Impediments to knowledge-sharing in a grocery distribution warehouse

Gitte Lindgaard\textsuperscript{a,b} & Sherri Madore\textsuperscript{b}

\textsuperscript{1}Department of Psychology, Carleton University, Ottawa, Ontario, CANADA
\textsuperscript{2}Faculty of Design, Swinburne University of Technology, Melbourne, AUSTRALIA

This paper reports one part of a field study conducted in a large grocery distribution warehouse in Ottawa, Canada. It focuses on the ability of employees at the warehouse to share knowledge with each other. Data were collected in interviews with a sample of the warehouse management, supervisors, and workers fulfilling different work roles. The interviews were followed by observations of three kinds of workers, namely the so-called receivers, assemblers, and loaders. Receivers’ job was to empty incoming trucks delivering products to the warehouse from a variety of suppliers and areas and then to place the products on their respective ‘home’ shelves. Assemblers were picking and shrink-wrapping products ordered by individual supermarkets, and the loaders placed completed orders on trucks delivering the products to supermarkets. A socio-technical framework was applied to the data, which showed that the management philosophy was quite inconsistent with how the work was actually done. In addition, several of the socio-technical principles were violated. These included exerting strict control on some, but not all, workers’ performance, failing to allow workers to become multi-skilled by over-specifying their jobs. In addition, management failed to provide social support or adhere to generic human values in concert with socio-technical theory and philosophy. The data therefore revealed a very negative social work climate, but they also showed that several issues identified as serious impediments to knowledge-sharing were rectifiable with comparatively little effort. Surprisingly, management agreed to introduce some of our recommendations, but the management changed shortly after completion of the project. As a consequence, none of the recommendations were implemented.

Practitioner summary: As researchers with a specific mandate to evaluate two technologies trialed in the warehouse, we went quite beyond that mandate by submitting the data to a socio-technical analysis revealing the ‘bigger picture’ of impediments to knowledge-sharing. We justify this additional work by the seriousness of those impediments and the relative ease with which several of them could be overcome. The application of the socio-technical analysis was straightforward, and the neutral language facilitated our efforts successfully to ‘sell’ that bigger picture to the management in a non-threatening manner.

Keywords: Knowledge-sharing, socio-technical theory, socio-technical philosophy, grocery distribution

1. Introduction

The management of knowledge and knowledge-sharing is very important for organizations to remain competitive in the new knowledge-based global economy (Lin & Lee, 2005), but it remains a major challenge in some industries. Knowledge-sharing may be described as activities designed to help communities of people work together in a democratic fashion to increase their ability to achieve individual and organizational goals (e.g. Dyer & Nobeoka, 2000). Stated differently, the ongoing and open sharing of explicit and tacit knowledge among employees facilitates organizational learning, which is seen to be a key factor for organizations to achieve a sustainable competitive advantage (Spender, 1996; Grant, 1996). Working in a climate in which one is encouraged to share knowledge and ideas would also seem to inspire motivation to share as well as being germane to fostering employee job satisfaction. Although it is recognized that inter-organizational learning is critical to competitive success and that organizations learn by collaborating with
other organizations such as suppliers (Powell, 1996), the unit of analysis here was an individual firm, namely a large grocery distribution warehouse in Ottawa, Canada.

The concept of knowledge-sharing presumes a relation between at least two parties: one that possesses knowledge, and one that acquires knowledge (Hendriks, 1999). Underlying successful knowledge transfer is thus the ability of the former party to articulate the to-be-transferred knowledge and willingness on behalf of the latter to internalize the knowledge and translate it into action. For this to take place successfully, the learning organization would need to cultivate openness and provide a supportive non-threatening climate. Inadequate organizational structures and organizational cultures that do not encourage employees to share knowledge are therefore among the impediments that have been identified as presenting barriers to effective knowledge-sharing (Davenport & Prusak, 1998; Hendriks, 1999). Organizational culture may be described as being integrated, differentiated, or fragmented (Martin 2002), or as operating at a number of levels (Schein, 2002; Borys, 2009).

