Online Ethics Center
FOR ENGINEERING AND SCIENCE

Comparison of Answers to Sustainability Questions

Description

Comparison of answers from students at Delft University of Technology and the University of Virginia concerning the sustainability questions posed in the case study "Ethical Issues in the Design of Ultra-Lightweight Vehicles".

Body

The following answers to the sustainability questions were given by students at two different universities. Note that the answers presented are representative answers, and not inclusive of all students' responses.

Question 1. Are engineers ethically obligated to consider sustainability in their designs? Why or why not?

Answers from the University of Virginia:

- If everyone, more specifically engineers, were obligated to seriously consider sustainability to every degree, many, if not all things would not be built.
- Engineers should be ethically obligated to consider the sustainability in their designs. Engineers should not simply meet consumer demand, but also consider the needs of society as a whole... The government should also offer some monetary incentives for engineering contractors who incorporate sustainability in design.
- The consideration of sustainability should not be burdened on the design engineer. Instead the consideration of sustainability should be with those who

are responsible for protecting the environment and its resources... to consider sustainability might limit the creativeness of the design. Sustainability in engineering is typically a by-product of the need to be economical. The only obligation of an engineer is to consider sustainability as if it was a specification of the design.

Answers from the Delft University of Technology:

- According to me it is obvious that engineers should take sustainability into account in their designs. They should at the consequences of a design for environment and society. Especially in designing mass products like cars it is absolutely necessary that these consequences are investigated.
- Only to some extent. The first task of engineers is to design a product of process that meets the set requirements. If this leaves room for sustainability considerations, so much the better.
- An engineer can and should contribute to a sustainable future. Especially in the design phase a lot of choices regarding sustainability can be made, therefore an engineer has a special obligation regarding sustainability.
- Sustainability should not be the most important design criterion.

Question 2. Defining sustainability is the first critical step in developing a plan for a sustainable product. This definition is not ethically neutral because such a determination implies a choice to include some aspects of sustainability, while ultimately rejecting others. Discuss the ethical dilemmas that could be faced by designers of lightweight cars attempting to define automobile sustainability.

Answers from the University of Virginia:

- A sustainable, lightweight car is fuel efficient but not very recyclable. A conventional car, on the other hand, is not as fuel-efficient but it is highly recyclable. It is therefore up to engineers to decide what's more important: fuel or materials.
- Is there a better way of designing more environmentally friendly cars other than making them lightweight? Does a sustainable car have a small environmental footprint?

- The problem of whether to focus on recycling, resource dependency, or energy consumption is a significant problem in defining sustainability... [engineers] also face the dilemma of creating cars that aren't as safe as heavier cars, and could therefore lead to more deaths, even though they may be better for the environment.

Answers from the Delft University of Technology:

- A first dilemma is of course whether a car should be produced in the first place. Perhaps an engineer should try to develop a more sustainable public transport medium instead. A second question is whether fossil fuels should still be used perhaps hydrogen is a better source of energy. A third question is whether materials that increase safety but are environmentally unfriendly should be used (for example the explosive tablets used in airbags). Do the saved lives of some humans outweigh the environmental degradation?
- An ethical dilemma in the definition of sustainability is the way in which different sustainability aspects are weighed. It is, for example, very difficult to decide what the more sustainable option is: a light and fuel efficient or a heavy recyclable car.
- A first dilemma is whether a car like this should be designed in the first place. Perhaps the engineer should design more sustainable public transport systems.

Question 3. Some elements of sustainability can be difficult to combine, for example lightweight materials are difficult to recycle or electric cars are very heavy but do not pollute the atmosphere. In your opinion do you think sustainable cars are feasible? Why or why not?

Answers from the University of Virginia:

- Public response, along with watching the effects of [lightweight car] technology on a small scale, will judge the need for this vehicle.
- We know gas is limited. We know cars pollute. However, we also know we have enough time to design a better car that eventually does not pollute or need gas. Practicality and public choice have called for cars. They are a critical pillar of American society, by the choice of the American people. If problems of sustainability begin to arise, they will be tackled when the time comes.
- In my opinion, the market for sustainable cars is very small relative to the

market for big trucks and SUVs. Sustainable cars are not feasible, especially in the United States. Generally the consumers' attitudes towards cars are that bigger means better, stronger, and more durable. Sustainable cars do not have the market for mass production.

