule in the system by putting everything into the first week, and then nothing afterwards.* If we didn't have room to maneuver, *we'd be cutting off our nose*" (Buyer/Planner 1). Another buyer/planner explained that "*We tend to front load the schedule at the beginning of the month*, then we *see how it goes* . . . It's somewhat *mentally based. I always have a general idea of what I can build* . . ." (Buyer/Planner 2). The buyer/planners are reluctant to make detailed scheduling commitments that will be difficult to change later. The assembly line workers, however, require much more detailed schedules than monthly targets, and this is recognized by the buyer/planners. "*. . .I can see it. It has some pluses, but it got confusing for the* (material handling and production group). They need something simpler. . .*The system is fine with me. It works for me better*" (Buyer/Planner 2). Peak keeps a five-day schedule on a combination of spreadsheets and paper forms.

Table III.
Inventory information resources used at Peak

Information type	Shared through ERP	Not shared through ERP
Inventory	I1 – Inventory movements and locations for all products	I2 – Work in process (WIP) inventory tracking on factory floor I3 – Detailed tracking within the warehouse I4 – Lot tracing for safety-related and exported products I5 – "Double checking" information on labels

Table IV.
Design information resources used at Peak

Information type	Shared through ERP	Not shared through ERP
Design	D1 – Bill of materials information for all products	D2 – Parts lists and restocking diagrams for shop floor workers D3 – Additional regulatory information

Table V.
Quality information resources used at Peak

Information type	Shared through ERP	Not shared through ERP
Quality	Q1 – Some factory status information (e.g. items shipped vs scrapped)	Q2 – Statistical process control charts Q3 – Assembly line performance Q4 – Supplier performance Q5 – Defect and quality reports

The detailed scheduling numbers are negotiated, and reconciled with the monthly master schedule, in the daily meeting among buyer/planners, production, and warehouse personnel.

Another scheduling task not implemented in ERP is the receipt of "daily delivery" orders. The system has the capability to generate a separate purchase order every time material is needed for production, and then check whether the correct material is delivered to the warehouse. For materials that were ordered daily in small quantities, from a trusted supplier, a separate purchase order was not created in the ERP system for each transaction. This reduced the administration required by the buyer/planners at Peak, and at the supplying company. The warehouse people receiving "daily delivery" materials developed their own local tracking system, using paper binders (S7). They recognize that "daily delivery" supply and "blanket" purchase orders (as opposed to a separate purchase order for each delivery) make life easier for others even as they struggle to monitor and control inventory. "(Buyer/Planner 4) *places blanket POs for a year, for a specific quantity. There's no way to track that, though. The system doesn't know what date they're supposed to come in...This all has an effect on your inventory turns. You don't know how successful you are, compared to if you tracked it through a PO. Blanket POs are easier for the supplier*" (Materials 2). "*Tracking daily delivery suppliers is kind of out there. You're constantly pushing the delivery dates. The blanket POs are a small headache in the back of your neck*" (Materials 1).

Peak buyer/planners developed a spreadsheet-based monthly sales forecast (S8), which contained information that was different from the official sales forecast built into the ERP master production schedule. Peak's sales organization was based 600 kilometers away. At the time of the study, there were on-going debates about whether the sales organization should be able to directly modify Peak's master production schedule by entering orders or changing forecasts. Peak buyer/planners used their own local forecasts because "*The second guessing we do is more accurate than the forecasts.* We know more about what's going in. [Does the sales organization know this?] *They don't know that the second guessing is going on...they don't know what they are representing*" (Buyer/Planner 1). The changes that the sales organization can make to the orders in the integrated system are a concern for the buyer/planners. "Most are just change in shipping. Still, *it breeds a bit of distrust. Some individual challenging what we're doing*" (Buyer/Planner 1).

