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# Is diesel a dirty word? Examining the communication and public relations challenges faced by auto manufacturers who want to introduce small diesel engines to the American market

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IS DIESEL A DIRTY WORD?  
EXAMINING THE COMMUNICATION AND PUBLIC RELATIONS CHALLENGES  
FACED BY AUTO MANUFACTURERS WHO WANT TO INTRODUCE SMALL  
DIESEL ENGINES TO THE AMERICAN MARKET

by  
Christopher Nelson

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## ABSTRACT

Christopher Nelson  
IS DIESEL A DIRTY WORD?  
EXAMINING THE COMMUNICATION AND PUBLIC RELATIONS CHALLENGES  
FACED BY AUTO MANUFACTURERS WHO WANT TO INTRODUCE SMALL  
DIESEL ENGINES TO AMERICAN CONSUMERS  
2010/11  
Joseph Basso, J.D., Ph.D., A.P.R.  
Master of Arts in Public relations

Cars with small diesel engines make up a large part of the automobile market in virtually every region of the world but the United States. In this study, the researcher sought to determine if there are preexisting attitudes toward diesel fuel and engines among American consumers and whether those attitudes affect consumers' expressed opinions (i.e. buying habits) which contribute to that disparity.

The researcher carried out two studies. The first was a modified Delphi study of public relations professionals in the automotive field. Respondents were given several basic questions regarding diesel engines in the American market followed by a series of rank-ordering exercises of their initial answers. Based upon responses, the researcher formulated a survey instrument to determine actual attitudes, administered to Rowan students between the ages of 18 and 25.

From the discussion with the experts and the results of the survey, the researcher determined that, although many negative preconceptions of diesel engines and diesel-powered cars exist, they are not as numerous and ingrained as expected. Though the majority of respondents stated that they would not consider purchasing a diesel-powered car, many also indicated that they would reconsider that decision if exposed to more information on the subject.

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## Chapter 1

### Introduction

Since the invention of the internal combustion engine, car designers and developers have searched for ways to make engines more efficient. Consumer demand for more fuel efficient vehicles in America has tended to correspond with the mercurial rise and fall of the price of gasoline. In the 1970s and 1980s, consumers demanded much smaller, cars, featuring equally small, efficient four-cylinder engines designed to maximize fuel mileage. More recent spikes in fuel costs have led to a growth in popularity of a new, technologically derived crop of high-efficiency cars, the most notable of which is the gas-electric hybrid (Beresteanu & Li, 2008).

In many parts of the world the price of gas remains much higher than in the United States. European consumers, for example, pay much higher fuel prices than Americans. In the United Kingdom, the U.S. Energy Information Administration estimates that from June to December of 2010 the cost of regular fuel was \$3.60 more, on average, than in the United States (U.S. Energy Information Administration, 2010). This, in combination with a denser populace, has led Europeans to depend on smaller, more fuel-efficient cars (Adams, 2009). And yet the hybrid technology popular in America is not nearly so prevalent in Europe. Instead, when European drivers need a car that has a long range and gets excellent mileage, many of them turn to small diesel engines (Wray, 2010).

According to the European Automobile Manufacturers' Association, diesel vehicles made up 53.3% of new car sales in the European Union in 2007 (2008). By comparison, the U.S. Energy Information Administration estimates that diesel-powered

cars made up only 1.7% of the American new car market in 2009 (2009). A simple comparison of one manufacturer's web sites across the two markets highlights the difference just as clearly. Honda of Great Britain lists its Civic model as available with three different engine options, one of which is a 2.2-liter diesel. The British Civic line does not include a hybrid. Honda's U.S. site, however, lists only two engine options for the Civic: a gas engine and a gas-electric hybrid. Likewise, the Accord and CR-V, both mainstays in America in gasoline-only form, also have diesel engine options in Great Britain and like markets, but not in the U.S.

Diesel engines offer several key benefits to owners. First, they require less fuel than gasoline motors to induce the combustion that produces power. This results in both high miles per gallon (or MPG) ratings, and longer range between fill-ups (European Automobile Manufacturers' Association, 2010). Second, cars equipped with diesel engines are priced (in other markets) at about the same level as cars equipped with gasoline engines. Third, clean diesel technology has come so far in recent years that, in many ways, a small diesel engine is now just as clean (if not cleaner) to operate as its gasoline counterpart (U.S. Environmental Protection Agency, 2004). And finally, the U.S. Energy Information Agency estimates that, from June to December, 2010, the cost of diesel was, on average, about the same as the cost of premium gasoline in the U.S. (2010).

