Lessons from Frankenstein on Technology and Society

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ABSTRACT
The lesson of Frankenstein is about the need to socialize our creations and, more generally, to care for our society. Service technicians work to make technology function in society; however, their work is poorly understood and little acknowledged. The circumstances of their job, their relationships with both customers and their employers, and even the tools chosen for them by their employers all indicate that the lesson of Frankenstein has not been learned. An effort to create a suitable (and well-socialized) tool for the technicians is described to show how hard it is to create technology with appropriate care and understanding.

Keywords
Work practice, monsters, society, culture, technology

INTRODUCTION
This paper uses the novel *Frankenstein* to think about the relationships of technology and society, primarily as seen from the perspective of service technicians whose job is to make technology work in that society. It is suggested that the essence of the Frankenstein story is the need to socialize our creations, an idea first suggested by Langdon Winner (1977), and beyond that, a need to care for society, to acknowledge, preserve, and honor relationships. Stories of service work are then introduced to show how neglect of society and socialization makes machinery, organizations, and people monstrous; these monstrosities are in many ways the real subject of technicians' work.

Frankenstein tried desperately to forget and ignore his creation; Winner reminds us that technology contains an urge to forget, too. The machines, tools, and arrangements of the service world show a powerful, deliberate ignorance. Among those subjects being ignored are the nature of the machines themselves, the things which must be done to them, the nature of the social relationships in such work places, and the arrangements by which a particular machine comes to be in a particular work place.

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The final section tells of a tool designed to help workers share what they learn on the job. Design of the tool was informed by ethnographic research and included participation by current workers and those who had done the job recently but were now technical consultants. Ethnographic observation of the tool in use found that it works well as a mechanism to provide information and less well as a way to share information. This is because sharing requires abstracting something from one's experience, representing it in writing, and sending it off for review by others. Doing this requires more than mere literacy, and its problematic nature was suspected by none of those involved in the design, including the workers. The result illustrates some of the complex difficulties of socializing technology.

PROLOGUE — THE NOVEL
In Mary Shelley's novel, Victor Frankenstein is a student of natural science at the university in Ingolstadt, in Austria. In the course of his research, he learns the 'secret of life', which includes how to create life, and, without further thought, he sets out to build a living creature. Like most technologists, he plans to build something bigger, faster, and smarter than existing models, and, unlike many, he succeeds.

Frankenstein succeeds in creating life, succeeds in bringing his creature to life, then is overwhelmed with horror, and flees to his room, where he eventually falls asleep. When he awakens to find his creation smiling at him, Frankenstein flees to the courtyard, where he spends the rest of the night pacing up and down, listening for footsteps. When day breaks, Frankenstein flees the house, leaving his creation to fend for itself in the world.

The crucial scene in the novel takes place somewhat later in time. Frankenstein has returned to Geneva, where his younger brother, still a child, has been murdered, and a long–time family servant has been executed for the murder, although Frankenstein is convinced the murder and the evidence for the conviction are both the work of his creature whom he had seen on a mountainside near the place of the murder on the night of his return. Frankenstein takes his grief into the mountains to the valley of Chamonix. On a rainy day, he ascends the Montenvers to visit the glacier, where his creature finds him and insists on telling his story as part of a plea for help from Frankenstein.

The essence of the creature's position is that Frankenstein ignored his responsibilities to his creation, in that Frankenstein failed to socialize him, failed to help him fit into society. The creature is by nature kind, gentle, and friendly toward men; due to his appearance, however, they fear and hate him, and attack him on sight. It is his rejection by society which puts him at war with society. Indeed, the murder of Frankenstein's brother, which was in fact committed by his creation, was precipitated when the child taunted the creature with his, the child's, place in society; that is, the child insisted the creature would not dare to harm him because M. Frankenstein, the child's (and Victor's) father, was a prominent and powerful member of society, who would surely punish this creature whom the boy called 'hideous monster', 'ugly wretch', and 'ogre'.