Similarly, social distance among employees working at different levels in a hierarchically organized company, language differences, as well as differences in mental or conceptual frames, have also been found to prevent knowledge-sharing in an organization (Vriens, 1998, cited in Hendriks, 1999).

Studies in knowledge-sharing typically focus on the impact that new technologies introduced into a workplace might have on the ongoing organizational learning and capability to innovate (Lin, 2007; Scarborough, 2003; Baskerville & Dulipovici, 2006). For an organization fully to embrace workplace democratization however, would seem to require more than a mere philosophy of employees sharing their knowledge. Unless the philosophy is consistent with employee behavior, it will not be possible for an organization to live up to a philosophy of openness. Because of the emphasis on technology in knowledge-sharing studies, the human and social aspects of effective sharing tend to be downplayed. This is where the theory and philosophy of socio-technical systems goes one step further than knowledge-sharing in that it emphasizes both the social and the technical systems contributing to the quality of human work in a democratic setting. In that theory, the social system comprises “sentient ‘components’ aware of their environment and capable of generating new behavior patterns in responses to the changes they perceive” (Eason, 2013, p. 214). Although the technical system is typically intended to support human work tasks, that ideal is often not accomplished. In some instances, the context into which a technical system is integrated changes more rapidly than the technology can be adapted to it; in others, it is not possible for the system designers to anticipate the work as performed. Where an organization purchases software off the shelf, the efforts and costs associated with adjusting it to local requirements, workflows, and routines are often grossly underestimated. As a consequence, the new technology might force workers to adopting ‘workarounds’ (see Blandford, Furniss & Vincent, 2014 for a recent example) in their work.

The objective of the overall project of which a part is reported here, was to help the management of a large grocery distribution warehouse decide which of two interactive technologies would best fit into the workplace. One technology had been in use for some time; the other was being trialed at the time of the study. The comparative analysis of those two technologies is reported in another paper at this Congress (O’Connor & Lindgaard, 2015). However, interviews with, and observations of, many of the workers and the warehouse management revealed a number of serious contradictions between the stated management philosophy and activities in the workplace. Some of these contradictions were detrimental to the performance of the collective warehouse’s task as well as to the performance of individual workers. This observation therefore inspired us also to adopt a socio-technical perspective to the data analysis. Our hope was that insights gained through such an analysis and conveyed in a non-threatening, non-blaming manner might help management to understand how relatively small changes could improve the performance and reduce some of the stress the workers were clearly experiencing. Following Emery and Trist (1965), Chems (1976), Mumford (1987; 2006) and others, data in the present report were thus interpreted in terms of socio-technical design theory and philosophy in an effort to identify potential systemic issues that apparently prevented effective knowledge-sharing at the warehouse.

The remainder of the paper is organized as follows. The next section briefly describes the how a large grocery distribution warehouse functions on a day-to-day basis. Thereafter, we introduce socio-technical theory. Space limitations force us to focus on those aspects that applied directly to this particular workplace in the highly condensed discussion. It is followed by the method section, and then by presentation of the results and discussion of these. A general discussion is then presented culminating in a conclusion.
1.1 Grocery distribution warehouse functions