- I do think that sustainable cars are feasible... but it would likely require a set of small shifts in social perspective to go along with the required technological advancements.
- There is just not enough motivation of companies to research and implement new methods of creating energy efficient, recyclable cars.
- Making a car lightweight is not a goal of sustainability, it is the fact that lightweight cars are more fuel efficient that meets a requirement of sustainability, so a heavy fuel-efficient car meets the same requirement.

Answers from the Delft University of Technology:

- Yes I think they are; all required technological principles are known. The fact that it is still quite difficult to realize sustainable cars is a matter of insufficient technological readiness/maturity and a lack of political and social awareness (and possibly oil company pressure and lobbying). I think that in the "near" future, cars will be equipped with hydrogen fuel cells where the only waste product throughout the car's functional life will be water. The fact that such a car is heavier doesn't really matter; the fuel it uses is for all practical purposes unlimited and the waste product is not a pollutant.
- It will be difficult to create sustainable cars because very different aspects need to be compared. I think however that the question is wrong. I think that it is impossible to find an ideal and perfect sustainable solution for cars, this does not mean that we should not try to attain such a solution. I think it is possible to improve existing cars with existing technology and this process should be repeated. The question is not sustainable or not sustainable but to what extent a car is sustainable.
- An environmental friendly car is not possible. For cars scarce materials and energy are used therefore cars are in principle not sustainable.
- Cars use energy and that energy will not be sustainable in the near future therefore cars will not be sustainable. Perhaps in due time when it is possible to provide enough sustainable energy.
- People do not want to give up the luxury and comfort of their car and are therefore not ready for sustainable cars.

Question 4. In the United States, there are no laws mandating that car manufacturers recycle any portion of automobiles, yet 97% of cars that reach their end of useful life are recycled and in general, 75% of the materials in these cars are recyclable. Recycled steel is very profitable in the United States, and in general, landfill costs are much lower in the U.S. than in Europe. Should the Unites States move in the direction that requires manufacturers make all cars 95% recyclable? Why or why not?

Answers from the University of Virginia:

- I believe that the United States should require manufacturers to make all cars 95% recyclable... A government mandate is required for this because it will be cheaper for manufacturers to make the parts of non-recyclable goods.
- I think the U.S. should require all manufacturers to make all cars 95% recyclable. This will increase the recycling effort and the additional recyclable automotive parts will add more money to the economy.
- I think that all manufacturers in the Unites States should be required to make their cars 95% recyclable for the following reason: manufacturers will be forced into innovative design of lightweight, fuel efficient cars.
- The development of electric or solar powered cars could be a bigger plus for the environment than recyclable materials could ever be. Therefore, more investigation into the possible consequences would be needed before I would recommend that the U.S. require all cars to be 95% recyclable.
- The U.S. should follow the Europeans' example because the average American buys more cars in his lifetime that the average European.
- Business interests and the market economy have the final word when it comes to funding various endeavors that promote sustainability... This is why I believe that mandating that manufacturers produce 95% recyclable cars is not a good idea. This will only serve to drive up the cost of production, which would not promote the idea of sustainability. Most manufacturers would prefer to produce a more sustainable design. They need to be shown that it is not only the ethically right thing to do, but that it is also the fiscally right thing to do.

Answers from the Delft University of Technology:

- Only if the total amount of pollution in absolute numbers decreases otherwise this measure can not be justified. It is better to design with another philosophy than trying to use more steel in a car.
- There should be regulations in the USA concerning the percentage of recyclable material in cars but used materials, weight and costs have to be taken into account. Therefore, it seems unlikely to have the same requirements in the USA as in Europe since cars are different. One can investigate whether the 95 percent is realistic in the USA.
- It can be that recycling costs so much energy and money that this is not sustainable anymore.
- The percentage of recycling should increase not by regulation but by taxes on the amount of waste material that is left after parts are recycled. Producers of cars should pay for every kilo of waste that remains after recycling the car they produced. This would stimulate producers to produce less waste.
- In US cars are heavy and consumers probably do not want lighter cars, therefore it is possible to require 95 % recyclable without cars getting heavier. This makes the choice for recyclability a good idea.
- Traditional cars (aluminum and steel) should be 95% recyclable, lightweight cars [should] not.
- The total amount of reduction in waste will be huge as there are a lot of cars in the US.
- This requirement should be made globally.

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