End users at Peak were also able to implement some ERP resources, in the sense that they were regularly used, but used them in a way that was not intended by the ERP systems design. For example, buyer/planners would sometimes enter "projected" customer orders (S5) into the ERP system as hard, firm orders rather than as forecasts. "We have 12-14 week lead times on many of our computer products. Customers can't always give us that much warning ahead of time. Often, *we have to place orders for them in the system* before we get the official order. That's reality. We have to *share the risk. Every major account does this*" (Materials 3). With enough confidence in their customers, Peak would allow the ERP system to treat these "projected" orders as real, and automatically create the purchase orders and scheduling changes implied by them.

Inventory information. The ERP system was used extensively for inventory information at Peak. Every part used at Peak was represented in the system. From the buyer/planner perspective, the information on inventory locations and movements in the ERP system (I1) was well implemented. "*The system is pretty accurate, the due*

dates are accurate. The inventory accuracy is 99.8 percent. That's pretty rare. I haven't had an inventory adjustment in the past year" (Buyer/Planner 1).

For many parts, however, more detailed inventory information was not implemented in ERP. At the time of the study, Peak was attempting to implement an ERP module for tracking inventory movements between different operations on the assembly line (known as work in process (WIP) inventory). The ERP module for WIP inventory tracking was abandoned in favor of a paper-based system (I2). Although the ERP system "*works fantastic. It's the ultimate way to keep track of things*" (Information Systems 1), it was widely recognized that the control benefits for buyer/planners and accountants were meager compared to the amount of extra work it created for production and materials. "*It became too much work...Yeah, they'd probably like it better, but I don't have the time to set it up*" (Production 1). "*Generally, I'm given enough information to do my job...The WIP tracking doesn't buy us much for the work it takes, we didn't have to do that. The buyer/planners are usually pretty much in tune with what's going on*" (Production 2). There was a general awareness of who exactly would be forced to do the extra work of maintaining the integrated information resource. "(Materials 4) *was the original coordinator* of the WIP project. Poor guy. *He'd wind up reconciling, doing the WIP counts. There's tons of little transactions you have to do*" (Information Systems 1).

Peak used two separate, personal computer-based systems for tracking additional lot tracing information (I3). Products with safety requirements face much stricter demands for traceability that the ERP system provided. One important product line "has its own incoming lot number. *It's kind of complicated.* It's the last three digits of the part number, plus one letter for the month, three digits for the year, the tooling number, and the quantity...[*Why do you need a separate lot number?*] *It's different...*[*Why not use the ERP lot number?*] The ERP auto assigns. *We can't change that number*" (Materials 4). Keeping the information resource off the ERP system imposes the work burden on the materials group only, without affecting other groups. Similarly, more detailed information about the status of inventory, and special handling conditions, are kept on paper sheets and sticky label around the factory (I4).

A final group of information resources for inventory not shared through ERP was created in response to a perceived crisis in the past (I5). These paper forms and colored stickers served as a final "double check" on floor activity. For example, "at the beginning of each shift, the operators go over this check sheet, to make sure everything's OK. We track the parts for 3 months, *every component. We had a very costly mistake last year. The material handler put some stock in the wrong container*, and we had almost a whole shift's worth of board with the wrong part. Now they have to *compare when they put it on the reel*" (Production 1). Though they often duplicated information held in the integrated ERP system, these information resources were easy-to-create, immediate solutions to a problem situation. Responding to a crisis through the integrated ERP system is more difficult and time consuming, as Peak found when it tried to start WIP inventory tracking through the integrated system. Much of the initial motivation for the failed project was a product costing data error, which led to many thousands of dollars worth of inventory "disappearing" when it was discovered. "(Accounting 2) *had to go in and tell the general manager why 300 thousand had disappeared. That episode sort of started the whole WIP project*" (accounting 1).

Design information. Peak implemented design information in ERP through the use of the bill of materials (BOM), which specifies exactly which parts, and in what quantity are required to build a product (D1). While other groups at Peak were concerned that design engineers did not always update ERP design information as quickly as they would prefer, we found few examples of design information not being shared through ERP. "*The BOM is only changed by engineers. You could print it yourself. It's updated fast enough, once it's established.* With new products, it's like *this might not work. Those I never trust*" (Production 1). "*The BOMs are volatile*, or at least the *development BOMs. Documentation is slower than knowing*" (Buyer/Planner 2).