The grocery distribution warehouse was located on an area covering approximately five acres, with the warehouse occupying approximately 375,000 square feet. The warehouse employed roughly 150 people, with most working in shifts (day, afternoon, night) 24/7. The task of distributing groceries to supermarkets is relatively complex. Products received from multiple sources and suppliers are stored, then assembled according to orders from individual supermarkets, and finally loaded onto delivery trucks. Ordering, billing, the distribution of tasks enabling effective functioning of the warehouse are all organized in a central Warehouse Management System (WMS). The workers use hand-held devices (or hands-free, interactive speech devices) for scanning (or verifying) products received, assembled according to individual supermarket orders, or loaded onto delivery trucks. The WMS links into a transport optimization system, which spans several distribution centers in the Province. Management challenges include catering to the substantial variations in requirements for storage and transportation of different products. Perishable produce, for example, has a very limited shelf life span; frozen foods require different temperatures from cool items such as milk and yoghurt. In addition, a warehouse must honor many different service-level agreements with individual supermarkets. (In this case, these were located in all corners of Ottawa and surrounding suburbs comprising roughly 1 Million citizens. All tasks that contribute directly to the safe handling and delivery of fresh, undamaged groceries to supermarkets must be optimally coordinated to ensure timely delivery while avoiding damage to products.

1.2 Socio-technical theory

The socio-technical theory originated in research at the Tavistock Institute for Human Relations in London in the 1950s. In particular, the introduction of semi-automatic looms in the weaving industry (Rice, 1958) drew attention to the interdependence of people in different work roles on one another and on individuals’ dependence on the tools they used to do their work (Eason, 2011). Around the same time, Emery and Trist’s (1965) research evolved within their perspective according to which human behavior could be influenced by the context in which it was observed (Pasmore, 1995). Eason (2011) describes how these early researchers noted that many “jobs became fragmented or subject to tight control as a result of technical change” (p. 88), an observation that Mumford (1987) had also made in her research. Such tight control would undermine Cherns’ (1976) principle of support congruence, stating that the systems of social support should be designed to reinforce the desired social behaviors. If employees are expected to cooperate with each other, management must also show cooperative behavior. Management philosophy should thus be consistent, and management actions should be consistent with its expressed philosophy. This principle is also articulated in Thorsrud’s (1972) characteristics of a ‘good job’, stating simply that individuals need some minimal social support and recognition in the workplace. Other principles of socio-technical design proposed by Cherns (1976) also of relevance here include the recommendation of minimal critical specification of tasks, which provides workers opportunities to make some decisions about their work. This need for the freedom of individuals to make some decisions that they can call their own is another an important need also emphasized in one of Thorsrud’s (1972) characteristics of a good job. Tasks that are over-specified supports fragmentation of the collective task, thereby preventing what Clegg (2000) refers to as ‘core process integration’, especially if management also exercises strict control on workers’ task performance. The over-specification of tasks relates to the principle of multi-functionality, according to which cross-training is desirable. Breadth of skills achieved in part through knowledge-sharing, thereby increasing workforce flexibility, would seem to be essential to the learning organization. Work activities should thus not be restricted to routine tasks; the distribution of mandatory and discretionary tasks should ideally be approximately equal (Pasmore, 1995), although that might not always be possible. Cherns (1976) points out that people who perform highly specialized fractionated tasks tend to be treated as easily replaceable parts in the larger system. In turn, such an attitude is likely to result in frequent turnover of staff, which in itself, can be detrimental to an organization’s performance. The recommendation to cross-train employees is in line with the notion of multi-skilling that Emery (1978) referred to as ‘redundancy of functions’. Finally, Cherns’ (1976) principle of design and human values is relevant here. It states that the provision of a high quality of work is a very important organizational objective. Presumably, this includes both objective and subjective, perceived quality of work. Clearly, the democratization of work is at the very heart of socio-technical theory and philosophy.
2. Methods

Semi-structured interviews were conducted with 19 staff at the grocery distribution warehouse using a semi-structured interview format. The participating staff included the distribution manager (n = 1), supervisors (n = 7), and staff members (n = 11: dayshift n = 4; afternoon shift n = 4; night shift n = 3) in the warehouse. The interview included questions on demographics (how long worked in the warehouse, how long in present job, educational background) but focused mainly on participants’ perception of the strengths and weaknesses in the warehouse size and layout in terms of supporting their work, about the distribution of labor, and what, in their opinion, an ideal warehouse would look like, how it would function, and what improvements they thought might be desirable and possible to implement in the present setup. Interview data were transcribed ad verbatim and sorted into emerging categories.

