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A Possible Structure for Moral Problem-Solving in Engineering Ethics

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Abstract

In this inquiry, we try to find a way to deal with moral problems and dilemmas in the realm of technology. We use a procedure that has been introduced in recent years in applied ethics, which is that of design analogy. According to this procedure, we can draw on insights and structures that are used in design processes to solve moral problems. Moreover, for the sake of moral evaluation in this structure, we need an ethical theory. Our proposed ethical theories are Kantian rule consequentialism and triple theory ,which is a combination of Kantian and Scanlonian contractualism and rule consequentialism. It seems that these formulas do not have the weaknesses of other moral theories, and because they offer a compromise between three moral theories, they can reduce moral disagreement among stakeholders and even decrease the complexity of moral problems. At the end of this paper, with the help of a case study, we will show how we can use this framework in actual instances. We will see that this systematic approach can help us state our problem clearly and comprehensively, and that its steps reduce the complexity of our moral problem. Finally, we will be able to evaluate the case with two efficient moral theories without neglecting any important relevant elements. This will lead us to take the right decision, prohibiting or decreasing disastrous impacts of our actions.

Keywords: Codes of Conduct, Design Analogy, Ill-Structured Moral Problems, Kantian Rule Consequentialism, Triple Theo.

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Introduction

Despite the long history of its usage, the ethics of technology is something new: ethicists did not show interest in—or maybe just ignored—this field until recent decades .It seems that with the rapid development of technology, philosophers realized the need to reflect on technological issues ,and on ethical issues, specifically .As philosophers gain insight in this field of study, they realize that our current deliberations on the ethics of technology are not enough: it seems that technology grows so fast that our supervision cannot keep pace with it.

One reason for this shift can be that ancient technology was very primitive and with limited applications. It did not give its users the power to disturb nature's equilibrium and have a great influence on a large number of people and future generations. Its impacts were restricted to the "here and now) "Jonas 2014 p.39). On the other hand, nowadays, our sophisticated technology not only gives us these powers, but also brings us a vast range of opportunities with new applications. These new opportunities give rise to different questions—ethical questions—that had no place in ancient technology.

In this paper, we try to propose an ethical framework for moral problem-solving in the field of technology. First we will try to ascertain the challenges of performing responsible or correct actions in this realm and what questions must be asked before developing a new technology. In the second section, we consider two possible solutions for overcoming those problems—namely, codes of conduct and design analogy. We will show that, aside from its benefits, a code of conduct is not a complete tool for solving ethical problems, but design analogy can be more successful in dealing with them. In the third section, we will introduce an ethical theory according to which we can interpret correct actions; this moral theory is a part of our systematic approach to ethics of technology based on our design analogy.

We use a modified Kantian framework, presented by Derek Parfit, 2011. Kantian ethics is one of the most important and highly debated theories in the history of ethics. However, this theory is faced with a variety of problems and criticisms that have led to philosophers being dubious of its efficiency. In recent years, Parfit, referring to these problems, has attempted to alter Kant's view so that it will be able to solve these problems. Parfit claims that his modified view combines two different ethical theories—Kantianism contractualism and rule consequentialism; moreover, he tries to combine those two theories with Scanlonian contractualism and presents the triple theory, making it perfect for our purpose[1] .In the final section, with the help of a case study, we try to show how we can use this modified Kantian view in the technological realm.

1. Ethics of technology: problems and challenges

In the past few decades, with the rapid growth in different technological fields ,their ethical aspects too have attracted more attention. However, as more and more ethicists and philosophers gain insights in this realm, they discover that ethical problems in technology are not easy to deal with. They have a messy character and usually cannot even be clearly stated. At the beginning of our investigation, we often do not know all the relevant facts and these facts can only be revealed to us in the process of solving the problem. As a result, in solving an ethical problem in this realm, we have to start with a somewhat vague notion and, after achieving some progress and gaining more information ,we need to come back to the initial steps and state the problem more clearly and comprehensively. For this reason, it is often said that ethical problem-solving in technology is an iterative process with feedback loops .Moral problems share this feature with design problems, and it can be said that" moral problems are ill-structured" (Van de Poel & Royakkers 2011 p.135; Albrechtslund.(٢٠٠٦

Multistability and technological mediation are two other problematic notions. Technological objects are multistable in the sense that they do not have a definite or absolute function. Their functionality is defined based on the context in which they are used: these objects can be used in different situations for a variety of purposes and some of these usages cannot be known to technology developers .For example, a nail can be used for hanging a tableau, for carving a sentence on a wall, as a murder weapon, and so forth. This will give rise to a number of complexities in dealing with moral problems and poses questions such as to what extent engineers should look for different functions of the technology they are about to develop, or to what extent they can be held responsible for the vicious usages of their products (Van de Poel & Royakkers 2011).