One information resource for design not shared through ERP was a spreadsheet database, used to print out part information for posting on the wall next to a sample of the actual product being assembled (D2). "We've set up samples with all the part numbers, so operators know what they should look like. . .I *just copy the numbers from a spreadsheet. If our design engineers had the time and inclination*, they could do it for us. *But they're so swamped I wouldn't even ask*" (Production 1). Keeping a separate parts database increased the risk of data inconsistencies, but provided a useful resource for production workers that did not require the attention of design engineers, who are perceived as too busy to provide this service.

The quality manager kept her own database of safety certification information separate from the ERP implementation (D3). "The BOM is OK. . .Each part has a buyer/planner watching the engineering changes. But sometimes, *because of the paper mill, buyers will sign without checking as carefully as they should*. Specialized things like flammability ratings are *not in that loop. Others are not as concerned* with those issues" (Quality 1). The quality manager was more comfortable with a non-ERP implementation that she could control herself.

Quality information. Though the ERP system used at Peak was capable of keeping track of rudimentary quality information, such as scrap and rework rates for different products, almost no quality information was shared through the ERP system for most products (Q1). "The quality engineers are not taking anything off the ERP. *They could take scrap information. There's no defect information, but there's some reject stuff*" (Quality 1). Yet there was a vast amount of quality information all over the plant, either in the form of charts (Q2) or paper forms (Q3, Q4, Q5).

Respondents at Peak felt strongly that locally maintained process control charts (Q2) were the best means of involving and educating production staff in quality control. One production supervisor created a colorful quality control chart in the shape of a giant watch. "*Here's the quality watch*. The arrows for major and minor defects are set at the beginning of each shift. *It's good for discussion*. . . . On these sheets, the operators use the dots to plot the *fallout from their operations. The operators plot it themselves*. The line lead, *he's going to ask why. That gets the discussion going*" (Production 1). Similarly, local forms are used for tracking assembly line performance. "Almost at each machine, we have sheets to track the performance of parts running down the line. My line leads and I collate these into a monthly status report. . .I need *something simple for me to use. I often use the computer to whip out quick, simple forms. A lot of times I try something quick and dirty*" (Production 1). There is also a recognition that performance information could be sensitive, which is another argument for maintaining quality information off the integrated, highly visible ERP system. "You're

supposed to zoom in on the root causes of problems...while at the same time you have to trust the employees. *Don't humiliate them*" (Materials 3).

Peak made attempts during the study to increase the amount of quality information shared through the ERP system. However, both supplier performance evaluation (Q4) and defect reporting (Q5) continued to be done using information resources off the ERP system. This was explained partly in terms of workload. For example, when evaluating how many parts from suppliers pass quality inspections, "even when we fill in the form, the default is (Peak) responsibility for a quality problem. But we often time don't fill out that part. If it's a change, the whole point is that it's in a hurry, it needs to be expedited. And (Buyer/Planner 5)'s busy a lot of time. Too busy to get our changes in in time. It's a workload issue, a time issue" (Buyer/Planner 1). Because the default setting was often the one entered into the database, the information on supplier performance as report by the ERP system was considered too generous by the buyer/planners to be useful. "*They always looked much better than they should*" (Buyer/Planner 1). The amount of effort to provide an ERP implementation of defect information was also seen as high. In the past, Peak "*did the reports for every line. The person that did that, she had carpal tunnel syndrome. She had to leave. She just retired. There was so much data for her to enter*" (Quality 1). But there was also disagreement between groups about how to measure defect information. "*We don't keep track of downtime in any one central place...Upper management hears that there's too much line down.* So we set up a project to define what downtime means, and collect data on it...The problem was, *I could not get any area to agree with any other areas about what downtime was exactly....The whole thing got me into red tape, and political intrigue, even though no one looked at the data to see what was there*" (Materials 1).

