Engenharia de Software

José Cascais Brás

Tópico 1

Learning Objectives

PROFESSIONAL SOFTWARE DEVELOPMENT

What is meant by software engineering.

SOFTWARE ENGINEERING ETHICS

A brief introduction to ethical issues that affect software engineering.

CASE STUDIES

An introduction to three examples that are used in later topics.

KEY POINTS

What is important to retain

SOFTWARE ENGINEERING

Ethical Considerations

❑ There are ethical concerns directly related to the practice of software engineering which are not merely fanciful questions or intellectual exercises.

❑ The practicing software engineer engages in a social process during software production and thereby acquires obligations to: users, clients, customers, colleagues, supervisors, the organization for which he works, and the discipline of software engineering.

❑ The ethical problems faced by the software engineer involve: the end product, the process of developing that product, and the human interactions in the development of the product.

SOFTWARE ENGINEERING

Ethical Considerations

❏ Computer ethics, according to the mass media, seems to include every conceivable misuse of computers. Many books on computer ethics contain little more than litanies of illegal or malicious acts one can engage in with computers.

❏ These acts are sometimes described as conundrums and leave one with the impression that there can be no progress in ethics.

❏ Many of the media reports of computer disasters are really pointing at symptoms of failed professionalism.

SOFTWARE ENGINEERING

Ethical Considerations

❑ The practicing software engineer has great potential to effect the lives of others and he has been made aware of this potential by overblown media reports.

❑ The ethical concerns of the practicing software engineer include the types of issues in the media reports.

❑ The media emphasis on these issues makes interesting reading but it misleads us about the significant ethical issues for the professional software engineer.

❑ As practicing professionals, the boundary of the software engineer's ethical concerns go beyond these `pop ethics' issues.

ETHICAL CONSIDERATIONS

Why We Need to Address Ethical Issues In Software Engineering

"When we think about software development, ethics isn't always the first thing to pop into our minds. After all, when creating software, you as a developer are supposed to address technical questions such as functionality and project specifications. But what we usually fail to recognize is that software and technology affect people's lives on a personal level and have the power to make them either better or worse."

ETHICAL CONSIDERATIONS

Why We Need to Address Ethical Issues In Software Engineering

"Everything people do today involves some kind of software. Driving a car, buying food, communicating, commuting, watching TV, shopping online - the list goes on and on. These technologies power our lives and are inseparable from human life.

Technology has even changed how businesses operate. In order to be the first to introduce products to the market, the best in development, most innovative in products and services, many enterprises overlook the side effects of their ventures and the issues they may cause to people's lives."

ETHICAL CONSIDERATIONS

Why We Need to Address Ethical Issues In Software Engineering

"Let's face it—there are companies that don't play by the rules. I'm not pointing fingers here, but it's a fact that companies hungry for profit do overlook common ethical business standards. Software developers get involved in unethical practices by working for cheating companies that put their own profit above people's lives and turn away from the consequences.

With technology being a huge part of our daily lives, you can't separate it from the ethics that affect daily life. They shape how we consume and how we create.

That being said, it is the responsibility of software engineers to provide users with a secure and transparent program that they can trust. After all, with great power comes great responsibility."

ETHICAL CHALLENGES FACED BY SOFTWARE DEVELOPERS

❑ At first sight, it is easy to think that the technical part of development is not directly related to people's lives. After all, it is the business practices that really affect users. However, software developers are the ones who know what their products can do.

❑ As consumers, we trust software providers to help us to optimize and improve our day-to-day lives in exchange for information like our name and email address. As software developers, we trust software providers to make good use of our creations. This trust is supported by vague regulations that still have a lot of loopholes if you know where to look. No one is completely protected from the unfair practices of software providers.

❑ Here are some of the ethical problems that software developers should be aware of when creating their products and choosing which companies to work for.

PROTECTION OF CUSTOMER DATA

❑Numerous websites' services exist in large part to gather your information.

❑Take Google for instance. Here is some of the information it has about you: where you've been, your search history, applications you've used and with whom you use them, your YouTube history, etc. Google even allows you to download all the data they have about you—in all honesty, it would fill a huge number of Word documents!