Moreover ,it should be noted that technological objects are not neutral tools in the hands of their users: they usually have an influence on the context in which they are used. Technology plays two mediation roles for us. The first is related to our perception of the world. Nowadays, with the help of complicated instruments, we can observe many different aspects of our world that were not reachable for us in the past. These tools amplify some aspects of our real world and at the same time they reduce other features. As a consequence of this characteristic, we are faced with new moral problems that were not raised before. For example, is it right to use MRI to detect a disease in a living fetus and consequently prevent him/her from being born (Van de Poel & Royakkers 2011) ?

Technology can also mediate our actions in a way that encourages us to do specific actions and prohibit us from doing others. It seems that when a person uses a technology, they are not completely free. Some philosophers even tend to say that in these situations the actor is the combination of the person and technology, not only the person whose intention leads to the action. This feature gives rise to new moral problems: for

example, to what extent are engineers responsible for this mediation role of technology? Is it right to use this characteristic to conduct or guide people's actions? Is it consistent with a human being's dignity? It seems that engineers must look to these considerations when they try to design a new kind of technology (Van de Poel & Royakkers 2011).

Another issue that emerges in moral problem-solving in technology is that, in different cases, there are various values that are not in complete harmony with one another .In other words, in satisfying one value, we need to ignore others. This means that usually our solutions are not able to satisfy all values and requirements at an acceptable level. For example, we may be forced to give up some safety issues for the sake of producing a cheap product. As a result, a trade-off between values and giving priority to some values becomes necessary in problem-solving and is in some respects a vague and very difficult burden to carry; and sometimes even these are not enough, and we must choose among various solutions that look equally good, and this will add to the complexity of moral problem-solving (Van de Poel & Royakkers 2011; Van Gorp 2005).

In this section, we have considered some of the issues that emerge in moral problem-solving regarding technology and pointed out some of the difficulties and challenges on the way to solving them. In the next section, we will consider some solutions for solving these problems and overcoming these challenges to see whether we can introduce an effective and thorough procedure for dealing with ethical problems in technology.

3. How to deal with ethical problems in engineering

3-1. Codes of conduct

One way to reduce ethical problem complexity and to help engineers, governments and stakeholders as a whole to decide what to do in different situations is the introduction of codes of conduct. These codes can play many crucial roles in an organization, a company, and even in a society. For example, they can highlight values, provide guidelines for action, improve professional reputation, add to people's (engineers, managers, etc.) moral knowledge and concerns, and so forth. But despite these benefits and functions, using a code of conduct has its own shortcomings and is not enough to solve all ethical problems. Because codes of conduct need to be used in many different situations, they are usually written generally and for this reason are somewhat vague. In many cases, it is very hard to draw a clear unique conclusion from these codes and this may, in turn, result in different inconsistent answers to the same question. In these cases ,codes of conducts just add to the complexity of the situation and make it very hard for engineers to overcome a moral dilemma .

Moreover ,there are often inconsistencies between different codes or even within codes of conduct that make it very difficult for us to use them (Martin & Schinzinger 2000). For example, it is possible that two codes of conduct conflict in a given situation and in this way engineers must decide which one is more important and also decide that whether they are allowed to ignore the codes which they think are less important. There is also another reason—a Kantian reason—for concluding that codes of conduct are not a complete tool for solving moral problems .

If we say that codes of conduct are enough for us to solve our moral problems, it means that we consider them to be what is called, in normative ethics, a supreme principle of morality—a

principle that helps us deal with all our moral dilemmas and questions. Some of the candidates for this role are Kant's universal law, consequentialism, contractualism, the Ten Commandments, etc .Kant believed that the supreme principle of morality should provide justification for those duties it commands. In other words, this principle should tell us why a certain activity is among our duties and another is not (Kerstein ۲۰۰۲). For example, it should tell us why we have to give public safety paramount importance and priority over economic benefits. But codes of conduct do not provide this justificatory basis and therefore cannot be a supreme principle of morality. We can therefore conclude that, beside their benefits ,codes of conduct are not complete and we need to consider other ways to solve moral problems and dilemmas.