Case study Part II: value conflicts at Peak

Using the ethnographic data from Peak, we identify three important areas of value conflict that participants used to explain their information behavior. While these three value conflicts were not the only areas of cross-functional conflict at Peak, they emerged as core categories in the data analysis because of their persistence across multiple functional areas, multiple information resources, and the duration of the study period – these were not explanations of isolated examples by single participants. The three areas of value conflict are:

(1) Conflicts over work priorities – Integrated systems may require participants to do extra work that does not benefit them directly. Which functional area does the work of entering quality information into an enterprise system, and who benefits from that work?

(2) Conflicts over dependency on the commitments of others – Integrated systems that project into the future can force participants to depend on what participants in other functional areas claim they will do. Will participants be willing to depend on the future commitments made by other functional areas?

(3) Conflicts over evaluation fairness – Integrated systems make work activity visible to others in new and sometimes peculiar ways, at the same time inviting others to evaluate that work activity from a distance. Will our functional area's work activities be evaluated in a fair and reasonable way?

Each of these value conflicts places a strain on the close and trusting social relationships needed for cross-functional cooperation through ERP.

Work priorities. ERP users at Peak express a common awareness that high workloads and general "busy-ness" lead to tradeoffs between different work activities. "*We have to make tradeoffs. It's the nature of the company. . .We don't have the people to do it. The workload is too high*" (Materials 1). A common perception at Peak is that all employees have too much to do, and very few resources to do it with. "*We've been trying to do so much, for so long, with not enough resources* that all of us are exhausted. *There are peaks and valleys in any business, but the way it's been going*, who knows if it will ever be calm again" (Buyer/Planner 3). "*We're lean and mean to the point of anorexia*" (Materials 3). Given these conditions, Peak employees do not expect perfection. "*Other things are a real mess right now. With our workload, some things you just have to close your eyes on*" (Accounting 1).

End users are therefore aware that different groups within Peak have different work priorities. "Getting people *to do their own follow-up, that's a real time management problem*. We've got some *differences in priorities* around here. . .*Our priority number one is to support production and shipments*" (Buyer/Planner 1). "They have their priorities. We've got our priorities. *If they're ringing this bell over here*, we're over there. I'm not surprised. They're materials. They've got their thing. We've got to worry about the production line" (Buyer/Planner 2). Peak employees have well-developed views of the priorities of different functional areas, and these are repeatedly mentioned when asked to explain why ERP information resources are shared or not. For the WIP inventory tracking (I2), for example, all of the functional areas involved expressed a clear sense of differing priorities, and which areas would benefit most from using an ERP-based information resource. "[Who would want WIP tracking?] *The buyers would love to know exactly what's in WIP. It's a black hole. They don't know how much to order. The buyer/planners continually have the material coordinators do semi-physical inventories*. They do it on the tally sheets. The product manager, *he wouldn't care. He'd just say, you'd owe me more people to do these transactions. The material coordinators, they would hate it. They would have to do all these adjustments all the time*. They'd have to do *all this work*" (Accounting 1).

Concerns about different work priorities can be found in all four types of information resources studied. Local information resources for scheduling (S6, S7) were explained in terms of mismatches between the work priorities of buyer/planners, materials, and production workers. ERP implementations of inventory control proved too difficult when too much of a work burden was imposed on certain groups (I2), while numerous non-ERP resources were created to serve working needs without involving the integrated ERP system (I3, I4, I5). The few information resources for design not shared through ERP were explained through the low priority given to additional design information by design engineers and buyer/planners (D2, D3). The reluctance to implement quality information in ERP (QL1, QL2, QL3, QL4) was explained, in part, by local working priorities and workload issues (i.e. needing something "quick and dirty").

When other functional areas are not perceived to share the same work priorities, people consider developing their own local information resources, using whatever means they have available. "Some of the groups are keeping other data *for their own benefit*" (Buyer/Planner 1). "*People try to use the systems that are there*. But if it doesn't work, they'll say hey, *I'll do my own thing*" (Materials 3).