PROTECTION OF CUSTOMER DATA

❑ What happens if the government or another legal entity demands information on clients from the information you've gathered with software you built? Where does your moral commitment lie? Have you conveyed your strategies clearly to your clients, and how have you secured their information?

❑ Personal data security is one of the biggest concerns in the digital world because of the sensitive information that your clients trust you with. Personal information is a point of interest for many organizations, from national security to cybercriminals. The companies that don't have policies in place for how to act in these kinds of situations place their clients at risk by not informing them of how their data will be treated.

INTELLECTUAL PROPERTY

❑In the fast-growing and profoundly aggressive innovation industry, software engineers and proprietors should practice caution to guarantee that their creations are properly protected inside the system of innovation rights.

❑Software development deals with interrelated issues that consist of a blend of copyright, patent, trademark, and competitive advantages law. To make sure that the customers are protected from unethical business practices, people in the software development business should be familiar with all these factors and how to implement them effectively. Unethical practices caused by the lack of knowledge do not excuse software developers from taking the responsibility for how their actions affect people's quality of life.

OWNERSHIP OF COPYRIGHT

❑In theory, you as a software developer own the copyright to your software creation, and no one can copy, distribute, display, or make changes to it without your permission. When it is created by a third-party engineer or a development agency, copyright agreement should always be involved in the collaboration process to define and protect the rights of the code creator and the client who originally had the idea. Registering copyright prevents your business from getting into trouble over ownership rights.

❑Typically, after the product has been commercially published, the source code is kept confidential to protect it from illegal copying and distribution. Using copyright to protect your source code is beneficial for the company because it provides a convenient way of securing intellectual property rights.

LICENSE AGREEMENT

❑If a client requires a software engineer to convey source code, the parties should clarify whether the client needs to claim the source code or simply modify or update the product later.

❑If the parties agree to a product permits agreement where the source code is required to be revealed to redo or refresh the product, the engineer may incorporate an arrangement under which the client is committed to keeping the source code confidential.

LICENSE AGREEMENT

❑These aren't the only ethical issues to watch out for. From hackers and cybercriminals to companies overlooking errors, these all fall under concerns about the state of ethics in the software engineering world.

❑These issues may seem distant and unrealistic until you actually face them. The truth is that no one is 100% protected, which is exactly why ensuring that companies follow software development codes of ethics and avoid shady practices should concern everyone from consumers to developers themselves.

ETHICAL SOLUTIONS

❏The tricky part about ethical questions is that they address a person's own moral code that has been formed through years of education, family, and societal impact. Add to it that life is not always black and white, and you have yourself a nice brain-twisting puzzle.

❏Even though facing these ethical dilemmas as software developers seems tricky, there are solutions and steps we can take to do better.

ETHICS EDUCATION

❑The most important step to take is to educate yourself and other software engineers about the ethics of your work. Development bootcamps often skip this part in favor of practical knowledge that can be used directly at work.

❑Technology is not neutral. Educating people about ethical issues and the consequences of their actions has become crucial at this point. The mindset of "Do it now, ask for forgiveness later" cannot be ruling business practices.

ETHICS EDUCATION

❑How the company operates is decided by management, not software engineers, and you can be forced to follow the chosen course of action even if you don't agree with it. Educating software engineers about the universal standards of business and software development ethics can improve their understanding of their responsibility to society and how to act on it. It can also help you decide which companies to work for or how to behave ethically in your own business.

FOLLOWING THE CODE OF ETHICS

❑There is a really useful set of rules called the Software Engineering Code of Ethics that indicates the moral and professional commitments of software engineers. This code was created by a global team made up of mechanical, government, military, and instructive experts.

ETHICAL PRINCIPLES

PUBLIC
Software engineers shall act consistently with the public interest.

1

CLIENT AND EMPLOYER
Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.

2

PRODUCT
Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance..

3

JUDGMENT
Software engineers shall maintain integrity and independence in their professional judgment..

4

5

MANAGEMENT
Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance..

6

PROFESSION
Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.