Therefore, it is assumed that a vehicle that makes use of a high efficiency motor that gets better mileage and longer range than a gas engine is just as environmentally friendly, and will minimally impact an individual's wallet in initial purchase price or average fuel cost would adequately answer a demand by the American consumer. Diesel-

powered cars, however, are virtually non-existent in the American car market (U.S. Energy Information Administration, 2009).

During the 1970s and 1980s, diesel engines existed in a much lower state of refinement. They were typically quite noisy and created a smoky exhaust that included high levels of sulfur, among other noxious gasses. Although they boasted long range and good mileage, diesel engines of the time were not particularly powerful. They earned a reputation among American consumers as dirty, loud cars that struggled to go over hills and merge into highway traffic. By the 1990s, the price of gasoline had stabilized as well, and mileage concerns began to fall further down on the list of priorities of the American car buyer (Hewitt, 2008).

A series of clean-air restrictions enacted throughout the 1990s and early 2000s dramatically regulating the emissions of all combustion engines used in passenger cars in the U.S. served to be the final nail in the coffin for the diesel (U.S. Environmental Protection Agency, 2004). The cost of building low-sulfur engines that met the new regulations, in combination with diesel's poor reputation, apparently made it a non-issue to those carmakers still building them. The diesel engine faded from the car lines of virtually every manufacturer in America (with Volkswagen the lone notable exception) by the turn of the century.

Recent developments in clean diesel technology, including cleaner-running engines and cleaner-burning fuels, however, have meant that diesel engines are a viable option for the American market once again — at least technologically. As manufacturers are beginning to reintroduce these new, cleaner diesel engines (BMW and Audi have already done so at the time of this writing, and a number of others are said to be ready to



follow suit shortly), the question remains whether American consumers will be willing to accept them as a viable green alternative to the already established gas-electric hybrid and emerging electric car segments.

A number of factors must be considered regarding consumer biases and preconceptions, especially with regard to a largely uninformed audience. As Wooten and Reed (1998) found, consumers exposed to the opinions of others before evaluating a product on their own are likely to let that exposure influence their assessment. In addition, Hawkins and Hoch (1992) determined that repeated low-level exposure to a statement or attitude has a direct effect on a person's perception of the truth of that statement. Since diesel does not permeate the American market the way it does in others, American consumers are more likely to rely on the opinions of others to form their own (Wooten & Reed, 1998). Consistent exposure to negative opinions may have a profound influence on how they perceive the forthcoming introduction of new automotive diesel technology.

### **Statement of Problem and Purpose**

As fuel prices have risen over the last decade, American consumers have increased their demand for fuel-efficient cars. This has led to the development of new technology (i.e. gas-electric hybrid cars) and the improvement of that already in use (standard gas and diesel engines) (Beresteanu & Li, 2008). Despite the wide use of small diesel engines in other parts of the world where fuel prices are routinely higher than in the U.S., American environmental laws, in combination with diesel's poor reputation, have kept most manufacturers from making small diesel engines a part of their model lines (U.S. Energy Information Administration, 2010, European Automobile

Manufacturers' Association, 2008). Indeed, until recently, even as demand has grown for that type of small, efficient car, manufacturers have chosen to develop and introduce new technology (i.e. hybrids) rather than to simply adapt existing clean diesel technology to the American market.

That is beginning to change, however. As technological advancements have allowed carmakers to begin reintroducing diesel engines to their lineups, the main road block to their success becomes the American consumer's perception of diesel itself.

The purpose of this research was to determine whether there is actually an overall positive or negative bias toward clean diesel motors being used in automobiles and whether the preconception of consumers negatively or positively affect their opinions thereof. Answering these fundamental questions is the necessary first step in determining whether consumers have adequate information to overcome latent attitudes or whether further information is required before they will start to demand such a product more consistently.

### **Research Questions and Hypotheses**

In this research the author will seek to answer the following questions:

Q1: Do Rowan students between the ages of 18 and 25 have a positive opinion of clean diesel automotive technology?

Q2: Do Rowan students between the ages of 18 and 25 have a negative opinion of clean diesel automotive technology?

Q3: Do preconceived attitudes about diesel technology found among Rowan students between the ages of 18 and 25 positively affect their perception of clean diesel technology?

Q4: Do preconceived attitudes about diesel technology found among Rowan students between the ages of 18 and 25 negatively affect their perception of clean diesel technology?

Based on the findings of Wooten and Reed (1998) and Hawkins and Hoch (1992), the author will explore two hypotheses in response to those questions:

H1: The majority of Rowan students between the ages of 18 and 25 will have a negative opinion of clean diesel automotive technology.