This experience has convinced Frankenstein's creature that he cannot have normal relations with humankind; human senses forbid it. Accordingly he demands that Frankenstein create a mate for him so that he, too, can enjoy society of a sort. Frankenstein at first agrees but later refuses and destroys his partially completed second creation. The rest of the novel involves the playing out of the creature's revenge; at the conclusion of the novel, at Frankenstein's deathbed, his creature claims that the doing of the revenge has caused far more pain to himself than it could have to Frankenstein. The interesting point here is not the impossible comparison but the fact that Frankenstein almost never felt anything other than fear, hatred, and loathing for his creation since its completion. In some sense, he pronounced his creation a failure in the laboratory and never reconsidered. The problems of its continued existence in the world did not occur to him except as his creature forced them on him, and he only briefly recognized the pain of its outcast and abandoned life during their earliest meeting on the glacier.

MONSTROUS INTERACTIONS — TECHNOLOGY & SOCIETY

For the purposes of this paper, one must consider Frankenstein's creature not as monster, which at least in Mary Shelley's novel is debatable, but as a creation of technology. One must then imagine mediating the failures of the interaction between that monstrous technology and the rest of society . . . .

Much of the study of science, technology, and medicine is devoted to studies of the creators of such things, the researchers, scientists, engineers, and doctors: Victor Frankenstein and his ilk. There are some studies of technicians who assist in the creation or who work in subaltern disciplines like radiology, but the emphasis is on creation in science, engineering, or medicine. The perspective of a service technician differs from these in that the service technician's nominal job is to deal with technology after it has been placed in the world and failed (or at least encountered problems).

For fifteen years I studied the work of technicians servicing photocopiers and other office machines for a single corporation. (Orr 1996, for example) By and large, the corporate view of this work is that it is the directed rote repair of identical broken machines. My analysis suggests instead that it is the maintenance of a triangular relationship between the users of the machine (who are also customers of the parent company), the machine itself, and the technicians who are responsible for this relationship. In this therapeutic role, the technician considers all aspects of the situation including the machine, the users, the location, and the environment, and both creation and creators look somewhat different in this light.

Although the machines are sold (and presumably bought) as rational solutions to common office needs, they have had some monstrous characteristics, particularly the early ones. Some early copiers were built with airtight covers, as it was not unknown for paper to catch fire in the fuser. The idea was to detect the fire, stop the machine, and let the fire extinguish itself; this seemed preferable to delivering flaming copy to the output tray. And the system worked quite well — unless someone opened the door to see why the machine had stopped. So there was an inner door to protect those opening the outer doors from sudden flare–ups . . . . One should remember that this did not happen in the laboratory or other premises in which the machine originated but in the office (usually) of someone who purchased the machine with the intent of doing some work.

Other machines had explosions. One technician told me a loving tale of a high–speed copier of engineering drawings in which any slight hesitation in the transit of paper through the fuser would ignite the paper. This was said to be no problem for A–size drawings, 8.5 by 11 inches, which would vanish completely, leaving no residue. Larger sheets, however, would emerge from the fuser on fire. Some ended up in the cleaning system's filter bag, which typically contains a cloud of toner, the dry ink which forms the image; this is essentially carbon dust of quite explosive character. An explosion here would cause the toner in the walls of the filter bag to fuse, making the whole quite rigid. However, the door through which the technician changed the filter bag was sized for its normal flexible state; after such an explosion, the bag had to be chiseled into pieces and removed as debris.

The technicians do not hate such machines, although they perhaps like them better in the past than as current concerns. Such a machine is a worthy opponent, partner, other, with which to create their identities as those who make it possible for such machines to work in the world. Their job offers some autonomy and independence and some opportunity to exercise their skills; if Frankenstein's creations had no problems, what would the technicians do?

It should be noted that the world in which these creations must function is not unproblematic. Customers may welcome these machines for their capabilities, but many users are

unwilling to learn what the machines require in return: the names of their components, the important distinctions in their supplies, or even how to use the machine correctly. The language issue is important to technicians, and they try hard to teach users how to talk about the machine, its parts and its functions. The users of the machine are their principal source of information about the machine's problems, sometimes the only source, and so the technicians want to know that when a user says 'collator', they *mean* the collator and not, for example, the recirculating document handler, which is found at the other end of the machine.

