

**The Ethics of Care: How Engineers can Promote Moderation of Drinking in Adolescents
and Young Adults**

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

In 2005, Four Loko's 'premium malted beverage' was released, which contained alcohol, caffeine, taurine and guarana (Siegel, 2011, p. 356). During its time and use by the public, this caffeinated alcoholic drink resulted in several deaths, alcohol poisoning, and several hospitalizations of college students (Melnick, 2010). It took five years for the FDA to announce that caffeine was an illegal additive to an alcoholic beverage following evidence that the stimulant masked the effects of alcohol (Siegel, 2011, p. 356). Not only was this drink fruit flavored, it was marketed to college students, specifically those participating in fraternity events (Cheshes, 2011). Although there hasn't been anything like this since, we have to imagine that something similar might happen again.

In my technical project, we have created a new design that once the ethanol from beer is removed, we inject it into another drink, specifically kombucha, which results in a new alcoholic beverage. This novel manufacturing method brings an interesting idea: we can mass produce any beverage with alcohol. With this new technology, we have to imagine how this could affect college students. In the United States, young adults, ages 21-25, have the highest prevalence rate of alcohol consumption at 61.2%, with 36.8% of this group engaging in binge drinking (SAMHSA, 2023). They drink more heavily, have more negative consequences, and engage in riskier behaviors (Quigley & Marlatt, 1996, p. 185).

Overconsumption of alcohol of this group, ages 18-22, have been a concern for decades (Nkire & Nwachukwu, 2010; Kellogg, 1999; MacDonald et al., 1991; Schuckit & Gunderson, 1977). While the rates of binge-drinking among this age group has decreased, the rates are still very high at 30-40% (Krieger et al., 2018). Another group of interest, college students, ages 18-20, have an alcohol consumption rate of 31.3%, which although is alarming considering it's

illegal to purchase alcohol in this age group, college creates an environment where alcohol is more easily attainable.

The general drinking habits of young adults and adolescents are shaped by the social and cultural context in which they interact and live. For instance, the US and the UK view drinking as a transition from work to play and the antithesis of working, while France and Peru see alcohol as a more integral part of the normal work day (The Social Issues Research Centre, 1998, pp 8-9). Thus, the prevalence of alcohol consumption in different countries varies greatly. When comparing the alcohol consumption of 15-16 year olds in Ireland and the US, we can see that Ireland is at 39%, while the US is at 12% (Ahlström & Österberg, 2004, p. 263). This is again due to a multitude of reasons like history and religion.

Although the majority follows these habits, it does not mean that the habits themselves are necessarily beneficial for the wellbeing of this age group. Young adults and adolescents are misusing alcohol and don't understand or consider or care about the consequences. These consequences range from brain development, health risk, social consequences – both short and long term, risky behaviors, and public safety, to name a few. (Scott et al., 2018; Tammy et al., 2018)

Alcohol plays a very big role in the lives of young adults and adolescents, whether directly or indirectly. If the new technology previously mentioned was heavily implemented, encouraged and promoted by engineers, why must it stop with kombucha, for example. This introduction of technology could lead to alcoholic beverages being geared towards younger people, specifically those that already know the taste of the non-alcoholic beverage. If alcohol is infused in non-traditional products, like kombucha or candy or chocolate, the alcohol content might be obscured to the point where the consumers are unaware of the process and therefore

underestimate the amount of alcohol they consume. Even further, regulatory changes can become increasingly complex, in terms of labeling, advertising, and age-restrictions, as alcohol is integrated into a variety of products.

Engineers have a responsibility to be ethical in terms of putting safety of the consumer before that person's individual freedom. For engineers in this industry, the American Institute of Chemical Engineers has a code of ethics that is promoted to all members. AIChE (2012) states two methods, which I find the most important to this issue, in order to maintain this code: an engineer's paramount responsibility is to protect the safety, health and welfare of the public, and advise their client if they believe that their actions may harm the public. They must take into account the virtue of care when considering the technology they use and its implications on society. It's fairly easy for college students to obtain alcoholic beverages through fake IDs, shoulder tapping, or using friends of age (Fabian et al., 2008), so engineers need to find a way to play their role in protecting these consumers.