H2: In the majority of cases, the attitudes of Rowan students between the ages of 18 and 25 negatively affect their opinions of clean diesel automotive technology.

### **Procedure and Methodology**

To test these hypotheses, the author used a two-part study. The author first used a modified Delphi study in which experts in the field of automotive communication were questioned regarding their views on American consumer attitudes toward diesel engines. They were asked whether they believe American consumers hold a bias toward diesel, whether they believe these biases or preconceptions affect consumers' ability to fairly judge diesel-equipped cars against gasoline and gas-electric hybrid models, and whether they believe greater, or more effective, communication can help overcome these biases or preconceptions.

Once the author determined a general consensus from these experts, the author used that information to assist in the design of a general survey given to Rowan University students between the ages of 18 and 25. The purpose for using this particular group was to gauge the opinion of a group of consumers who are aware of modern technologies and will likely consider the purchase of a car at some time over the next several years. Though not generalizable to a larger public due to its inclusion of only Rowan University students, the study gave an excellent cross-section from this influential group of consumers.

In order to determine how these procedures relate to other studies regarding consumer bias and communication, the author first carried out a review of relevant literature from peer reviewed journals, books and other scholarly publications.

### **Assumptions**

The author assumed that most consumers were at least aware that diesel engines exist and that they were, in some way, fundamentally aware that these engines differed from gasoline engines.

Further, the author assumed that respondents answered the questions accurately and without bias.

### **Delimitations**

A Delphi study is inherently limited by its nature. It cannot be generalized because the group sampled was not randomly selected. In addition, a substantial amount of interpretation was necessary on the part of the researcher, leaving a larger than ideal opportunity for bias. However, the author used the Delphi study mainly as a tool for

building the general survey to be used in the second part. This helped mitigate these limitations.

A general survey of Rowan University students was not generalizable to any larger public. In addition, though all efforts were made to assure the survey is understandable to the common consumer, there was a possibility that many of the students surveyed were not confident enough in their own knowledge of automotive technology to accurately answer the questions. This may have limited the data pool.

### **Definition of Terms**

For the purposes of this article, the author used the following definitions for terms not standard to the average reader:

Diesel engine – Any internal combustion engine that uses diesel (cetane) fuel to facilitate the combustion process (Erjavec p. 199-200, 679).

Gas engine – Any internal combustion engine that uses gasoline (octane) fuel to facilitate the combustion process (Erjavec p. 182-184).

Hybrid (or Gas-Electric Hybrid) – Refers to a car that uses both an internal combustion engine and an electric motor to generate its forward momentum. Different manufacturers use the two systems in various ways, but all fit under that basic definition (Erjavec p. 683-685).

Miles Per Gallon (MPG) – Refers to the number of miles that a vehicle travels in the time it takes to burn one gallon of fuel, be it diesel or gasoline (U.S. Department of Energy, 2011) .

Small diesel engine – Any 4- or 6-cylinder diesel engine designed for use in a passenger car, typically 3.0 liters or less in displacement (Erjavec p. 199).

## Chapter 2: Literature Review

### How Consumers Form Opinions

“Opinions are the views held by people on given issues such as politics, economics, society, and even fashionable colors of clothing. So, opinion formation processes are common in community or society” (p.1231) This is the model that Bo Shen and Yun Liu (2007) use to frame their study on opinion formation.

Numerous theories exist, however, regarding opinion formation. One such long-standing theory, the focus of a study by Duncan Watts and Peter Sheridan Dodds, holds that “a small minority of ‘opinion leaders’ (stars) act as intermediaries between the mass media and the majority of society (circles),” (2007, p.441) thereby influencing the opinions of their followers. Watts and Dodds use computer modeling in their study to test the validity of this theory, which they refer to as the “influentials hypothesis” (p.442). Their findings, though, indicate that the opposite may actually be true. Their data shows that large shifts in public opinion occur not because of the presence of certain influential individuals, but because a “critical mass of easily influenced individuals” has been reached, which triggers a “cascade of influence” (p.454). As they put it, “when the right global combination of conditions exists, any spark will do; when it does not, none will suffice” (p.454). They do note that sometimes that spark may come from those “influentials” and so their role cannot and should not be completely discounted (p.455).