3-2. Design analogy

A systematic approach to ethics of technology may light our way. Some ethicists like Caroline Whitbeck have drawn an analogy between moral problems and design in order to use insights that engineers gain in the design process in ethics.[2] Constructing an exact analogy is not in the interest of this paper, but we can note some similarities between these two domains.[3] Design problems, like ethical problems, are ill-structured. They cannot be comprehensively and clearly stated; we usually do not know and cannot know all the relevant facts; there is a vast number of solutions and none satisfies all design requirements completely, and so forth. This analogy has two important lessons for us. Firstly, practical problem-solving is not just about choosing a solution from among different possible solutions: it also includes finding new solutions. Secondly, in this kind of problem-solving, we may be able to solve requirements and values conflicts in light of new solutions (Dorset 2006.(

There are different models for design processes in

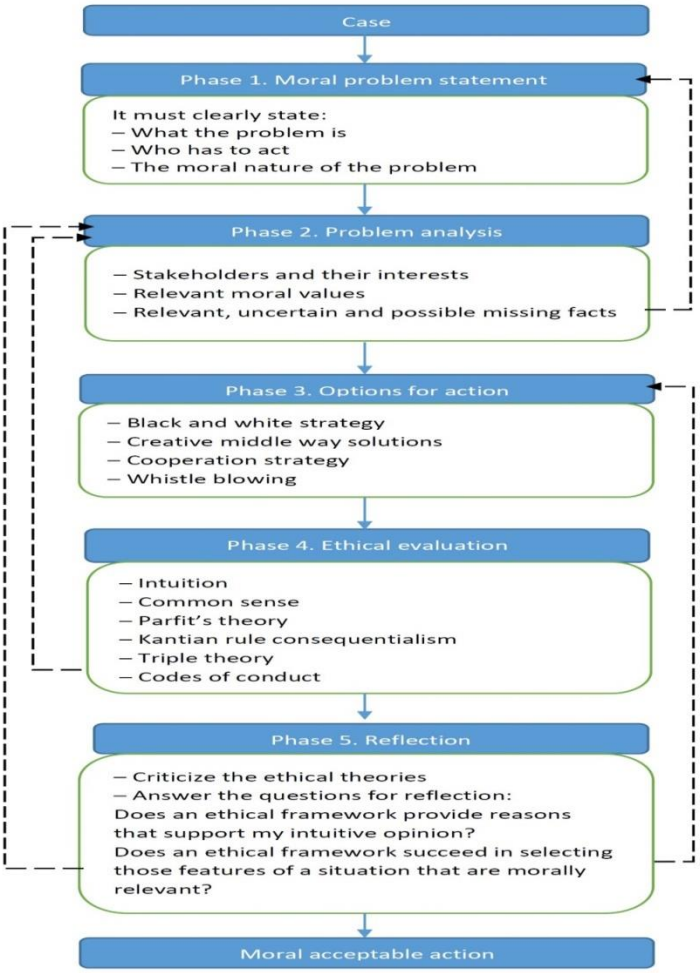
engineering, and we can call them the design cycle. Each design cycle usually consists of a number of steps. In the first step, the design problem is stated and relevant facts and design requirements are introduced. In the next step, a number of possible alternative solutions are devised and evaluated; in this stage, creativity is of paramount importance because, with the help of creative solutions, we are able to arrive at a compromise between different conflicting values. In the third step, one of our conceptual designs is selected and given more detail (Van Gorp 2005; Van de Poel & Royakkers 2011). We can introduce such a structure to the body of moral problem-solving in technology and call it an ethical cycle. Ibo van de Poel does this in his book *Ethics ,Technology, and Engineering* .His ethical cycle has five steps, including the moral problem statement, problem analysis, options for action, ethical evaluation ,and reflection.

In this cycle, as in the design cycle, the moral problem is first stated and formulated. In the second step, relevant elements are introduced, like stakeholders and their interests, relevant moral values and relevant facts. In the third step, possible solutions are generated; again, creative solutions can help us to solve moral dilemmas. In the fourth step, different solutions are evaluated morally in light of a moral framework.[4] Finally, an overall reflection is devised for reaching a well-argued conclusion[5]) Van de Poel & Royakkers 2011). All of these steps can be observed in Figure[1].