Learning to distinguish the correct supplies for the machine is important, too; with the incorrect supplies, the machine will at best perform poorly and may not work at all. Some years ago, there was a popular story among our local technicians about a machine which had suddenly begun making extremely light copy. The technician working on it could never find any possible cause for this and finally changed the toner because there was nothing left to try. This cured the problem, which was nice, but the technician was not happy at having a cure for a problem when neither problem nor cure made sense. At this point, a user came in and volunteered that he had recently refilled the toner bottle (which is supposed to be changed, not refilled) and showed the technician the bottle used for the refill. That toner was for a different machine . . . in which the polarity of all the electrostatics on which xerography relies is reversed; that toner simply could not work in the machine in question. Such problems are very hard to diagnose because there is a tendency to think only in terms of the machine and its possible vagaries. The technicians tell such stories to remind themselves that problems can come from the social situation as well, and these problems are much harder because the possibilities are limited only by the imaginations of the participants.

Frankenstein, the creator, does not always make positive contributions to his creature's way in the world, either. The technicians encounter a variety of difficulties which originate with the corporation for which they work. One such is machines made too cheaply, so that parts fail prematurely and frequently. In time, a replacement part may appear, both more substantial and more durable, which must be retrofitted to all machines, but the technicians feel this process wastes their efforts and skills. [1] The technicians believe that other machines are sold prematurely, before their development is complete. Keeping such a machine alive outside its incubator/laboratory is hard work indeed.

Finally, the corporation may promise users that a machine can do things it cannot, or at least cannot in the real world. A small machine was sold as being able to make copies on card stock through its bypass feeder. Technicians servicing this machine found this to be true during its first month or so in use; then the feeder mechanism wore to the point where card stock would jam, although it would go on feeding normal weight paper quite happily. It is true that a complete rebuild of the feeder mechanism would restore the ability to feed card stock, but technicians are allowed neither the time nor the parts budget to do so as often as necessary. Thus, the corporation is not completely dishonest; the machine will feed card stock sometimes but only for a short period of time without interventions the technicians are not allowed to do. However, it is the technicians who have to explain this to the users.

The point to these stories is not how monstrous the machine, how dumb the user, or how deceitful the corporation, although all of these are at least sometimes true. The point is that both machines and their users need understanding, help, explanation, negotiation, and translation for the machines to function in the world, and this is what the technicians really do. [2] It is then curious that the corporation does not acknowledge this work of the technicians, does not concede that work must be done to fit the machines into society, but rather insists that the work the technicians do is the repair of identical broken machines [3].

Nor does it heed what the technicians learn in the field, either about the machines or about the users. The corporation in which I have studied the work of service technicians has never learned how to link the practice of the technicians back to the practice of the creators of technology. There are mechanisms which purport to do this, but the technicians believe they are never heard, and there is little evidence to suggest otherwise. Speculation on why this is so suggests factors ranging from corporate ideology favoring control to the likelihood that engineers and technicians have radically different understandings of the machine, in that engineers know how a machine is *supposed* to behave and how it is statistically likely to fail, while technicians know how they *do* behave and are, further, connoisseurs of the ways in which they fail.

TECHNICIANS, MACHINES, AND *FRANKENSTEIN*

To be explicit about the parallels with *Frankenstein*, my point is that the work of making machines fit in society, the work which technicians do but corporations do not see, is precisely what Frankenstein failed to do, the omission of which turned his creation monstrous and brought about the tragedy of "A Modern Prometheus", as Mary Shelley subtitled her novel. [4] Recent anthropological writings have used the cyborg to

[1] The fact that the choice is so consistently made in favor of cheap price is due to the dynamics of new product development. It is easy to demonstrate the savings from a cheap part, and they are clearly attributable to the producing organization. It is difficult to demonstrate the savings of a better part through reduced service, nor is the attribution of this savings so easy to maintain. If costs are not calculated over the life of the machine in the world, the choice for the developing organization is obviously in favor of cheaper parts.