First, I will perform a cultural comparison between Ireland and the US of young adult and adolescent drinking habits, while analyzing historical and social factors that play a major role in shaping alcohol expectancies. This will help in understanding the importance of tailoring not only engineering solutions, but also policy and intervention strategies. I want to study these two countries specifically because I have grown up and taken part in both adolescent and young adult drinking culture. I also want to develop a different, more outside perspective on both drinking cultures through this comparison, as well as through the following research.

Next, I will elaborate on what an "ethical" engineer is in terms of virtue ethics, specifically focusing on the virtue of care. I will take that definition and explain the good and bad implications of (1) an engineer using and promoting this technology and (2) of young people

consuming these drinks. More distinctly, I will examine the health and social impacts, as well as previous work that had been done. Finally, I will draw on these investigations to create ways for engineers to better promote responsibility and good mediated experiences through the virtue of care.

From Guinness to Bourbon: A Topsy-Tale of Irish and American Drinking Cultures

Ireland and the United States have had connections dating back to Irish immigration to the US during the colonial era 1607–1775 (Blessing, 1980, p. 528). This historical tie still endures today, as a significant portion of the American population – roughly 20%, or 31.5 million – claim Irish heritage (Moore et al., 2021). Despite not having these Irish roots in my family, I still have a connection with Ireland. I moved from Virginia to Dublin, Ireland when I was 16 years old and have traveled back and forth over the last four years while being in college. I spent my last teenage years learning about and becoming enveloped in Irish culture. More specifically, as I have witnessed and participated in both drinking cultures as an adolescent and as a young adult, this topic of drinking culture has become very fascinating to me. I want to understand the historical, cultural, and social factors that play a major role in shaping both drinking cultures and alcohol expectancies.

Of course, the similarities between Irish and American drinking cultures extend beyond their historical ties. Both countries have experienced temperance eras supported by religious groups, and the emerging notions of drunkenness still remained very similar in both countries. The temperance movement proclaimed that a drunk person was not morally weak but subject and victim to alcohol (Olson et al., 1985, p. 5). In the US, the movement was rooted in Protestant churches, which eventually led to the creation of the Women’s Christian Temperance Union in 1873 (PBS, 2011). In Ireland, it was more rooted in the Catholic Church with one group, the

Pioneers Total Abstinence Association, created by Fr. James Cullen in 1898, which is still operating today (Mauger, 2021, p. 72). An additional motivator of the Irish temperance movement were Irish nationalists who believed that the key to gaining freedom from British rule was through sobriety, which can be noted in one slogan: “Ireland sober, Ireland free” (Mauger, 2021, p. 72).

The prohibition era in the US started in 1920 with the 18th Amendment, which prohibited the manufacture, sale and transportation of alcohol but not the possession, consumption or home brewing (Olson et al., 1985, p. 6). While it worked in some ways, prohibition showed that problems which stem from drinking cannot be eliminated (Olson et al., 1985, p. 3). After prohibition, research was conducted in the US that created a new view on drunkenness: a disease called alcoholism. This new idea stated that neither the consumer nor the beverage is morally evil but that there is a chemistry between these two artifacts that results in a specific outcome (Olson et al., 1985, p. 8). Ireland was slow to adjust to this new view but it eventually spread during the 1950’s through Alcohol Anonymous groups arriving in Europe (Mauger, 2021, p. 75).