Now we can see how this new approach can help us solve or dissolve the problems that we mentioned in the first section. As we have seen, one of the main challenges to ethical problem-solving in technology is that moral problems are ill-structured. There is no definite formulation for them and each formulation may have inconsistencies. Trying to solve the problem is a necessary condition for understanding it comprehensively and for finding relevant facts, etc. and these are exactly the

problems that an engineer is faced with during a design problem. In fact, it has been said that it is crucial for an engineer to be able to finish a task with a partial knowledge of relevant elements. They are able to deal with complexity by putting the problem in a design cycle: as they move forward in the design cycle, they realize new aspects of the problem and , with the help of feedback loops, they can reformulate the problem more comprehensively in the initial steps.

Figure 1: Steps of an ethical cycle



This picture is redrawn from *Ethics, Technology, and Engineering* with small alterations.

Another issue that emerges revolves around value trade-offs. In each ethical problem ,there are usually conflicting moral values that cannot be satisfied by existing solutions: satisfying one means ignoring the others or fulfilling them in an imperfect manner. This difficulty can either be solved or dissolved by using an ethical cycle. As we have seen, one part of this cycle is about finding a new solution, as well as choosing between different ones. In light of new solutions, we can dissolve situations in which different values conflict and a trade-off among them is necessary: these solutions can give us the opportunity to fulfill requirements and values in a satisfying manner.

Technological mediations and multistability are two ethical considerations that directly relate to the design of technology. New technology can mediate our perceptions and actions, and consequently have an influence on our relationship with the real world and other human beings, and this will give rise to new ethical questions and problems in the realm of technology—for example, is it right to use this mediated knowledge to prevent a human being from being born, or to what extent are we allowed to use technology to alter people's actions, and so forth. With respect to multistability, our concern is that new technologies can be used in different ways that are very hard, if not impossible, for developers to foresee. Now the question arises as to whether it is it right to develop technologies that have some unknowable aspects, or can be used in harmful ways.

When we try to design a new technology with regard to an ethical cycle, we are forced to notice different values and moral considerations. Designers therefore try to deliberate on the different mediating roles of their product and make it compatible with moral standards.[6] It should be noted that technologies have a mediating role on human action and perception regardless of whether or not designers attend to the fact, so it should not be in direct contradiction of human dignity

to give these mediating roles a desirable or good characteristic (van de Poel & Royakkers 2011). Moreover ,in this cycle, designers try to predict as many stabilities as possible ; moreover, as they go forward in the cycle, they can find new stabilities and use them in their evaluations. They must also be aware of the limitations of their predictions: it is sometimes impossible to foresee all ways that a product can be used; so, in respect of this, designers must be cautious in developing new technology or using radical designs.[7]

In this section, we have talked about two possible solutions to ethical problems in the realm of technology. We have seen that codes of conduct are not a complete tool for dealing with moral problems and dilemmas. After that, we discussed an analogy between design and ethics of technology. We realized that we can use insights that designers gain in design problem-solving to solve our moral problems. At the end of this section, we showed how this can help us overcome ethical problems and challenges that arise in technological fields. Our investigation is not finished yet: as we have seen, for this ethical cycle to be successful, we need an ethical framework to evaluate different alternative solutions. In the next section, we consider our proposed framework for this ethical cycle, namely Parfit's Kantian rule consequentialism.

4. Kantian rule consequentialism

In this section, we will consider a moral framework, proposed by Derek Parfit, for the sake of our ethical cycle. In his book *On What Matters* ,Parfit tries to show the weaknesses and problems of Kant's universal law formula, according to which: "I ought never to act in such a way that I couldn't also will that the maxim on which I act should be a universal law" (GMS٤٠٢) .Parfit argues that for this formula to be successful, it must be modified; and for this modification, he uses two other moral frameworks, namely contractualism and

consequentialism. Finally, Parfit came up with a new formula that he called Kantian rule consequentialism: "Everyone ought to follow the principles whose being universal laws would make things go best, because these are the only principles whose being universal laws everyone could rationally will" (Parfit 2011 p.418).

In the next step, Parfit argues that his formula can combine three different and very important moral frameworks: Kantian contractualism, Scanlonian contractualism ,and rule consequentialism. He believes that these three moral frameworks would usually give us the same conclusion in our moral assessments, but they choose different routes to arrive at this conclusion. To use his own words, "These people[8] are climbing the same mountain on different sides" (Parfit 2011 p.419). If this is true, it can have many applications for us: for example, it can reduce moral disagreement between ethicists and engineers. In this section, we will briefly consider these three moral frameworks, then introduce Parfit's argument for combining them[9] .In the end, we will present his formula in more detail.