Dependence on future commitments. Employees at Peak shared a concern about whether other functional areas intended to live up to the commitments represented in

the shared ERP system. Workers at Peak view the production planning and control system as a holder of commitments, particularly when discussing future scheduling information. "*Major schedule changes have a way of coming back to you*... We've got to make sure that suppliers *meet their commitments*" (Buyer/Planner 1). There is tremendous concern about whether the commitments represented in the schedule are "real" or not. "I can't believe what I've just been hearing. *We've been screwed*...*I don't know what's real anymore until we build. It used to be when the funds were let go, it was real. I have a sales forecast now that means nothing to me*" (Materials 3). "We're trying to *keep the schedules real*. There's always supplier slippage" (Buyer/Planner 1).

Given a common interpretation of scheduling information as commitments that are either "real" or "unreal", Peak employees expressed their reasons for using ERP information in terms of whether they could rely on other groups to present a "real" picture. The creation of sales forecasts outside of ERP (S8) was explained in terms of a distant sales organization not being perceived as supplying "real" commitments, only poorly informed guesses. Conversely, when buyer/planners and the materials group at Peak had confidence in the future intentions of their suppliers, they would maintain even "unreal" or "projected" commitments as firm sales orders in the ERP system (S5). Unlike the discussion of priorities above, assessments of other groups providing "real" or "unreal" commitments were only used to explain the adoption of one type of information, scheduling.

Evaluation fairness. Peak employees recognize that there are different ways of making work activities visible, some more legitimate or reasonable than others. For example, the buyer/planners were asked why they were no longer rated by the number of tasks that are on schedule, a measure emphasized in the ERP system. "*They did rate us on that at one time*. Doesn't really work, though. *If you want me to concentrate on that, fine, I will. Even if the line goes down*...*You can always play with the numbers*" (Buyer/Planner 3). "It's not a good number, because we could make it look good by scheduling everything way out. Nothing would be late. But the line would come crashing down" (Buyer/Planner 1). Some activities are more visible than others, and visibility can shift depending on organizational interests and important events. "What's most visible isn't necessarily the same thing as high dollar. *It's political*. Some products are real hot, get all the attention" (Buyer/Planner 3).

Definitions of reasonable and unreasonable means of evaluating played an important role in the sharing of quality information in particular. Part of the explanation offered for why supplier performance evaluation (Q4) and defect reporting (Q5) were not implemented in ERP had to do with the difficulty of obtaining agreement about evaluation measures. The problem of agreeing upon performance specifications or requirements is an issue often remarked upon by the quality group. "*It's a thankless job for quality engineers to match requirements*...*it's such a subjective topic. I wish it weren't*" (Quality 1). The widespread understanding of visibility as shifting due to organizational interests, and varying from reasonable to unreasonable, helps to explain why non-ERP information resources for quality (for example, Q2) were justified in terms of avoiding "fear" and "humiliation" in production workers. "They are most effective when they *spot trends visually, and when they feel good about themselves*. If they see a problem, they have to *let us know right away*. We can't have them *fear that they will be held responsible*" (Production 2). With the more highly integrated resources for quality information in ERP, it is more difficult to put these fears to rest.

Case study Part III: a theory of information values

The final part of the case study relates our findings back to the larger information systems literature through the theory of Information Orientation (Marchand *et al.*, 2001). The theory of Information Orientation is one of the few theories in IS research that explicitly addresses values in information use. The purpose of this comparison is to serve as a check point for the concepts derived through the ethnographic work, and to relate our findings to research beyond the narrow confines of the specialist ERP literature.

From a review of the major schools of IS research, Marchand *et al.* (2001) created a concept of Information Orientation. An organization's Information Orientation is a measure of a bundle of practices and behaviors that lead to improved business performance. Information Orientation consists of three parts: Information Technology Practices, Information Management Practices, and, most relevant for this case study, Information Behaviors and Values. In their survey of 1,000 managers in 26 countries, Marchand *et al.* (2001) report that higher Information Orientation scores are associated with improved business performance and industry leadership.

In their theory, Information Behavior and Values consists of six separate values that should be maximized in any organization. These positive information values are listed in Table VI.

How does the analysis of value conflicts in the Peak case challenge or support the theory of Information Orientation?