Despite similar alcohol movements, there are many differences when diving deeper into each culture. Two main differences are cultural norms, which includes religion and history, and expectancies due to those norms. On a general note, I think that individualism plays a major role in how these cultures respond or interact with alcohol. The United States scored the highest on the “individualism index” at 91 compared to Ireland which scores as 70 (Barton, 2004, p. 96). This clearly agrees with Christiansen & Tehan’s (1987) claim that “American adolescents approach initial drinking experiences with an ambiguous and uncertain normative structure that permits the development of a greater range of, and less polarized, drinking styles” (p. 561). Young Americans typically learn about alcohol outside of the home, through trial and error, and

personal experiences (Christiansen & Teahan, 1987, p. 560). American families present a more “try it on your own ” or “do what you want” attitude, which is not what Irish families are like. They continue by claiming that there is a greater influence of parents in which they typically see the “use of alcohol in terms of black or white, good or evil, drunkenness or complete abstinence” (p. 561). Even Irish adolescents claim that they perceive themselves living in a less alcohol-tolerant environment in which drinking is not just a social activity but it is also problematic (Christiansen & Teahan, 1987, p. 561). Ireland also has a unique historical aspect that cannot fully be compared to the US. While the British controlled the US for 176 years, Ireland was ruled for over 800 years by their neighboring island. An infringement on their sovereignty created lasting and profound attitudes that have shaped their culture, such as nationalism, cultural revival, and skepticism of authority.

When comparing adolescent US and Irish drinking expectancies, Christiansen & Teahan (1987) found that Irish adolescents expect “less social benefit, less improvement of cognitive and motor functioning, and less sexual enhancement, but greater increase in aggression” (p. 558). This is rooted in the observation that drinking and becoming drunk was a “precondition for the release of hostility towards the English” (p. 561). So while Irish adolescents drink less than their US counterparts, their social drinking turns into problematic drinking where they become more aggressive due to embedded historical attitudes. Also, they scored lower on expectations for sexual enhancement, which is not surprising when you take into account the impact the Catholic Church has had on Irish history and culture (Christiansen & Teahan, 1987, p. 561).

Compared to the US, Ireland has had a long and involved history with religion, specifically the Catholic Church, since the fourth and early fifth century (Walsh & Bradley, 2003, p. 1). And while never formally maintaining a church and state government, the Catholic Church

is deeply rooted among her people. This has had more consequences, in terms of drinking, on the Irish than in the US due to having a variety of religious backgrounds and a heavy emphasis on the separation of church and state (U.S. Const. amend. I). Like mentioned earlier, drunkenness was considered a sin, so to combat young people from engaging in this sin, the Catholic Church promoted confirmation pledges. An adolescent being confirmed, typically aged 14, would make a pledge to abstain from drinking until they were 21 (Delaney et al., 2011, p. 9; Christiansen & Teahan, 1987, p. 560). Also, celibacy rules of the Church created sexual repression and frustration, which led to excess drinking (Mauger, 2021, p. 86). Additionally, many schools in Ireland are segregated based on sex, due to the Church dominating and practically running the education system, which can result in loneliness and isolation, leading more young people to drink (Mauger, 2021, p. 86). This dynamic is interesting because while the Church views drunkenness as a sin, their dominance in everyday Irish life leads to them engaging in excess drinking.

This cultural comparison between Ireland and the United States helps to understand that to decrease the overwhelming percentage of adolescent and young adult drinkers, we need to recognize why they are drinking in the first place. After review, some of the causes include historical, social, religious, and cultural reasons. Despite learning about these factors that contribute to young people drinking, there is another contributing factor that was not previously discussed in the cultural comparison that must be addressed. Engineers, designers, and others who create and promote alcoholic beverages play a major role in influencing and encouraging this younger population to drink. How do they do this? Do they have a responsibility to the consumers to promote moderation? Are there ways in which they can maintain their jobs while

also promoting responsible drinking? These ideas will be explored in the next section, along with what makes an “ethical” engineer.

Cheers to Virtue: Ethical Engineering Formation

Young people partake in drinking habits for numerous reasons, especially for social and physical enhancement motives (Smit et al., 2020, p. 73), which is known to lead to negative effects like aggression, physical injuries and long term health problems (Martinez et al., 2014). As previously mentioned, it is important to acknowledge that the consequences of drinking are not just caused by a consumer’s background and individual choices; they are also driven by the engineers, designers, and others who promote and take part in creating these products, especially the values that are embedded by them (Klenk, 2020, p. 525). These actors have a responsibility to advocate for the best interests of the consumers. However, this is not usually the case. As we see today: money runs the world.