[2] As well as repair it. They do repair machines which are actually broken, but they do much more besides.

[3] 's definition.

signify the codependence of humans and technology, to emphasize our growing intimacy with our machines. I find Frankenstein to be a more useful metaphor, because I want to argue that a fundamental issue is lack of care for our creations, including our technology, our society, and, for that matter, nature. These constructions and their accompanying distinctions are, in fact, partly motivated by a desire to forget and delete the issues behind them. Langdon Winner's book, *Autonomous Technology* (1977), shows us a technology which is at least out of control, if not actually autonomous, partly because "a pervasive ignorance and refusal to know, irresponsibility, and blind faith characterize society's orientation toward the technical." (p. 314) But this is more than ignorance; Winner says

> " . . . there is a sense in which all technical activity contains an inherent tendency toward forgetfulness. Is not the point of all invention, technique, apparatus and organization to have something and *have it over with*? . . . . Technology, then, allows us to ignore our own works. It is *license to forget.*" (pp. 314–315; italics in the original.)

Something to consider in discourse of work, culture, and technology, then, might be to see what is being forgotten or ignored by using these summary constructions. One may also wonder whether the construction is adequate to replace that which is thus being erased from consideration. Winner finds the Frankenstein story appropriate to his consideration of technology; the gist of both is "the plight of things that have been created but not in a context of sufficient care" (Winner, 1977, p. 313).

Winner's point about Frankenstein's creature, and technologies more generally, is first, that their creation occurs with insufficient care for the interactions between the created and the world in which they will exist, and second, that the creators consistently display a passionate desire not to know about the fates of their creations. Both the lack of care and the determined ignorance exist with respect to society as well as technology

Although it can be read as a commentary on technology and its creation, *Frankenstein* is much more a treatise on the problematics of human society and human relationship. Shelley writes of society as something which must be achieved and which is inherently fragile. Creation or birth is insufficient for participation in society; work at social relationships is essential for social integration to be achieved and maintained. It is Frankenstein's refusal of this work and denial of these relationships which brings tragedy on him, his family, and his creation. However, Winner's points about insufficient care and desire to forget can be seen to characterize not just the development of technologies in late twentieth century capitalism but also the basic relations of society. My earlier examples of the work of technicians are not intended to show just the work on social relationships required for technologies to function in society; the technicians' interactions with their parent corporation also show the denial of those relationships in the corporate pretense that the technicians' work is only the directed rote repair of identical broken machines. [5]

TOOLS FOR TECHNICIANS

The tools which the corporation provides for the technicians and the manner in which it provides them also reflect this denial of social relationships. My earlier work showed that the technicians depend on the community of their peers; it is the community that preserves and circulates the knowledge gained through experience, the community that validates their identities as technicians, and it is to the community that they celebrate their success in stories (Orr 1990, 1991, 1995, 1996). However, this community is not acknowledged by the corporation any more than the social nature of the technicians' work. Recent efforts to deploy computer-based tools for the technicians display both Winner's point about the creation of technology with insufficient care and my point about the denial of social relations.

In 1993, the corporation's service organization distributed a small number of laptop computers with a suite of tools as an experiment. [6] The tools included an expert system (for some products), an electronic version of the machine documentation (for the others), a parts inventory system, a forms editor for various official reports, and a commercial word processor and spread sheet. Other than the commercial packages, nothing quite worked. From both technicians using the tools in the field and members of the sponsoring organization, one found that the expert system did indeed solve those problems for which it had been programmed, but these did not constitute all or even the majority of problems experienced in the field. Indeed, in my observations and those I know, the system only ever solved one actual field

[4] I should point out that I am working exclusively with the novel and only know the movies second hand. From what Winner says about the movies, there are some interesting differences which connect in interesting ways to attitudes toward technology, but I do not have time to deal with them now.