Upon completion of the interviews, six staff members were observed while completing a task end-to-end. Two of these were so-called receivers, whose job was to receive incoming products, empty the delivery trucks and placing the offloaded items in their ‘home’ locations. Each receiver was thus observed emptying one truck completely and placing the products. Two assemblers, who pick products from the shelves to fulfill supermarket orders, were each observed completing one full supermarket order. Two loaders whose job was to load orders completed and shrink-wrapped by the assemblers into other trucks delivering these to the supermarkets. Activities were sampled at 20-second intervals in all observations. Worker behavior and impediments to effectiveness as well as impediments to knowledge-sharing were noted.

3. Results and discussion

The findings are presented in three sections below. The first discusses a misalignment between the organizational rhetoric and observed activities. The second addresses the problems associated with job over-specification, multi-skilling, and tight control over one group of workers’ performance. This is followed by an outline of how the principles of support congruence and adherence to human values were violated.

3.1 Organizational rhetoric and observed activities

The distribution manager’s perception of how the ideal warehouse should work was very clear. His main concern was to maximize efficiency by meeting all set delivery times which, in turn, would enable the warehouse to stay within budget restraints and predict product volume to meet forecast targets. The work environment would be safe, accident-free, and foster respect among employees at different levels of the internal warehouse hierarchy with everyone working towards the common goal of distributing product in a timely fashion and avoiding damaged products.

Unfortunately, our observations revealed that the reality of the workplace was far removed from these ideals. In particular, the ideal of ‘everyone working towards the common goal’ was sabotaged by management enforcing strict task-completion criteria on the assemblers but not on receivers or loaders. Assemblers using one of the two to-be-assessed technologies were required to perform within time limits set by the WMS, and assemblers using the other technology were required to complete a certain number of orders on a shift. An assembler who deviated from the time- or quota requirements was severely reprimanded on a first occasion and faced instant dismissal if this happened again. Naturally, this motivated the assemblers to focus exclusively on getting their job done. The ‘common goal’ ideal was thus in direct conflict with management’s strategies for maximizing the warehouse’s effectiveness. Likewise, privileges, for example, permission to leave work early, and bonuses, e.g. free restaurant dinners, were bestowed only on higher-level employees in supervisory or managerial roles rather than being linked to performance excellence or employees exceeding job requirements. As this practice was well known among employees, it did little to foster mutual respect and social cohesion among employees. Democratization of work, so central to socio-technical theory and design, was evidently not among management’s ideals. The next two sections show how the management-imposed requirements impeded knowledge-sharing in the warehouse.

3.2 Job over-specification, multi-skilling, and tight control

...
Contrary to Cherns’ (1976) principle of ‘minimal specification of tasks and jobs and Clegg’s (2000) statement that tasks should be flexibly specified, all workers at the level of receivers, assemblers, and loaders were allowed to perform only their specifically assigned tasks. The strict task-performance times and goals imposed on assemblers motivated them to work fast, which often resulted in lop-sided loads that were dropped off in the loading bays. The loader would then need to pull such loads apart, re-stack, and shrink-wrap them a second time to fit them into the waiting truck. Spending this extra time meant that the loader was running behind with his work. Consequently, the loading bays and surrounding warehouse areas became so cluttered that assemblers simply had to drop their completed loads wherever they could so as to keep within their permitted task-time. As a result, the loader had to spend even more time locating the next load to go into the truck.

Our observations included calculations of those time wastages. The magnitude of these showed clearly that one in three loaders could have been reassigned to other duties if the cluttering and the need to re-stack loads had been prevented.