Integrity. In the Peak case, the scheduling information resources were linked to questions about the integrity of other functional areas, particularly whether they would put "real" commitments into a schedule and then live up to those commitments. The *integrity* value links information use with a set of social relations that extend well beyond the information system. The idea that information use is about trusting others, and not simply the raw accuracy of information, is supported by the Peak case, particularly for the inventory information.

Formality. The pattern of ERP selective adoption at Peak argues that the development of more local and informal information resources is pervasive, and relatively easy. The use of informal resources is tied to all three value conflicts, but

Information value	Definition
Integrity	Use of information in a trustful and principled manner
Formality	Willingness to use and trust institutionalized information over informal sources
Control	Extent to which information about performance is continuously presented to people to manage and monitor their performance
Transparency	Openness in reporting and presentation of information on errors, failures, and mistakes
Sharing	Willingness to provide others with information in an appropriate and collaborative fashion
Proactiveness	Active concern to think about how to use information, obtain new information, and the desire to put useful information into action

Table VI.
Positive information values in the theory of Information Orientation

particularly to the issue of work priorities. The case study challenges, however, whether *formality* is a value that can be maximized, or even should be maximized. As long as there is a division of labor in organizations, and time is limited, the presence of value conflicts suggests that formality will always be a tension to be managed and negotiated, not a value to be maximized.

Control and transparency. The Peak case supports the inclusion of *control* as an important information value that participants are very concerned with, but again disputes whether continuously presenting performance information to unspecified "people" is a value to be maximized. How performance is measured, and what the results are used for, is an important potential area of value conflict. At Peak, there was widespread awareness of how performance evaluation, if done unfairly, could lead to either dysfunctional behavior or retrospective "witch-hunts". The ERP users at Peak tell us that the question of evaluation is fundamentally about fairness, which implies much more of a potential for value conflict than the neutral concept of error *transparency*.

Sharing and proactiveness. The Peak case only examined which information resources were *shared* over a sustained (seven month) period, not how *proactively* that information was used. While *sharing* information might seem to be an obvious virtue, the Peak case argues that the presence of value conflicts between functional areas puts serious limitations on how much ERP information *sharing* is practical. The issue, of course, hinges on the definition of "appropriate" information *sharing* in the theory of Information Orientation, and this is what a value conflicts approach seeks to clarify.

This brief comparison between the positive Information Behaviors and Values in the theory of Information Orientation (Marchand *et al.*, 2001) and the Peak case shows how cross-functional value conflicts in ERP use relate to some of the concerns found in the wider IS research literature. The theory of Information Orientation usefully identifies many of the key areas of concern for ERP users at Peak, but does so in a way that obscures the value conflicts over work priorities when time is limited, dependence on the commitments of other functional areas, and definitions of fair behavior.

Discussion

According to our analysis of the Peak case, social relationships between functional areas are critical for understanding how members of different functional areas decide which ERP resources to use, and which to ignore. We identified three areas of value conflict in enterprise systems, focusing not on the specific value positions of each of the seven different functional areas, but on the issues and debates where value conflicts were widespread. Based on this case study, our conjecture is that a workable enterprise system will require the creation of a social and technical system that supports cross-functional cooperation through some resolution or accommodation of these value conflicts.

Implications for ERP research and practice

A focus on value conflicts between functional areas offers a new account of the organizational complexity of the ERP systems that have been the subject of so much research. The Peak case argues for both closer attention to the richness of social relations in ERP use, and for closer attention to the exact technological resources that

are being used or ignored. The integration ideal of ERP is a social accomplishment, rather than a software package to be purchased and implemented. ERP use demands a set of close and trusting social relationships between functional areas that have not always cooperated in the past.

For ERP practitioners, the value conflicts approach offers both a specific and a general message. The specific message is that the three value conflict questions (work priorities, dependency on commitments, and evaluation fairness) can be used to identify potential ERP problem areas, and to clarify the costs and benefits of different ERP choices for various functional areas. Even without focusing on these three specific value conflicts, the general message is that value conflicts between functional areas are fundamental to enterprise systems. No matter what specific approach or method is used to aid in an ERP implementation, participants should ask basic questions about value conflicts. Who are the groups involved? What are the important value conflicts in this situation? What are the tradeoffs for the value positions of different groups – who wins, and who loses?