[5] Indeed, the denial of relationship seems endemic. Discourse in business magazines on the future of work in the mid-1990s predicted the disappearance of jobs (Fortune, September 19, 1994) and the transformation of work and working conditions (Business Week, October 17, 1994), but an analysis of some articles revealed all the discussion to be very abstract except the assurances that there will be no job security (Orr, 1994). There was also a strong current of fear in the rhetoric about the need for instantaneous unforeseeable change (as is only natural), and I would suggest instead that, faced with an uncertain future, business writers and managers were intent on denying any relationship connected with employment other than the strictly contractual.

[6] These have since been adopted for general use. The tools are essentially the same, although the parts tool is somewhat better and the documentation is sometimes current.

problem; perhaps it was more successful for others. The documentation was out of date and painful to use. The parts system was sufficiently awkward that no one would try to use it, a telling criticism in that earlier work had found a parts inventory system to be the most desired tool among the technicians (Orr, 1992). The forms editor did not create forms acceptable to the districts in which it was tested. These are fine examples of the creation of technology with insufficient care.

It was known, for example, that the technicians actually spend relatively little time on diagnosis, in that most problems are routine and well–known such that diagnosis is virtually automatic, and yet the corporation invested in an expert system. It should not have been hard to determine that the electronic documentation was not current, nor could it have been difficult to discover that the forms produced by the forms editor were not acceptable to the systems already in use, but this was not done. It is not clear what attempts were made to determine the usability of the parts system, but the fact that the most ardent enthusiasts for new tools pronounced it unusable suggests that they were inadequate. One might also note here the urge to forget, which Winner mentioned; the corporation learned these things, too, by following up their experiment, but they were very slow to act upon the failure of the technology they sent out into the field.

Nor was more care directed to social relations. One may note the omission of an electronic mail program from the list of packages, a particularly significant omission both in terms of my observations of technicians' work practice and the fact that the corporation in question has been selling electronic mail for more than ten years. Indeed, there was not even a suggestion of a bulletin board, although one was eventually created. This includes a primitive mail facility which allows the technicians to send messages to each other but not to other members of the corporation or outside the corporation.

These failures appear perhaps more egregious when contrasted with more localized efforts to assist service work. Beginning in 1991, PARC was involved in an experiment with one district to see whether radio communication between technicians would help their work (Orr 1992, 1995; Orr & Crowfoot 1992). After six months of experience, the technicians were quite clear that the radios helped them with diagnosis, with coordination, with morale, with parts supply problems, and with the training of new technicians, but these were not acceptable benefits from the corporation's perspective, which required demonstrable dollar savings. To the corporation's credit, they did test the radios for themselves and found such savings, but their rejection of the technicians' experience suggests both their distance from the work and their lack of concern about the social relations necessary to do that work.

EUREKA, AN EXAMPLE

In recent years, colleagues in research, with my consultation, in collaboration both with technicians and technical specialists, who consult to technicians, developed a tool for the technicians. The idea for the tool grew from the observation that the technicians make annotations on their documentation, in spite of corporate rules to the contrary. The goal was to permit the technicians to share those annotations, a goal which made sense to the technicians, but this goal ignores the situated nature of those annotations. Annotations are written where they are in the context of work which leads the technician to those pages of the documentation; the writing is done there to provide for future tasks which may bring the technician back to this page and in some sense this context, where the writings may seem relevant We further failed to understand the difference between the work of writing annotations on the right page in context and the work of writing, probably in some other situation, what could be read as the same information, with no way of knowing the context in which it will be read. In fact, in this project we made a remarkable number of erroneous assumptions about shared culture and the naturalness of certain activities, and it is not yet entirely clear what is being forgotten or hidden with this technology.

The tool, named Eureka, was intended to permit and encourage technicians to share what they learn on the job with other technicians. My work has shown how important this learning is to the work of the community and how it traditionally circulates in stories told among the technicians. The intent of Eureka was to widen the circulation of such knowledge by getting the technicians to write it down to be added to a database. The written entity was referred to as a tip. However, the corporation insisted that all such entries be vetted and approved by technical authorities, and it is unclear how much this might discourage the technicians. The initial version was done in France, and the databases were shared by all French technicians. When a revised version was deployed in Canada, I spent some time observing its use both in Montréal and in Vancouver. The Canadian version of the tool is now available to technicians in the U.S.A., and the same database serves both countries.