4-1. Kantian contractualism

After Immanuel Kant stated his supreme principle of morality[10] in *Groundwork for the Metaphysic of Morals* ,a lot of philosophers undermined the efficiency of his formula .They believed that this formula would face plentiful problems when it came to use. Some of these problems and dilemmas are each-we dilemmas ,the threshold objection ,the ideal world objection , the rarity and high stakes objection ,and the non-reversibility objection[11]. Parfit tries to modify this formula in a way that it is able to solve these problems. To reach this goal, firstly, he uses another moral framework called contractualism .A key feature of contractualist theories is universal acceptance . Contractualists usually ask us to imagine a situation in which

we want to decide what moral principle everyone can accept. Our decision must be rational and this is possible when we make the best choice (Parfit 2011).

According to the rational agreement formula" ,Everyone ought to follow the principles to whose being universally accepted it would be rational for everyone to agree" (Parfit 2011 p.343). Parfit changes the universal law formula in a way such that it become compatible with this criterion. He puts "everyone" instead of "I" and calls the new formula the Kantian contractualist formula" :Everyone ought to follow the principles whose universal acceptance everyone could rationally will, or choose" (Parfit 2011 p.342).

4-2. Scanlonian contractualism

Scanlon ,on the other hand, uses the opposite route for his version of contractualism in comparison with other contractualists. In his formula, the focus is on what is the principle that no one could reasonably reject, instead of asking what principle everyone could rationally choose or accept. According to Scanlonian contractualism" ,An act is wrong if it would be disallowed by any principle that no one could reasonably reject" (Scanlon 2000 p.197.(

Scanlon argues that the only reasons that can be used for reasonably rejecting a principle are those that are presented by different individuals. For this reason, everyone should reject a principle from his/her side and no one should speak on behalf of a group or collection of people. Because of this restriction, the reasons that are used for rejecting a principle can only be attributed to individuals and this will prohibit them from being aggregated interpersonally. In his view, a strong reason for a person to reject a principle cannot be outweighed by a weaker objection that has more supporters .Moreover, the fact of whether a principle is reasonably rejectable or not depends on whether there is anybody who has stronger objections to each

alternative principle. This means that reasonably rejecting a principle has a comparative nature. It can therefore be concluded that from Scanlon's point of view, each person can reasonably reject a principle only when he/she is able to propose an alternative principle in a way such that no one can present an objection to this new principle as strong as his/her objection (Scanlon 2000).

4-3. Rule consequentialism

Consequentialists take the facts about the consequences of actions as a fundamental element in their view. Consequentialism can therefore be stated in these terms: "Whether our acts are right or wrong depends only on facts about how it would be best for things to go" (Parfit 2011 p.373).

All consequentialists use the notion of 'what makes things go best' in their view ,so we can call this notion the consequentialism criterion. Direct consequentialists use this criterion directly for everything—acts, rules, beliefs—while indirect consequentialists use this criterion directly for some things and indirectly for others. For example, rule consequentialists use this criterion directly for rules and indirectly for actions (Parfit 2011). Such a view can be stated like this" :everyone ought to follow the principles whose universal acceptance would make things go best" (Parfit 2011 p.375). Parfit argues that some of the principles that everyone can accept are in a way that their universal acceptance "make things go best"; he calls them UA-optimific principles and restates rule consequentialism (UARC) as follows" :Everyone ought to follow these optimific principles) "Parfit 2011 p.377).

4-4. Kantian rule consequentialism

According to Parfit (۲۰۱۱: p.378**:**)

> (A) Everyone ought to follow the principles whose universal acceptance everyone could rationally will, or choose.
>
> (B) Everyone could rationally choose whatever they would have sufficient reasons to choose.
>
> (C) There are some UA-optimific principles.
>
> (D) These are the principles that everyone would have the strongest impartial reasons to choose.
>
> (E) No one's impartial reasons to choose these principles would be decisively outweighed by any relevant conflicting reasons .
>
> Therefore,
>
> (F) Everyone would have sufficient reasons to choose these optimific principles.
>
> (G) There are no other significantly non-optimific principles that everyone would have sufficient reasons to choose.
>
> Therefore,
>
> (H) It is only these optimific principles that everyone would have sufficient reasons to choose and could therefore rationally choose.
>
> Therefore,
>
> Everyone ought to follow these principles .