7

COLLEAGUES
Software engineers shall be fair to and supportive of their colleagues.

8

SELF
Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.

IT STARTS WITH YOU

❑ Sometimes, software developers may not realize how much impact they have on people's lives through the products that they create.

❑ Knowing that people's quality of life could depend on how the software in mobile and web applications that they use in daily life was created is a good reminder of the role of software developers in global processes.

IT STARTS WITH YOU

❑ Business ethics are never just black or white, but every developer has their own responsibility to see how their decision to engage in a certain practice during a development process can affect others in the future.

❑ Even though you might not be among the decision-making group in the company, it's everyone's individual choices that can make a change in how companies treat their consumers. Thinking that unethical practices don't concern you is simply wrong—if you know about unfair practices in a company and don't take any action, you become an accomplice to it.

ETHICAL CONSIDERATIONS

CASES
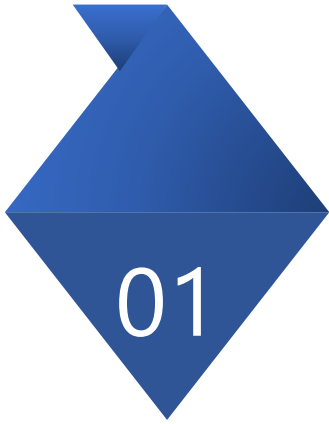
01 The User Interface

02 System Modifications

03 Professional Judgement

ETHICAL CONSIDERATIONS

THE USER INTERFACE (A)

❑ A computer company is writing the first stage of a more efficient accounting system which will be used by the government and will save taxpayers a considerable amount of money. A software engineer is asked to design a user interface for the system. The accounting system and the interface contain all of the functionality described in the requirements. The system is installed, but the user interface is so hard to use that the complaints of the customer's staff are heard by the customer's upper level management. Because of these complaints, upper level management will not invest any more money in the development of the new accounting system and they go back to their original more expensive system.

ETHICAL CONSIDERATIONS

THE USER INTERFACE (B)

❑ A computer company wrote a radar system for ships which identifies incoming aircraft as friend or foe. A software engineer developed a user interface which will display needed information. This information can be used to determine if defensive action is necessary. The radar system and the interface contain all of the functionality described in the requirements. Although all of the information required was displayed, it was not displayed in a way that was adequate for them to distinguish a military attack plane from a commercial airliner. This contributed to the loss of many lives.

ETHICAL CONSIDERATIONS

SYSTEM MODIFICATIONS (A)

❑ A computer company wrote a very complex system for a national bank. The system manages local checking accounts, saving accounts and loans. It also manages the bank's branches. Its effectiveness is partially responsible for the bank's success despite the failure of many similar banks. The bank becomes aware of some things it can do that will better protect is from the threat of lower profits. They request that the computer company make immediate modifications to this system and deliver it within a week. The software engineering department decides to do the work.

ETHICAL CONSIDERATIONS

SYSTEM MODIFICATIONS (A)

❑ A computer company wrote a very complex system for an anti-ballistic missile. The system is being used successfully to shoot down incoming missiles in a current military action. The military determines that the anti-ballistic missile would protect them more effectively if it shot down incoming missiles while they were further away. They ask the computer company to make immediate modifications to the system and deliver it within a week. The software engineering department decides to do the work.

PROFESSIONAL JUDGEMENT (A)

❑ A computer company is working on a integrated control system for a national shoe manufacturer. The system will gather sales information daily from shoe stores nationwide. This information will be used by the accounting, shipping, and ordering departments to control all of the functions of this large corporation. A quality assurance software engineer suspects that the auditing functions of the system are not sufficiently tested, although they have passed all its contracted test suites. She is being pressured by her employers to sign off on the software. Her employers say they will go out of business if they do not deliver the software on time. She signs off.

PROFESSIONAL JUDGEMENT (B)

03

❑ A computer company is working on an experimental fighter. A quality control software engineer suspects that the flight control software is not sufficiently tested, although it has (finally) passed all its contracted test suites. She is being pressured by her employers to sign off on the software. Her employers say they will go out of business if they do not deliver the software on time. She signs off.