Implications for IS research and practice

ERP is only one of many modern computerization movements (Kling, 1996) that would benefit from a clarification of value conflicts and social choices. As IS research develops more explicit awareness of computerization values, such as in the theory of Information Orientation (Marchand *et al.*, 2001), we should be careful not to forget the presence of value conflicts, and the need to explicitly identify the system choices that will support or impede specific value positions.

The approach to value conflicts illustrated by this paper argues for both greater social specificity and technological specificity in IS research. Rob Kling tirelessly argued for theory and practice that was based on a realistic, as opposed to an oversimplified or ideal, set of assumptions about social relationships. Identifying value conflicts requires ERP researchers to be much more specific about social relationships – such as the relative costs and benefits of tighter inventory tracking for production managers vs accountants or warehouse workers – than has been the case previously. At the same time, identifying value conflicts also requires ERP researchers to be more specific about technology choices – for example, the different conflicts around scheduling vs quality information – rather than treating ERP as a monolithic package to be implemented (a peculiar irony, given the modular design of ERP software). The calls for greater attention to technological detail (Orlikowski and Iacono, 2001) are not in conflict with greater attention to the social. They naturally follow from each other: conflicts imply that choices must be made.

Perhaps the most intriguing challenge for the future is how to facilitate discussions of value conflict in the world of IS practice, to bring about Rob Kling's hope that computerization choices might be made in a much more socially benign way. Traditionally, the response of IS researchers has been to provide more tools, methods, and education for technology designers, in support of their role as technology builders. Interestingly, in the Peak case, members of functional areas outside of IS were making many of the decisions to use, ignore, or create replacements for various parts of the ERP system. The value conflicts identified were largely social – how to divide and coordinate work, how to evaluate fairly, how to develop trust – but each with a vital technological component. To influence this world of practice, IS researchers will need

to provide ways of clarifying value conflicts and social choices in enterprise systems for non-technology specialists. "Users" are making "design" decisions through the everyday, practical choices they make at work.

Conclusion

In Rob Kling's work, computerization is a human process involving value conflicts and social choices. Claims about how people could, or should, computerize are inevitably claims about how to organize human beings, as well as how to organize IT. Rob proposed that social analysis skills should be part of the education of every information and computer science professional.

Integrated enterprise systems place new demands on cooperative relations between functional areas. This paper discussed an example of computerization where the assumptions about highly integrated social relationships were sometimes reasonable, but sometimes invalid. When participants perceived that the value conflicts were accommodated in a balanced and legitimate way, they chose to use information resources within the enterprise system. When the conflicts were perceived as too great, participants chose to ignore the enterprise system, or develop their own competing information resources.

The challenge of incorporating value conflicts in discussions of computerization is still with us, despite all the clarity and force of Rob Kling's arguments over the years. By recognizing that organizations are heterogeneous, rather than homogeneous, and that technologies offer many different potential configurations, we can move closer to a world where the outcomes of massive computerization projects like ERP are as beneficial as possible for all participants.

References

Akkermans, H. and van Helden (2002), "Vicious and virtuous cycles in ERP implementation. A case study of interrelations between critical success factors", *European Journal of Information Systems*, Vol. 11 No. 1, pp. 35-46.

Al-Mudimigh, A., Zairi, M. and Al-Mashari, M. (2001), "ERP software implementation: an integrative framework", *European Journal of Information Systems*, Vol. 10 No. 4, pp. 216-26.

Altheide, D.L. and Johnson, J.M. (1994), "Criteria for assessing interpretive validity in qualitative research", in Denzin, N.K. and Lincoln, Y.S. (Eds), *Handbook of Qualitative Research*, Sage, London, pp. 485-99.

Bagchi, S., Kanungo, S. and Dasgupta, S. (2003), "Modeling use of enterprise resource planning systems. A path analytic study", *European Journal of Information Systems*, Vol. 12 No. 3, pp. 142-58.

