Instead of holding *assurance of* public health, safety and welfare to be paramount, qualified public paramountcy thereby means that the engineer shall hold *acceptability of risk* to public health, and so forth, to be paramount. Questions like "Acceptable to whom?" "What are appropriate grounds for acceptance?" and "What are reasonable methods of assessing risk?" are answered in the contexts of public law and methodological precedence as existing in the lore of engineering. Thus, the engineer *can* comply with qualified public paramountcy rules.

Discussion Questions

1. Why does Taft Broome argue that the conventional science conceptions of engineering are incorrect? How does the debate of public paramountcy fit into this argument?
2. What are some of the problems with engineering codes of ethics that require engineers to hold public welfare "paramount"? Why is the notion of public paramountcy inconsistent with the new conception of engineering, according to Broome? To what extent do you agree with this claim?
3. How does Broome make the notion of public paramountcy consistent with the new view of engineering?
4. How could Broome's conclusion be used to help engineering firms make ethically sound decisions about just how safe their products should be?
5. Are the responsibilities imposed by Broome's theory "ordinary" in the sense described by Welch (Chapter 2) or are they more consistent with Smith's "separatist" account (also from Chapter 2)?

Trade Secrets and Patents in Engineering: Ethical Issues Concerning Professional Information

EUGENE SCHLOSSBERGER

ADVANCING HUMAN PROGRESS, a key value of the engineering profession,[1] usually requires the free and open exchange of ideas and knowledge. Yet companies cannot afford research and development if the knowledge they acquire at great cost is freely appropriated by their competitors. When Company M simply appropriates Company N's costly research, Company M has lower research costs than Company N, and so, other things being equal, can produce the same product or service more cheaply. So, in a market economy, the goal of advancing human progress demands a trade-off between sharing knowledge and protecting knowledge. An ethical approach to patents and trade secrets maintains the right balance between those two goals. Engineers must find that balance when addressing three ethical questions about the use of professional informa-

[1]See Schlossberger, Eugene, *The Ethical Engineer* (Philadelphia: Temple University Press, 1993), which contains a more detailed discussion of some of these issues.

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tion: May an engineer use professional information obtained while working for another employer or client? When is it ethical to reveal trade secrets? Is it wrong to "get around" patent laws by making minor changes in a patented process or device?

Types of Professional Information

Professional information in engineering falls into four categories: patented information, trade secrets, tricks of the trade, and general knowledge.

General knowledge is information that is generally available. Information found in textbooks, journal articles, university courses, seminars, and conferences [is a form] of general knowledge. The two defining characteristics of general knowledge is that the information is publicly available and its use is not legally restricted.

Tricks of the trade are harder to define. They are shortcuts, problem-solving strategies, unofficial solutions to common types of problems, ways of thinking, approaches, and other nonpatentable information and ideas one learns by working and by being around others who have had considerable experience. Tricks of the trade include what one learns through an apprenticeship, from a mentor, or through working together with other experienced professionals. Tricks of the trade are insider information, information not publicly available but learned from one's own experiences as an engineer or by being privy to the experiences of another engineer.

Trade secrets are either proprietary information or business secrets. Business secrets include specific company plans or business data not available to the public. Proprietary information includes specific secret processes, ingredients, etc.

Patented information is publicly available information whose use is legally restricted.

Revealing Information

There are several reasons why engineers changing employers are obligated to respect the trade secrets of their previous employers.

Engineering is a co-operative venture. In addition to workbenching (leaving plans or models on the workbench for everyone to look at and make suggestions), engineers often talk about aspects of their projects with other engineers. The "workbench mentality" is an important part of the culture of engineering that benefits engineers, their employers, and the society at large. Engineers benefit because the workbench mentality gives them a sense of being part of a community dedicated to important goals, rather than hired hands coming in to do a task. It stimulates creativity and excitement, challenging engineers to be the best engineers they can be. Employers enjoy greater productivity, both through improvements due to other engineers' input and through increased employee motivation and job satisfaction. The public benefits because the result of this cooperation and brainstorming is a better, cheaper, and/or safer product. In short, engineering as a field is justifiably committed to the workbenching mentality. But, obviously, employers cannot permit, much less encourage, a workbenching mentality if employees who see the company's advances and discoveries might take them to a competitor. A necessary condition for a workbenching mentality is a firm understanding that employees who become privy to a company's secrets will not use those secrets for (or reveal them to) a competitor. In a sense, then, engineers, by working as engineers, make an explicit or implicit promise to respect trade secrets. Put another way, the duty to respect trade secrets is a justifiable institutional duty of engineering, and hence anyone who chooses to become an engineer has a duty to respect trade secrets.

A second argument concerns the duty of loyalty. Engineers are professionals, and their contract with the firm they work for calls for a semi-fiduciary relationship: in exchange for their salaries and benefits, engineers are expected not simply to perform whatever tasks they are assigned, but to employ their talents and abilities for the benefit of the company. Engineers receive various benefits from their status as professionals, including higher pay and greater respect. To accept these benefits of their semi-fiduciary status without fulfilling the obligations of that role is dishonest and unfair. So engineers have fiduciary duties of loyalty to their companies. When an engineer's employment at Company N ends on March 9, the scope of her duties of loyalty to Company N stops at March 9—she has no loyalty to Company N concerning matters that arise after

March 9. However, her duties of loyalty do not end on March 9: she continues to have duties of loyalty to Company N concerning her work for the company before March 9. After all, fiduciary duties are duties of trust, and trust is ill placed if the information or other advantages obtained during the period of trust may be used against one after the fiduciary relationship concludes. You would not, for example, confide in your attorney if he felt free, after the trial, to broadcast what you told him. So trade secrets continue to be protected by the duty of loyalty even after employment ends.