This argument shows that, for Kantian contractualism to be successful, it must result in rule consequentialism. Parfit names this "the Kantian argument for rule consequentialism" (Parfit

2011 p.379). Premise (A) is Kantian contractualism formula and, as Parfit puts it, if other premises were true, this argument would be sound. We do not want to survey these premises[12] and, for the sake of brevity, we accept Parfit's conclusion. As we said, Parfit believes that, to solve Kant's formula problem, we must modify it. In the first step of this modification, he draws on a contractualist concept and introduces Kantian contractualism: "Everyone ought to follow the principles that everyone could rationally will to be universal laws" (Parfit 2011 p.407). In the next step, he shows that there is no non-optimific principle that everyone can reasonably choose. Consequently, this principle must result in rule consequentialism to be successful. So, Parfit introduces his modified version of Kant's formula) Kantian rule consequentialism (as follows: "Everyone ought to follow the optimific principles, because these are the only principles that everyone could rationally will to be universal laws" (Parfit, 2011, p.411).

It should be noted that, according to this formula, the right actions are not the ones that would make things go best, but the ones that are permitted by the best principles. The fundamental element of this formula is that we should follow the principles that everyone chooses to be universally accepted. In other words ,if an action makes things go best but it is disallowed by our best principles ,performing this act would be wrong. In many cases, optimific principles permit us, or even require us, to perform actions that do not make things go best. We should make a distinction between optimific actions and actions that are permitted or required by optimific principles: only the latter is morally right .Optimific principles are the best principles, and actions that are permitted by these principles are morally right[13] (Parfit 2011).

Finally ,Parfit presents his convergence argument and claims that Kantian contractualism, Scanlonian contractualism, and

rule consequentialism can be combined. In his opinion, optimific principles are the only principles that everyone can rationally choose, and the only principles that everyone can rationally accept cannot be reasonably rejected. So ,he states his triple theory as follows: "An act is wrong just when such acts are disallowed by some principle that is optimific, uniquely universally willable, and not reasonably rejectable" (Parfit 2011 p.413).

So ,as Parfit claims, triple theory is supported by three different moral frameworks and, in turn, this theory can provide support to each of these moral theories. If we can show that various moral theories that seem to be very different are in fact consistent with one another and with our moral common sense, and in most cases will lead to the same conclusions, this can give us a good reason to believe in the rightness of our chosen procedure. Moreover, this can be helpful for us to settle the prevalent conflict between different ethicists and stakeholders who believe in various moral frameworks. This is another merit of this moral theory.

5. The Ford Pinto case

In 1968 ,as a result of losing market to other factories, the Ford Motor Company decided to design and build a new small and cheap car quickly. Therefore the time that was needed for car development was reduced from the normal 43 weeks to 24 weeks, and for the sake of cheapness normal design patterns were neglected and radical changes took place in the design of the car. Because this new car must compete with rivals, its style took priority over other considerations, and safety issues did not receive enough attention. Finally, the Ford Pinto's design process was completed and the company decided to begin its mass production .Meanwhile, it was discovered that because of its radical design, the Ford Pinto's fuel tank was more vulnerable to puncture in the case of accidents and this could

lead to many dangerous situations (van de Poel & Royakkers 2011).

There was an option for solving this problem. By changing the new design slightly and spending an extra $11 on each car, this danger could be prevented; but when this observation was reported to the company officials, they refused to make this alteration. The Ford Pinto's design met all the existing safety standards ,so they concluded that this new change was not necessary and there was no need for them to postpone the production of the new car. After some years and many disastrous accidents involving the Ford Pinto, when the Ford Motor Company was accused of homicide, they tried to justify their action with a cost-benefit analysis .In this analysis, they considered $200,000 for human life and $67,000 for each burn injury.[14] When they multiplied these numbers with the number of dead and wounded people ,they arrived at a total cost of $49.53 million, while the total cost of alteration to 11 million cars and 1.5 million light trucks would be $137 million. So, the Ford Motor Company argued that their decision not to make an alteration was more beneficial to society than making that change (van de Poel & Royakkers (2011).

Now ,in this inquiry, we do not want to investigate whether the Ford Motor Company was guilty or not; our point is to see if Ford's officials had used the ethical framework that has been introduced in this paper, what decision could they have made. In the first step of our framework, the moral problem should be stated .In this case, our moral problem statement could be this :

Should the Ford Motor Company make an alteration in a new car design that can be more vulnerable to explosion than other cars, in the case of collision, bearing in mind that it fulfills all existing standards for safety?