ETHICAL CONSIDERATIONS

Carl M. Skooglund:
Texas Instruments
P.O. Box 655474
MS 206
Dallas, Texas 75265

01

THE USER INTERFACE

❑ *This appears to be both a quality issue and an ethics issue. In each case, I would contest the fact that the "interface contains all of the functionality described in the requirements."*

❑ *In the radar example, being unable "to distinguish a military attack plane from a commercial airliner" does not meet the requirement that the information" can be used to determine if defensive action is necessary."*

❑ *In the accounting system case, the customer was unhappy because the interface was "so hard to use." Clearly, the system did not meet end user needs despite the written requirements. And it certainly was far from a "more efficient accounting system."*

ETHICAL CONSIDERATIONS

Carl M. Skooglund:
Texas Instruments
P.O. Box 655474
MS 206
Dallas, Texas 75265

01

THE USER INTERFACE

❑ *Before the government (customer) decides to pull the investment there seems to be some key questions they must ask. Who is the customer, the government agency that will use the new accounting system or the U.S. taxpayers who will save a "considerable amount of money?" Is the problem in using the system, a system design problem or a training issue? Did the government properly define the operating parameters of the system? Did the supplier make a substantial effort to understand end user requirements?*

❑ *It seems that the government and the supplier both have an obligation to the taxpayers to answer these questions so that some lessons can be learned to either correct the situation or at least to prevent a reoccurrence.*

ETHICAL CONSIDERATIONS

Carl M. Skooglund:
Texas Instruments
P.O. Box 655474
MS 206
Dallas, Texas 75265

02

SYSTEM MODIFICATIONS

❑ *If the software engineering department agrees to make modifications in a complex system, it should do so with the understanding that the time required will be sufficient to perform a thorough check out. Pressure to accelerate the work was obviously there driven by financial benefits in one instance, and the potential for saving lives in another. But a premature, poorly designed effort could clearly create unforeseen problems that might cost money and lives.*

ETHICAL CONSIDERATIONS

Carl M. Skooglund:
Texas Instruments
P.O. Box 655474
MS 206
Dallas, Texas 75265

02

SYSTEM MODIFICATIONS

❑ *The ethical obligation of the software engineering department is to understand the requirements and the risks, to apply their best technical judgment and to candidly discuss the options with the customer. Agreeing to perform a task poorly simply because a customer requests it is not acceptable. Any organization must establish internal performance standards that supersede other demands whether the customer agrees to assume the risk or not.*

ETHICAL CONSIDERATIONS

Carl M. Skooglund:
Texas Instruments
P.O. Box 655474
MS 206
Dallas, Texas 75265

03

PROFESSIONAL JUDGEMENT

Pressures of this type are all too frequent, and they often come down to technical judgment and gray area decisions. Fortunately, I have never been confronted with a decision that traded off a quality compromise with going out of business, but we are asked to assume that in this case. I see these issues to consider:

❑ *- Sending out a product that the designer is unsure of could potentially create far greater problems in the future. It could cost lives in the fighter example. Industry is replete with examples of companies that took expedient shortcuts on their way to bankruptcy.*

# ETHICAL CONSIDERATIONS

PROFESSIONAL JUDGEMENT

Carl M. Skooglund:
Texas Instruments
P.O. Box 655474
MS 206
Dallas, Texas 75265

03

❑ *This case points out something very important. If an ethical working environment can be established that promotes candor, open discussion of problems, trust and teamwork, then hopefully a situation will not arise that pits individual against the group. Decisions on whether or not to sign off on an element of work should be made within a team environment. If it's clearly a case of an unethical group against a principled individual, then unfortunately, it sometimes comes down to a question of whether or not that individual should work for that organization. This of course is more easily said than done.*
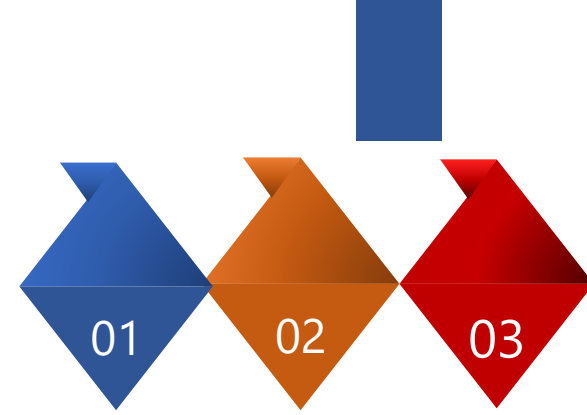
ETHICAL CONSIDERATIONS