Shifting the focus to engineers, their main goal, as historically taught in university, is to “make the world a better place by creating and disseminating knowledge and by preparing engineering leaders to solve global challenges (University of Virginia, 2024a), or essentially, solve problems. If there is an issue, they are the ones who are capable of creating a solution to fix it. There are now additional classes, especially at the University of Virginia, like Science, Technology, and Society that emphasize the importance of taking morality and ethics into account when designing and solving problems (University of Virginia, 2024b). In an ideal world, graduating engineers would apply this knowledge to their new jobs. However, many lose sight of the importance of ethics and morality and turn to what they remember doing in their school work: solving the problem as fast as possible to meet deadlines and moving to the next one without considering the variety of possible consequences.

A perfect example of engineering priorities was seen in the BP Deep Water Horizon oil spill in the Gulf of Mexico in 2010. A poor cement job and a faulty shoe track barrier failed to maintain hydrocarbons within a reservoir, which led to a fiery explosion and the death of 11 workers (BP, 2010). A more in depth analysis shows that the reasons for this disaster was due to years of cost-cutting, pressure from political and industry stakeholders, a diminishing pool of technical knowledge, and insufficient resources allocated to government agencies responsible for leasing oversight and regulation (Graham et al., 2011, pp 55-127). Each of these reasons is part of a more systemic issue related to the prioritization of short-term profits over long-term safety and sustainability. This is one of many examples where the safety of workers, clients, or consumers was dismissed in favor of money based motives.

Some engineers in industry are driven by money, which can be seen in a report from GoodCorporation (2023), where 44% of engineers and technicians in the UK feel that profitability is valued and prioritized over “fitness for purpose” (p. 17). Other drivers could be status, recognition and titles. Engineers, designers, marketers and investors are sometimes even willing to target and engage a new consumer group that the product was not initially intended for in order to reach these accolades. For example, candy cigarettes, popular in the 60’s and 70’s, were fairly cheap, and were stored on the lower shelves where it was easier for children to see and reach, therefore enabling them to consume and become aware of this specific product (Klein & St Clair, 2000, pp 363-364). Additionally, tobacco companies allowed trademark infringements because they were aware that the confectionery promotes children to eventually use real cigarettes (Klein & St Clair, 2000, p. 363). Another example is marketing vapes to teens by promoting ads on social media, creating a sleek and customizable USB or pen design, and most importantly, adding flavors, such as gummy bear and frosted cookies (Jones & Salzman,

2020, p. 57). These examples not only entice younger people to use unhealthy products, they show that promoters have the ultimate goal of getting this age group to continue using or move towards intended products that are unsafe for use. However, these promoters would not be so successful without the brilliant minds of the engineers that are creating the designs and the technology to produce the products that they are promoting. While the drivers previously mentioned are sometimes useful in the completion of tasks and problem solving, we need to understand how these drivers can bring out the evil side of engineers. We also need an alternative model to emphasize the ethical responsibility of engineers more thoroughly than the current standard of the AIChE code of ethics. This new model is virtue ethics.

Virtue ethics is about living a good life by focusing on developing certain moral traits and abilities that people can work on within themselves (Vallor, 2021, p. 87). Another way to interpret virtue ethics is that it emphasizes not just doing good but also being good (Schmidt, 2021, p. 120). This ethical theory is better at regulating people in positions of influence compared to deontology and consequentialism. Both deontology and consequentialism lean more towards preventative measures and look at the outcome of a decision itself rather than understanding the person who is making those decisions. Virtue ethics represents a more aspirational approach to problem solving, which aligns with a heuristic attitude (Schmidt, 2021, p. 120). This is important for not only engineers to embody, but also institutions and non-engineers as well. Without core virtues, the search for external goods will ultimately replace the pursuit of internal goods (Schmidt, 2021, p.121). It is also valuable to remember that the primary goal and purpose of an engineer is not just technical brilliance, but rather to help and promote the well-being of society (Schmidt, 2021, p. 123). With this in mind, we can see that

neither deontology nor consequentialism can accurately help engineers to fulfill this proper purpose, hence we must rely on virtue ethics to guide us.