My initial premise was that it would be hard to observe Eureka, in that it is a tool designed to be used when a technician is stuck and in need of extra resources. Most service calls are fairly routine for most technicians, and they may not even need the documentation, much less additional help. Technicians also may consult with their teammates in times of need before turning to Eureka, if they can. Consequently, I believed that Eureka would be a tool that is probably seldom used but quite important when it is used.

There were two principal findings from my field observations: The first is that almost every technician reports that Eureka has been useful; the second is that while there was a great deal to see in the field, there was relatively little use of Eureka, for the reasons mentioned above. I saw one technician generate a tip, and I talked to one other who had submitted tips, but none of the others had, and few seemed to think it likely that they would.

ON WRITING TIPS

Eureka in France originated with the idea of allowing technicians to share the notes they make on their documentation. In this sharing, however, notes became "tips," and private information became public.[7] All the technicians seem comfortable working with tips; this is the kind of information they have had in technical bulletins throughout their working careers. Creating tips, however, seems problematic for some, only about 20% of the technicians have done so, and it seems worth considering why this might be.

One should begin with the transformation of notes to tips; notes written on the documentation are literally on the right page, and that context is lost when the information is written somewhere else. Moreover, those notes now become entries in a database; something known becomes data, whatever that may be, and must be sorted into the appropriate fields, put into specific slots, structured according to the needs of the software. This rendering of personal experience and understanding, in a form not indigenous, determined by others, must then be sent off to others for their approval, which is decisive.

In earlier work I have reported the use of stories by the technicians to circulate what they have learned from specific experiences servicing the machines. A common response in computer science circles was to suggest that such stories be collected in a database; the objection to this is that it ignores most of what we know about stories. To begin with, it treats stories (and their analogue here, tips) as found objects, whose meaning is constant and inherent in the object. On the contrary, the telling of stories is a situated activity in which the story is co-constructed by the teller and audience, permitting easy repairs, if necessary. Moreover, in the service world, stories are usually told by competent practitioners to other competent practitioners; this shared frame of reference permits stories to become extremely elliptical and compact, but they can be elaborated on demand. Technicians have no trouble rendering their experience in words to each other or to other competent listeners.

Writing experience as a data base entry, however, seems problematic; tip submissions are not co-constructed. The rendering of experience as text and the decision of how much context must be defined and how much left implicit are very different matters from the rendering of experience as story in discourse with others who respond. Writing may be natural for academics, it is not clearly so for others, and indeed, the technicians have not normally written narratives. They have filled out forms to report their work; what they wrote was primarily a list of numbers defining the affected areas of the machine, a crude specification of the problem, and a list of the parts used. With these forms, however, it is relatively clear what goes in each box. It may, then, be more curious that some do write than that many do not.

There are other problems; one is in the noticing of and abstraction from one's activity. Most technicians find their own practice unremarkable; they may have been servicing a product for ten years and know that what they do is more (and less) than is specified in the documentation, but picking out any piece of it to become a tip is difficult. Service activities do not segment neatly, except sometimes into discrete service calls; the decomposition of a call would be arbitrary, and the choice of a portion of one's routine activity as noteworthy and reportable to someone not there does not seem to happen naturally for these technicians.

TWO TIPS

On one field trip, the technician I was observing solved a problem that would become a tip, and indeed, he wrote it up and sent it in that evening. It was a good problem, in which the machine was being misled by the originals to be copied and could not be coerced to do the right thing with that original in that place. He was delighted, telling me that it was very satisfying, that finding a problem like that is enough for one day. He also reminded me that we would never have understood the problem if we had not met the user and seen the set of originals.