Gilbert J. Tumey:
Boeing Computer Services
P.O. Box 24346
Seattle, WA 98124-0346

01   02   03
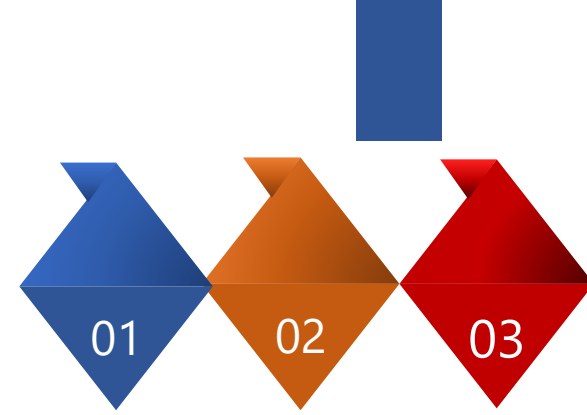
❑ *As in most situations, the biggest challenge in resolving perceived ethical violations is to identify and agree on the issue to be resolved. The situations contained in the three case studies could represent or be the result of any number of issues. These issues could be identified as contractual, management, communications, or ethics related. They could also be any combination of the four.*

❑ *By its very nature, ethics is not a clear matter right or wrong, black or white, or good or bad. Ethics deals with gray areas, perceptions, and the intent of the individual/entity performing the act.*
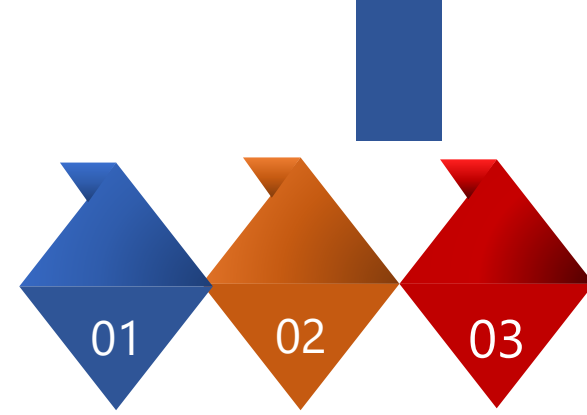
ETHICAL CONSIDERATIONS

Gilbert J. Tumey:
Boeing Computer Services
P.O. Box 24346
Seattle, WA 98124-0346

01   02   03

❑ *In responding to the situations contained in the three case studies, the first task is to identify the issue and reduce it to its least common denominator. Working from the premise that most people are basically honest and want to do the right thing, I believe you can trace the issues associated with these cases to contractual, management, or communications issues. The issue of ethics would only exist if you consider ill intent behind the individual's actions*

ETHICAL CONSIDERATIONS

Gilbert J. Tumey:
Boeing Computer Services
P.O. Box 24346
Seattle, WA 98124-0346

01 02 03

❑ *Most perceptions of unethical acts fade when they come under the spotlight and individuals communicate with one another and become aware their actions may be misunderstood. These situations tend to grow and fester as the length of time increases without open dialogue between the individuals involved. Therefore, it is important to foster an environment where open communication can take place and individuals can feel confident in discussing such issues with those directing their actions before the situation grows out of proportion.*