Finally, respecting Company N's trade secrets when the engineer moves to Company M, by forcing the engineer to try novel approaches to problems, has the potential to advance human progress.

On the other hand, there are good reasons why general knowledge an engineer acquired during employment should be considered the property of the engineer. After all, the employer has no special claim on that information itself—it is public information. The employer might have paid the cost of the engineer's learning that information, but one cannot gain the right to restrict someone's use of widely available information simply by being the one to tell her about it or by paying for someone else to tell her. If one could, one might eventually gain a virtual monopoly on the use of information in a common reference book simply by mailing the book to enough engineering students. Thus it is widely acknowledged that engineers may make use of any general knowledge they might have when changing employers, even if that general knowledge was acquired on the job or as a result of courses or conferences paid for by the employer.

Tricks of the trade present the most difficulty, as it is sometimes difficult to distinguish between tricks of the trade and trade secrets or between tricks of the trade and general knowledge. As noted in *The Ethical Engineer*, it is absurd to expect an engineer to try on Company M's time a solution that she has already seen will not work when working at Company N. Doing so ill serves the engineer's loyalty to Company N and to the goal of advancing human progress.

In sum, the general rule in engineering, is that general knowledge and tricks of the trade go with the engineer while trade secrets stay with the employer.[2]

The duty to respect trade secrets, like most duties, has limits and is sometimes overridden by more urgent duties. Trade secrets that are themselves improper or immoral are not covered by the duty to respect trade secrets. That P Company's secret process illegally infringes a patent is a trade secret, but not one that engineers have a special duty to protect: the duty to respect that trade secret is *voided*. (Of course, the engineer retains her general duty of loyalty to the company, a duty that might affect how and to whom the engineer reveals the information.) In other cases, the duty to respect trade secrets may be *overridden*. An engineer morally obligated to blow the whistle on a safety issue might need to reveal trade secrets in the process of explaining and documenting the danger. Because the trade secrets themselves are not morally tainted, the duty to preserve trade secrets remains, but must bow to the more pressing duty to alert the public or proper officials about a severe safety hazard. Overridden duties are nonetheless duties and can have important consequences. The duty to respect trade secrets requires at least four things of an engineer blowing the whistle:

1) The engineer should make every effort to avoid having to blow the whistle, for example by exhausting all in-house remedies.
2) The engineer should make every effort to reveal as few or as little about trade secrets as possible in the process of blowing the whistle.
3) The engineer should make every effort to restrict access to the trade secret (reveal it to as few sources as necessary).
4) The engineer should make every effort to inform the company beforehand about trade secrets that must be revealed.[3]

[2]Some businesses try to restrict use of tricks of the trade in direct competition, for example, by asking employees to sign employment contracts guaranteeing that they will not compete with the employer for so many years after leaving or within a certain radius. Such contracts are unusual in engineering.

[3]Philosophers sometimes talk about *prima facie* duties and final duties. We all have a prima facie duty to keep our

Respecting Patents

Engineers are generally required to keep to the letter of patent and copyright laws. To what extent is it unethical to make modifications in a patented process that do not violate the law but amount to "stealing" the idea? Engineers must find a balance between being fair to the patent-holder on the one hand and, on the other, loyalty to their employers' interests and to the goal of advancing human progress. There is no formula for finding such a balance, but *The Ethical Engineer* lists four relevant questions:

1) To what extent has the patent-holder had the opportunity to benefit from the patent?
2) Is the modification a genuine improvement on the original or just a device for skirting patent laws?
3) How significant is the modification? How big a change is it?
4) Is there any doubt about whether using the modified process is legally permissible?

promises, but sometimes our final duty is to break a promise, such as when I promise you I will attend your dinner but must break that promise in order to rescue my son from a burning building. This example shows that the distinction is at best misleading, because it ignores the distinction between voided and overridden duties. If I discover that a promise I made was obtained by fraud, I nonetheless made a promise, and as a result I may have some duties to innocent third parties who acted in reliance on the promise, but the duty to keep the promise is voided. By contrast, the duty to keep my promise to attend your dinner is overridden by the duty to rescue my son. Both are *prima facie* duties, but the moral situation, the nature of the moral pull exerted by the duty, is quite different in the two cases.

Conclusion

As with most human activities, an engineer's revealing or using information falls into three categories: cases that are clearly permissible, cases that are clearly impermissible, and difficult cases about which there is legitimate doubt and disagreement. The factors discussed above help an engineer in identifying which choices fall into the first two categories and in coming to an ethically defensible view about difficult cases. Ethics, as Aristotle says, is not an exact science, but that does not mean it yields no results. Some choices are clearly wrong. Some choices are clearly permissible. Some views about the remaining choices are reasonable and others are not. Engineers must make a good faith effort to weigh all the relevant ethical factors and, to the best of their abilities, make ethically defensible choices.

Discussion Questions

1. What is professional information? What are the guidelines suggested by Schlossberger for determining whether an engineer may use professional information obtained while working for another employer or client?
2. According to Schlossberger, is it ever ethical to reveal trade secrets? What about general knowledge or tricks of the trade? Do you agree with his claims?
3. Schlossberger suggests that the duty to respect trade secrets has limits, and is overridden when various conditions are met. What moral theory (or theories) might justify his analysis of the limits of the duty to respect trade secrets? How might someone disagree with his analysis?
4. To what extent do you think it is unethical to "get around" patent laws by making minor changes in a patented process or device?