Additionally, virtue ethics bestows upon us societal roles and moral virtues that we must uphold to partake in being good. For societal roles, engineers are tasked with the assessment, management, and communication of risk, which places us in a position to determine if the products and technologies we are using lessen the well-being of some people rather than enhancing the well-being for all (Schmidt, 2021, p. 124). The moral virtues that an engineer must follow are care, objectivity, and honesty, which must be used while performing practical judgment (Schmidt, 2021, p. 129). Care is the most important of these virtues, because without it, an engineer cannot truly empathize with the user of the product, especially the potential consequences it might bring about, specifically safety, health and well-being. Objectivity is necessary to be able to deliver evidence-based reasoning decisions. Honesty is vital to maintaining trust and integrity in each transaction, design, and decision.

However, there are some drawbacks to using this ethical theory. Objections to virtue ethics often revolve around its perceived lack of codifiable principles and its ability to provide a clear account of right action (Hursthouse & Pettigrove, 2022). Similarly, Timmerman & Cohen (2020) state that some criticize virtue ethics over not being able to produce action-guiding moral principles and for justifying moral beliefs without a logical foundation (p. 256). This being said, virtue ethics alone should not have to determine what is right or wrong, like deontology or consequentialism, when reflecting on the questions of how one should live and what kind of person one should become (Hursthouse & Pettigrove, 2022).

Despite these criticisms, virtue ethics is the best ethical theory to resolve the issues previously stated. Without virtue ethics, engineers and others become dissociated from their

moral responsibilities. In the case study, you can see that because the cultures are so different, a plan to implement moderation or more conscious engineers does not follow a simple course of action, like deontology or consequentialism would lead you to believe. Virtue ethics allows us to be able to look at each scenario and enhance the well-being of all based on us being good people while following the core virtues of care, objectivity, and honesty.

Raise a Glass to Ethics: Crafting Culture in the Beverage Industry

After diving into the relationship between engineering ethics and the promotion of responsible drinking habits, it becomes clear that the synthesis of cultural understanding and virtue ethics creates a promising framework for guiding engineering and upper management practices in the beverage industry. Not only must the beverage industry create unique strategies based on cultural factors within the industry as well for the consumers, they must also maintain transparency between management and engineers, so that a cohesive plan is created to bring about the safety and health of consumers.

Within a cultural context, it is imperative that both these groups understand that the issues of underage and binge drinking are not solvable through one general solution. As previously mentioned, the United States is more individualistic than Ireland, and therefore must be approached with the promotion of the idea of autonomy. This in contrast to Ireland where the best method would be the collectivist approach. Focusing on the US, there are a few ways in which the beverage industry can do this. They can emphasize personal responsibility and support the consumers to make informed decisions about their alcohol consumption. In this, the industry can promote the benefits of moderation and mindful drinking to achieve the goal of the consumers overall well-being, self-care, and self-improvement. This aligns with the code of ethics that engineers must follow in order to protect the health, safety, and well-being of the

public. They can create targeted marketing for non-alcoholic drinks, which would include making them a trendy, health-conscious option to maintain a vibrant lifestyle. Turning to Ireland, the number of non-alcoholic beverage sales has tripled from 2017 to 2021 due to shifting the culture to focus on social interaction enjoyment without having to get drunk (McAvinchey, 2023). This is likely due to improved marketing targeting healthier lifestyles. Additionally, leveraging community-based initiatives to create spaces for alternatives to alcohol-centered socializing can emphasize the value of a shared experience over individual consumption. These communities include schools, churches, and community centers, where they can also lead alcohol prevention efforts due to their role as trusted sources of support.