On another field trip, the technician had recently solved a couple of problems that would make good tips, but he had not written them up. When I asked him about writing tips, he told me all about the problems, with great detail and enthusiasm. Then he got to the issue of writing up, and his tone went flat. He said, "I suppose I should, because, what is it? Fifty dollars or something?" This is not enthusiasm.

What would account for this difference? The first technician has been fixing these machines for 21 years; the second, only a few years. The first has been a technical specialist, a consultant to other technicians with a mandate to teach and share expertise. It is possible that the experience as a specialist prepares technicians for writing tips through previous experience trying to communicate what they know. Certainly the technicians I met who had submitted tips were often former technical specialists, but I am not sure that that is enough of an answer, because not all former technical specialists had submitted tips.

ON EUREKA

Our experience with Eureka raises questions about our construction of culture and technology, particularly our assumption of the continuity of culture (in spite of Leigh Star's warning to beware of presumptions of universality and to expect multiplicity (Star, 1994)). Thus, the expectation that, because we write, the technicians will write was a particularly vain one, nor did we consider the differences between notes in the documentation and tips for, or in, a

[7] I think there are some questions about the category of tip, where it came from and what it really means. Here it refers to a fairly self-contained relatively small piece of information, and as such it seems a familiar concept for technicians to use, although not to create.

database. The question suggested by Frankenstein is 'What kinds of care do our culture and technology need if ideas and implementations like this are to work?'

Winner's point about technology as a means or excuse for forgetting seems supported. Technicians mostly work alone, and while the circulation of information within the community has been essential to their work, communications with their colleagues have not been easy. This tool will allow those few in the corporation who knew about the importance of lateral communications to forget; they can assume that this tool will fulfill the need for the circulation of information. Our constructions of both technology and culture, that is, our presumptions about writing and the similarity of databases and less structured forms of information, added to managerial disinterest in the doing of the work they supervise, will not let us see that the tool is not actually working for most technicians, and the existence of the tool will hide the work the technicians do to communicate as they always have. Truly, a tool created without sufficient care.

There remains, however, this curious category, the tip, which seems to summarize the lessons of Eureka. The technicians seem to find tips natural to use, but only a few find them natural to write. I do not know why this is so, and I am unsure how to investigate the reasoning behind things not done. Perhaps the technicians would write more tips if they had e-mail and became more used to writing. The fundamental point for those concerned with technology is this: the current instantiation of Eureka illuminates the fundamental strangeness of representing bits of our experience and then sending them off to a machine in the hopes of getting them back again when we need them.

CONCLUSION

If technology is occasionally monstrous and users sometimes hostile, it is far more often true that the creators and vendors of technology pay little or no attention to the fit of that technology with society. One might argue that the existence of technicians to do that work frees the technologists of that need, but the technicians' work is little regarded and those things necessary for its doing only occasionally provided. If society is something that must be created and cared for, the social relations around technology are often ignored or even denied. Technicians servicing machines must maintain not just the machine but a triangular relationship involving themselves, the machines, and the users of the machines, but the corporation which pays them to do this ignores all of the work other than that with the machine. Moreover, the tools that the corporation chooses to deploy display both insufficient care for their real role in the world and a denial of the importance of social relationships around technology. This is indeed the essence of Frankenstein's tragic flaw.

The implementation of Eureka suggests some of the difficulties inherent in socializing technology. We are reminded that society and culture are not uniform or continuous. While literacy may be common, writing remains situated, and attempts to relocate the activity to a new context cause problems for the tool and its users. This suggests that efforts to socialize technology must ultimately be as situated and sensitive to local context as the individual actions of service technicians.

In Mary Shelley's novel, Frankenstein's refusal to help his creation be part of society makes him monstrous, makes his creation monstrous, and ultimately destroys both of them. His refusal threatens society, which depends on viable relationships, but as the refusal is limited to an individual instance, so is the damage. If post–modern industry denies the relationships necessary to the functioning of society, what kind of monsters do we become (although one would certainly prefer to say 'they'), what kind of monsters will emerge from our society, and what then will limit the damage?

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