In the next step, we should analyze the problem to know about relevant elements—stakeholders ,their interests, relevant values and facts. In this case, stakeholders are the Ford Motor

Company—including Ford's officials, engineers, and workers—and people who use the Ford Pinto.[15] For the Ford Motor Company's interests, we can mention more profit, higher sales ,and good reputation; the users' interests include safety, honesty, performance ,and low price. There are some relevant values, like human life, honesty ,safety, etc. Finally, the relevant facts are that because of the gear construction situation in the new design, it could puncture the fuel tank in collisions at a speed of 35km/hr or more, and this could be very dangerous for passengers. Another fact is that this new design fulfills all existing standards.

In the third step, we should consider our options for action. In this case, we can mention two options.[16] Firstly, not making the alteration to the Ford Pinto; secondly, making the alteration at an extra cost of $11 for each car. There may exist other options ,but we do not consider them here. In the fourth step, we must evaluate our options from an ethical point of view. We draw on Kantian rule consequentialism ,as introduced in the previous section. According to this theory, "Everyone ought to follow the optimific principles, because these are the only principles that everyone could rationally will to be universal laws" (Parfit 2011 p.418 .(So, for each option we must ask ourselves, is this course of action optimific, the one that everyone can will to be a universal law?

Regarding the first option, our principle might be this: to achieve the greater benefit ,we can produce products that fulfill all existing standards, even though we know that this product can have harmful consequences for people who use it .Clearly, this is not an optimific principle. To show this, we can imagine a world in which all companies and manufacturers believe in this principle. In such a world, people cannot trust producers, a fact which is a necessary condition for their relationship with them. People will know that the only thing that matters for companies is their benefit, not the consumer's safety .Human beings will become very cautious in trying new products or they

may even prefer not to try them at all. As a result, corporations cannot develop, new products cannot be successful in the market, and people's lives will be more difficult. This principle definitely is not a principle that everyone could rationally will to be a universal law: users, at least, do not have enough reason to want this.

Our principle for the second option can be this: in each case, when our product can harm people, although it is able to meet all existing standards, we make a costly alteration to reduce the negative consequences of this new product. It seems that this principle is optimific. In a world where all producers believe in such a principle, people can easily trust companies and new products. People know that their safety is of great importance and priority to corporations. As a result, they will be eager to try new products, companies will have great opportunity to develop, and their inventions can be very successful in the market .Moreover, it can be said that all users and manufacturers have enough reason to want this principle to be a universal law. This principle would bring safety and convenience for users and reputation and success for companies .

So ,it seems that according to our moral framework, the second option is moral and should be chosen. But, before making a final decision, we should consider the final step, namely reflection. In this step, we can examine our conclusion with triple theory, common sense, and so forth. According to triple theory: "An act is wrong just when such acts are disallowed by some principle that is optimific, uniquely universally willable, and not reasonably rejectable) "Parfit 2011 p.413). In the previous step, we showed that the second principle is optimific and uniquely universally willable.[17] Now, if we show that this principle cannot reasonably be rejected, this principle will be morally acceptable. Because this principle protects users and considers their safety a priority, it seems that they cannot reasonably reject this principle. So, if there was a

reason for rejecting this principle, it should be from the company's side.

In this case, the Ford officials can argue that this principle would impose a burden of making their product more expensive and postponing manufacturing of the car that can have many harmful effects on their sales and may result in losing the market to their rivals. But this reason is not enough to reject the second principle. As we mentioned in section 4.2, according to Scanlonian contractualism ,a principle cannot be reasonably rejected only because of burdens that it imposes on individuals,[18] because it is very probable that every alternative principle imposes an even greater burden on others. In the Ford Pinto case, this is true: the alternative imposes a burden as great as death on other people and this definitely outweighs the burden on the Ford Motor Company. According to common sense, also, we can say that the second principle is morally right or even necessary. All of us can confess that we are responsible for our actions and decisions, and if we know that our decision can jeopardize public safety and we can resolve this danger at a small cost to ourselves,[19] it is our duty to take necessary action to prevent that danger .