Although these suggestions for promoting better drinking practice and non-alcoholic drinks are quite broad and can be implemented by a number of different groups, we can concentrate more specifically on what engineers and upper management groups within the beverage industry can do. First, it is crucial for engineers and upper management to be transparent with each other. Transparency is necessary when sharing information about the decision-making process, the reasoning behind certain business choices, and the potential impacts on a variety of stakeholders (Najam, 2023, p. 64). If upper management is more clear with what their priorities are, then engineers now have the responsibility to make a decision based on the ethical codes that are set upon them (Najam, 2023, p. 65). Also, transparency would allow ethical issues to be addressed earlier and mitigation measures can be added in a timely manner. Taking consumers into consideration, engineers can ensure good labeling practices that make sure that the user is fully informed and aware of the alcohol content.

In addition to transparency, engineers need to advocate for design practices that prioritize consumer safety. This includes pushing back against pressure from stakeholders that prioritize

cost-cutting or aggressive marketing strategies. There are a few ways engineers can be prepared to face this daunting task even when power dynamics often shape decision making. As mentioned before, Engineering Ethics courses are included in UVA's curriculum for engineers, as well as in many other university programs. These are crucial to exposing students to the duties they must uphold once they graduate and go into industry. However, I feel that having ethics classes provided within each specific major would be even more beneficial so that engineering students, as they are able to discuss case studies directly related to their degree, as well as understand their major engineering societies code of ethics. Once in industry, professional development workshops should be provided to continually learn and keep the values of care, objectivity and honesty at the forefront of their mind. Finally, because engineers can become so engrossed in the technical work and might lose sight of the end goal, interdisciplinary collaboration with public health experts, social scientists, and ethicists can help engineers gain a more comprehensive understanding of the broader implications of their designs.

While engineers have been the primary group of discussion, it would not be fair to exclude upper management, including marketers and stakeholders, in the solution. This group has a greater influence on the industry as a whole, and therefore has the responsibility to promote a culture of accountability. A lack of this can clearly be seen in the Boeing 737 MAX case where Boeing and the FAA had conducted risk assessments on the refurbished designs and did not address the concerns (Herkert et al., 2020, p. 2962). A way to keep accountability of the core ethical values and virtues within the company is to create a system where sincere and meaningful responses to anonymous complaints are addressed (Herkert et al., 2020, p. 2968). This will maintain the code of ethics, as well as empower engineers with safety concerns because the ethical processes will be strengthened. Additionally, this group should also create professional

development workshops, both separate and in collaboration with engineers. The separation will allow upper management to focus on different aspects of the industry and the consumer, while workshops in collaboration with the engineers will give them insight into how the other thinks and takes decisions.

Conclusion

Engineers have the responsibility to uphold the codes of ethics brought upon them by their engineering societies, as well as maintaining the values of care and transparency when creating technology. Let us not forget that the duties of management, marketing, and other designers must follow these virtues as well, because engineers are not the only ones to bear the burden of cultivating and preserving ethics within the workplace. More importantly, these actors must keep the safety and well-being of the consumers at the forefront of their minds to promote responsible drinking practices to young adults. By fostering transparency, advocating for ethical design practices, and collaborating with interdisciplinary experts, these actors can achieve this goal. In addition to the obligations of these groups, tailored strategies based on cultural differences can also address the underage and binge drinking issues of students.

Although these practical applications are not completely novel, actually supporting the systems into everyday practice is quite difficult. For management positions, it is difficult to balance ethical considerations with business interest, especially because money and profit is always involved. For engineers, broadening their scope of focus to the implications of their designs rather than just completing the project also poses issues. It is challenging to shift these mindsets overnight; it requires an ongoing effort and commitment of all the stakeholders involved. That being said, I do believe that with the proper encouragement and guidance,

engineers, as well as management, will be able to always consider the ethical ramifications of their work.

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