ETHICAL CONSIDERATIONS

Gilbert J. Tumey:
Boeing Computer Services
P.O. Box 24346
Seattle, WA 98124-0346

01   02   03
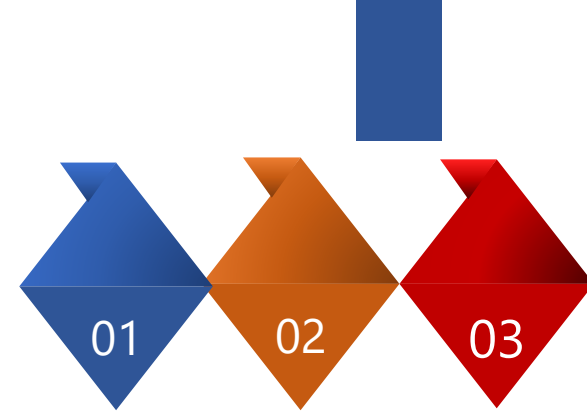
❑ *Another way of demonstrating this point is to look at it from the perspective of decision making. The business decision is viewed from two different perspectives, one being the ethical perspective and the other being the economical perspective. Ethical decisions are classified as being right or wrong, referring to indicators like trust, fairness, and honesty. Economic decisions are classified as being good or bad, referring to such indicators as profit, revenue, or return on investment. In the process of making a business decision one should strive to make right-good decisions, right from an ethics standpoint and good from an economics standpoint. The following diagram illustrates this concept.*

(adapted from Ethics and Leadership,William Hitt)

TWO DIMENSIONS OF DECISION-MAKING

❑ The choice is rather obvious when the situation falls within the `Problem' or `Win-win' quadrants, however, the number of choices can increase when dealing with a `Business' or `Ethical' dilemma. However, we can further reduce the choices in most business situations through increased dialogue. Most ethical situations can be resolved or converted into business dilemmas through communication. Defusing the situation by placing it on the table and talking about it with the parties involved.

TWO DIMENSIONS OF DECISION-MAKING

❑ Relating this to **Case 1**, We would conclude the issues to be business related unless the engineer developing the interface knew the interface was too difficult or intended to hide facts from the customer/user in order to receive acceptance.

❑ If facts were intentionally concealed, it would be a matter of ethics, the issue being honesty. As long as the engineer performing the work was responsive to the requirements, communicated and received approval for changes, and did not try to hide or camouflage the facts, I would not see it as a matter of ethics.

TWO DIMENSIONS OF DECISION-MAKING

❑ Relating to **Case 2**, We would have an issue of ethics if the work was accepted knowing it could not be completed within the allotted time. This would be a issue of honesty when making the commitment.

❑ However, if the commitment was made in good faith and it was believed it could be completed within the allotted time, I would not see it as an ethical matter.

TWO DIMENSIONS OF DECISION-MAKING

❑If circumstances changed after the original commitment, and something happened to change the time schedule, it would become another issue to be resolved and the ethics would be dependent on how the new issue was handled.

❑Assuming open honest communications, subsequent issues discovered and addressed would be business related or judgment issues and not considered issues of ethics.

TWO DIMENSIONS OF DECISION-MAKING

❏ **Case 3** would appear to be more straight forward. The software either does or does not do what it is intended to do. It passes the required test or it does not pass. This assumes the results of the tests are honestly presented. There is nothing wrong with delivering a product that might have shortcomings as long as the customer is aware of what they are receiving and agree with it.

TWO DIMENSIONS OF DECISION-MAKING

❑ This involves talking with the customer throughout the development cycle to ensure there are no surprises when it comes to the final sign off. For the individual to sign off on the software knowing there are serious flaws would be a misrepresentation of the product being delivered and a matter of ethics. I believe open and honest communication is the preferred course of action in this case. The economics of the decision being made or the `fate of the company' does not change the ethics.

KEY POINTS

❑ In summary, ethical issues involve personal values such as honesty, fairness, and trust. Issues of business judgment involve economic indicators such as revenue, profit, production quotas, etc.

❑ Communication is the key to avoiding most issues or perceptions of unethical conduct in the business environment.

KEY POINTS

❏ Hence, the best insurance against unethical activities is for the company, group, or organization to foster an environment where employees feel confident in communicating their thoughts and to ask questions if they feel something is not being pursued in an ethical manner.

Q&A