Another problem with the strict performance timing was that the computer algorithm calculating the amount of time to execute each order did not include information about product weight and volume. Instead, it merely assessed assembler performance time in terms of physical movement from one product to the next in the warehouse. As a consequence of that missing information in the computer algorithm, light products had occasionally already been picked before a heavier product was to be added to a load. Unfortunately, the assemblers’ devices only displayed 1-7 to-be-picked items at a time, depending on the technology and device. This made it impossible for the individual to predict which items were yet to be picked. Stopping to offload the lighter items in order to put them on top of the heavier ones was not an option, as this would lead to an unacceptable increase in task-performance time, which would cause problems for the assembler later. The assembler could, of course, ignore the weight/volume problem and continue stacking his order as per the computer display, risking delivery of damaged (light) products. In one instance in which that was observed, the assembler shrugged his shoulder, saying that, by the time the relevant supermarket would complain, it would most likely be impossible to track the offending load back to him personally. Yet another option was to ‘break the load’ by stopping the order before loading the heavy items. Another assembler would then continue the order by stacking the heavy items first on another pallet. However, the addition of a pallet meant that the load might be too tall to fit into the waiting truck. In those cases, the loader would again have to un- and re-stack the order onto a single pallet.

Although the WMS algorithm was essential for staff scheduling purposes, it made no sense to tie assemblers to the algorithmically predicted task-times. Had the receivers, assemblers, and loaders been trained to multi-skill across all three kinds of task, the abovementioned problems could have been avoided, provided assemblers would not also be tied so strictly to the preset task-times. Indeed, more flexible allocation of multiple tasks, one of the core principles of socio-technical design (Clegg, 2000), would have given the workers opportunities to learn other skills. It would also have enabled them to support one another socially instead of forcing them to focus exclusively on their own fraction of the collective task. Even allowing assemblers that level of independent thinking and decision making without feeling compelled to adhere to the predicted task-times could have added some minimal pleasure to their jobs as well as increasing the collective performance effectiveness in line with the stated management philosophy. Instead, the strict division of labour and the imposed work requirements were shown to comprise serious impediments to knowledge-sharing in the warehouse.

The severe disruptions the violation of the principles of avoiding over-specification, tight management control, and training staff to be multi-skilled had not been articulated or discussed with the management before. Of course, the workers all knew about the problems, but the disincentive of reporting such issues were so strong that inaction was preferred. Instead, without attempting to identify the problem sources themselves, managers and supervisors attributed all of the delaying problems to a lack of assembler training and motivation. Staff turnover rates were extremely high, as the fallacy of job over-specification and exertion of tight control would predict.

3.3 Support congruence and adherence to human values

At the beginning of a shift, a fierce race among employees to secure equipment in good working condition was observed. Many of the handheld devices that the loaders and assemblers used were either faulty, slow, or had missing or very low batteries. If, in the midst of assembling a load, a device ran out of power, the
assembler had to find his supervisor to get it fixed or to be given another device. The WMS booked the time that took as ‘inactive’, a state that was indistinguishable from a worker taking an unscheduled break. Anyone clocking up too many of those ‘inactive’ episodes would be reprimanded, and his account of what he had been doing would not necessarily be believed. Supervisors could be anywhere, and given that the warehouse covered an area of approximately five acres, it could be very time-consuming to locate one. The workers tended to refrain from reporting faulty equipment, as they would sometimes be blamed personally for its condition. Consequently, equipment was often left in poor repair for several days or even weeks before being attended to, and it was not separated from fully working equipment in the bins where equipment was left at the end of a shift. The attitude and behaviour of managers and supervisors clearly failed to live up to the principle of support congruence: workers received no social support, respect for, or recognition of, a job well done.