Chae, B. (2001), "Technology adaptation: the case of large-scale information systems", *Proceedings of the Twenty-Second International Conference on Information Systems*, pp. 581-5.

Hanseth, O., Ciborra, C. and Braa, K. (2001), "The control devolution: ERP and the side effects of globalization", *The DATA BASE for Advances in Information Systems*, Vol. 32 No. 4, pp. 34-46.

Hislop, D., Newell, S., Scarbrough, H. and Swan, J. (2000), "Networks, knowledge and power: Decision making, politics and the process of innovation", *Technology Analysis & Strategic Management*, Vol. 12 No. 3, pp. 399-411.

Jorgensen, D.L. (1989), *Participant Observation: A Methodology for Human Studies*, Sage, Newbury Park, CA.

Kallinikos, J. (2004), "Deconstructing information packages: organizational and behavioural implications of ERP systems", *Information Technology & People*, Vol. 17 No. 1, pp. 8-30.

Klein, H.K. and Myers, M.D. (1999), "A set of principles for conducting and evaluating interpretive field studies in information systems", *MIS Quarterly*, Vol. 23 No. 1, pp. 67-94.

Kling, R. (1978), "Value conflicts and social choice in Electronic Funds Transfer system developments", *Communications of the ACM*, Vol. 21 No. 8, pp. 642-57.

Kling, R. (Ed.) (1996), *Computerization and Controversy: Value Conflicts and Social Choices*, 2nd ed., Academic Press, San Diego, CA.

Lamb, R. and Kling, R. (2003), "Reconceptualizing users as social actors in information systems research", *MIS Quarterly*, Vol. 27 No. 2, pp. 197-235.

Lincoln, Y.S. and GUBA, E.G. (1985), *Naturalistic Inquiry*, Sage, Newbury Park, CA.

Marchand, D.A., Kettinger, W.J. and Rollins, J.D. (2001), *Information Orientation: The Link to Business Performance*, Oxford University Press, Oxford.

Orlikowski, W.J. and Iacono, C.S. (2001), "Research commentary: desperately seeking the "IT" in IT research – a call to theorizing the IT artifact", *Information Systems Research*, Vol. 12 No. 2, pp. 121-34.

Parr, A. and Shanks, G. (2000), "A model of ERP project implementation", *Journal of Information Technology*, Vol. 15, pp. 289-303.

Patton, M.Q. (1990), *Qualitative Evaluation and Research Methods*, 2nd ed., Sage, Newbury Park, CA.

Sia, S.K., Tang, M., Soh, C. and Boh, W.F. (2002), "Enterprise Resource Planning (ERP) systems as a technology of power: empowerment or panoptic control?", *The DATA BASE for Advances in Information Systems*, Vol. 33 No. 1, pp. 23-37.

Skok, W. and Legge, M. (2002), "Evaluating Enterprise Resource Planning (ERP) systems using an interpretive approach", *Knowledge and Process Management*, Vol. 9 No. 2, pp. 72-82.

Strauss, A.L. (1987), *Qualitative Analysis for Social Scientists*, Cambridge University Press, Cambridge.

Further reading

Burrell, G. and Morgan, G. (1979), *Sociological Paradigms and Organisational Analysis*, Heinemann, Portsmouth, NH.

Glaser, B.G. and Strauss, A.L. (1967), *The Discovery of Grounded Theory: Strategies for Qualitative Research*, Aldine Publishing, Chicago, IL.

Kling, R. (2000), "Learning about information technologies and social change: the contribution of social informatics", *The Information Society*, Vol. 16 No. 3, pp. 217-32.

Kling, R. and Allen, J.P. (1996), "Can computer science solve organizational problems? The case for organizational informatics", in Kling, R. (Ed.), *Computerization and Controversy: Value Conflicts and Social Choices*, 2nd ed., Academic Press, San Diego, CA, pp. 261-76.

Scheer, A-W. and Habermann, F. (2000), "Making ERP a success", *Communications of the ACM*, Vol. 43 No. 4, pp. 57-60.