Taken as a whole, we can argue that, according to our moral framework, the right decision for Ford officials was to choose the second option and make the alteration. This is perfectly in accordance with our moral intuition and can serve as a proof of the effectiveness of our proposed framework; in comparison with, for example, the consequentialist view which ford's managers adopt and result in a disaster. It should be noted that we do not want to say that our framework can solve all moral problems and dilemmas; our point is that this framework can be a good procedure for dealing with the complexity of moral problems, especially in applied ethics. However, we need more progress and there is a long way to go to find an ultimate solution for our moral problems .Finding new solutions for

current moral challenges can be a good sign of progress in this realm and make us hopeful for the future of our search .

Conclusion

As we have seen, new technologies bring about new opportunities for a better life as well as new ethical problems. Sometimes these problems are not easy to solve ,or even easy to state, because of their chaotic character and complexity. In this inquiry, we consider two possible ways of dealing with these features of ethical problems in the realm of technology, namely codes of conduct and design analogy. We saw that besides the benefits, codes of conduct cannot be a complete solution for our ethical problems while, on the contrary, a design analogy may be very helpful for philosophers and engineers in solving these challenges. We can use the insights that engineers gained in solving design problems and use the structure of a design cycle to take a systematic approach to ethical problems in technological fields. An ethical cycle can reduce the complexity of ethical problems and help us to restate the problem more clearly and comprehensively with the help of its feedback loops.

Moreover ,we realized that in our ethical cycle we need an ethical theory to evaluate different options from an ethical point of view. Therefore, we introduced Kantian rule consequentialism, a modified version of Kant's universal law formula combining two important ethical theories, Kantian contractualism and rule consequentialism .Moreover, we considered another formula, triple theory, which combines these two with Scanlonian contractualism. As it was mentioned, we choose these formulas because they are parts of some of the most important theories in ethics; also, their combination can help us reduce moral disagreement between different stakeholders who believe in different ethical theories. Finally, with the help of a case study, it was shown how we can use this

cycle to solve an ethical problem.

Although our ethical cycle was successful with respect to our case study, it does not mean that it can be successful in solving all moral challenges. As Parfit mentioned in his book, more often than not, the three ethical theories that he used conflict with one another and lead to different actions. So, we may need to modify these theories further to reach a perfect integration between them. Moreover ,it is probable that in some cases our proposed structure cannot give a definite or right solution. These are signs that we need to develop our theory and make progress in finding solutions to our ethical and moral questions. Although we are not able to solve all moral problems and settle all ethical disagreements right now, we have solved many of the problems so far and this can make us optimistic as to the future of our endeavor in this realm.

Endnote

1. Because our actions will have impacts on different people that presumably have different ethical points of view: for this reason, it will be very important if we can reach a compromise or unity between those different theories.

2. Note that, by saying this, we do not mean to say that ethics and design are the same: these domains have important differences beside their similarities. Our point is that because of the similarities revealed in the analogy, we can use structures that are used in design processes for solving moral dilemmas.

3. For more information, see Whitbeck (1998) and Dorset & Royakkers (2006).

4. In his book, van de Poel suggests that we should use different "moral frameworks ,"but for the sake of this article we have replaced it with" moral framework."

5. This step is a consequence of using different moral frameworks. We could eliminate this, but because further reflection does no harm, we decided to keep it. In this step ,we can compare our choice of action with, for example, common sense.

6. This concept is like the value sensitive design: "Value Sensitive Design is a theoretically grounded approach to the design of technology that accounts for human values in a principled and comprehensive manner throughout the design process" (Friedman , Kahn & ,Borning 2002 p.1).

7 "The opposite of normal design. Design in which either the normal configuration or the working principle (or both) of an existing product is changed) "van de Poel & Royakkers 2011.(

8. The people who use these three moral frameworks.

9. This brief summary will help us to achieve a better understanding of Parfit's formula and use it correctly .

10. Kant presented three formulas—universal law, humanity, and the kingdom of ends—and believed that these formulas were equal and were just different ways of stating one principle. In this inquiry, we regard only his universal law formula.

11 For more information, see Parfit (2011).

12. For more information, see Parfit (2011.(

13. In fact, it should be noted that Kantian rule consequentialism cannot be reduced to act consequentialism, according to which : "Everyone ought.

14. They used figures from the National Highway Traffic Safety Administration's report for this argument.

15.We can consider users' family and relatives as stakeholders, but we ignore them for the sake of simplicity.

16. As mentioned before, in this step, we may be able to solve the problem with the help of creative solutions.

17. With regard to our options for action.

18. Or in this case ,a company.

19. In relation to the costs that our action can have for others.

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