A case study reported in the literature concerning a field study of a warehouse in London’s dockland, the purpose of which was to distribute food and drink to contractors (Mars, 2009). Mars describes working conditions that may best be labelled as ‘abysmal’. Workers had to take their lunch in the toilet facilities equipped with an insufficient number of old, most uncomfortable chairs; the toilets were most unhygienic, with missing seats and doors. Huge muddy or water-clogged potholes and equipment in poor repair characterized the immediate outside environment. This made transport of goods difficult, and even human movement from one building to the next almost impossible. The workers all lived within a mile of their work in a very poor neighbourhood in which their forefathers had also lived for many generations. Many of the workers were quite old; they would spend their day playing cards in the toilet block, having ‘earned’ their rest over time. Younger workers worked much harder, covering for the older workers and respecting their ‘rights’ while looking forward to eventually taking their turn to spend their days in idle companionship. The remarkable point to note was this extremely supportive social network and the strong social cohesion among these people who had known each other all their lives. No such social support was evident in the Ottawa distribution warehouse. Not only did management fail to support the workers; the workers had no incentive to support their co-workers whom they hardly knew because of shift work and many working part-time. In addition, the workers represented a wide variety of people whose homes were scattered throughout Ottawa. Finally, the huge staff turnover rates also worked against workers forming close relationships or even friendships.

All of the observations and instances described above mitigated against a culture promoting knowledge-sharing and in which the socio-technical philosophy could prosper without intervention and without changing attitudes and habits in the warehouse.

4. General discussion

The prevailing organizational culture in the warehouse could best be described as fragmented (Martin, 2002) and operating at a number of levels, as pointed out in the introduction (Schein, 2002; Borys, 2009). The differential treatment of employees working at different hierarchical organizational levels inspired resistance rather than social cohesion. Despite the very clear organizational structure, the strict vertical and horizontal division of labor further impeded any incentive to provide social support within and between the hierarchical levels of workers. Yet, despite the strongly negative culture, and much to our surprise, the warehouse manager was positively impressed by the findings of this study and receptive to seek to improve matters. The data revealed a sufficiently convincing case to motivate him to seek to repair the damage that especially the effects of the strict work-to-predetermined times imposed on the assemblers had been shown to cause. The severity of this had not been identified or recognized before, but neither had the manager of his top-level staff attempted to investigate reasons behind the suboptimal performance of the warehouse. As a first important step, the management team agreed to work towards introducing multi-skilling among the workers, even though that would mean manual staff scheduling, as the WMS could not be relied on for that. The warehouse manager also agreed to remove the requirement of assemblers to work strictly to the predetermined task-times. Among our recommendations was thus an abbreviated list of conditions under which teamwork would be an effective choice, borrowed from Medsker and Campion (1997), also presented in Clegg (2000). This included acknowledgement of the

• high interdependencies of the three core worker activities
• benefits that flexibility of cross-training could bring to the collective task effectiveness
• need to provide social support by encouraging workers to report damaged equipment
• need to recognize the contribution all workers make to the collective task
• need to identify common measures of performance
• identify ways the workers would agree to participate in defining and implementing changes

While we realized that it would take an ongoing, lengthy, and concerted effort actually to change the prevailing culture, we did not have the skills, experience, or time to pursue it further. Yet, our hope that management would understand the negative impact of some of the rules and requirements imposed on workers was at least fulfilled. The technology that the workers preferred and which was shown to provide more benefits than disadvantages was purchased and implemented. However, this was the point at which our research ended, and although we left the workplace with ideas for how to improve the warehouse’s collective performance, the management changed very soon after the study had been completed. Unfortunately, the new management was neither interested nor motivated to follow through any of the recommendations. As a result, the work culture at the warehouse remains punitive, still experiencing the same high staff turnover rates as before.

5. Conclusion

The socio-technical research framework adopted enabled us to see, and convey, the big picture rather than concentrating solely on the issue of assisting management to select the most suitable technology to support the workers’ tasks. Bringing some of the pressing issues that could be fixed with relatively little effort to the awareness of the people responsible was an interesting learning exercise for us, even if the recommendations that the framework enabled us to propose in a non-threatening manner turned out not to be borne out in the end.

Acknowledgements

We would like to thank all the people who participated in the study and who gave us freely of their time and knowledge. We are especially grateful to the warehouse management who allowed us to complete our research at the warehouse.

References