In a similar, but slightly varied study, Nino Boccarrà accepts that opinion leaders play a significant role in opinion formation, but seeks to examine how those leaders influence opinions in groups where there are subgroups of other similarly-informed leaders (2007). Boccarrà concludes that in polarized subgroups people seem to be more

influenced by elite opinion leaders, whereas groups whose opinions are distributed more evenly from a central viewpoint seem to be more influenced by those to whom they are close (p.108). In short, he found that groups who formed polarized opinions do so based on influence by elite leaders, while groups with a more even distribution of opinion draw their influence from more personal sources (Boccarda, 2007).

Shen and Liu hypothesize that opinion formation is a two-stage process. The first stage occurs when the individual comes into initial contact with the issue (what they refer to as the “initial state”) (2007, p.1233). The second stage, the interaction stage, is the process during which individuals interact with others and either affirm or change their opinions from the initial stage (p.1233). Testing this two-stage concept through computer modeling, the researchers determined that it is a valid tool for observing opinion formation. They found that, in simulations with various parameters, both stages played significant roles in the formation of opinions. The importance of each stage varied with the parameters so that in some cases the initial stage had greater influence while the interaction stage had greater effect in others (2007).

C.J. Tessone and R. Toral take an approach that focuses on the unique characteristics of each individual, putting forth a model that assumes that “individuals have diverse preferences when adopting an opinion regarding a particular issue” (2009, p. 549). In their model, opinion formation comes about as a result of “diversity-induced resonance, by which an external influence (for example advertising, or fashion trends) is better followed by populations having the right degree of diversity in their preferences” (p. 549). Put simply, opinion formation occurs most easily in groups of people who are already inclined to have similar opinions in similar areas — it resonates with them.



Tessone and Toral's data shows that when this model is tested, two basic "ingredients" come to the fore in the formation of an individual's opinion. Those are "social pressure" and the "effect of advertising" (p.554). Further, based on their data, they conclude that "an external message can propagate better in a society if there is some degree of diversity in the individual preference" (p.555). While this may seem like an obvious intuitive conclusion, the depth of their analysis grants it validity.

In their study on the influence of other's opinions on a consumer's own estimation of a product's merit, David B. Wooten and Americus Reed II form two hypotheses. The first is two parts: a. that consumers who are exposed to others' opinions of a product before they use it will be influenced by those opinions when asked to make an immediate judgment; and b. that customers similarly exposed to others' opinions will show less influence if given time to consider the product before giving their judgment (1998, p. 84-85). Their study involved several focus-group style experiments, with subjects receiving varying levels of exposure to the opinions of others and then being asked to give their own opinion after varying periods of time and consideration. Wooten and Reed confirmed their two-part hypothesis and conclude that "consumers who accept an informational social influence do so by anchoring on initially considered information and adjusting to account for additional inputs" (p. 96).

When evaluating from memory the authors concluded, "the initially considered inputs are those that are presented most recently" (p. 96) i.e. the actual experience first, *then* the others' judgments. Their second hypothesis, which is an attempt to adjust for a potential problem with the first, seeks to examine the possibility that consumers show greater influence because of an ambiguous experience with the product. They

hypothesize that, if given an unambiguous experience, the consumer will be less likely to allow the others' opinions to influence their own judgment than if their own experience was more ambiguous. Their data led them to accept this hypothesis as well (Wooten & Reed, 1998).

In a similar study, Scott A. Hawkins and Stephen J. Hoch examine “how subjects' level of involvement during initial exposure to consumer trivia influences what they learn and what they subsequently come to believe” (1992, p. 212). The authors studied if, after a consumer hears a piece of information in passing, consumers will then evaluate that statement as true when asked to process it actively — a process they refer to as the “truth effect” (p. 212). Through their experiments, Hawkins and Hoch were able to determine that to be the case. Further, they found that, with greater repetition, this truth effect was enhanced. As they put it, “when subjects experienced an ‘it rings a bell’ reaction, they judged the information to be more true (1992, p. 223).

In their first collaboration, Baba Shiv, Julie A. Edell and John W. Payne focus on the effects of negative advertisements on consumer opinions. Based on previous studies, they formed two hypotheses. The first has two parts: a. Negatively framed ads are more likely to be successful when the audience has to do little processing of their own, and b. when the audience's processing level is high, they will be less likely to choose the negatively framed ad and possible even more likely to choose a positively framed one instead (1997, p. 287). The second hypothesis states that a negative ad will result in a less favorable attitude toward that ad's sponsor, no matter the level of cognition (1998, p. 287). In both of their experiments the authors found evidence confirming their hypotheses. In their first experiment the authors exposed two groups of respondents to

advertising by one airline company (A), in which it compares itself to another (B). One group was exposed to an ad in which airline (A) compared itself in a positive light to airline B, while the other group was exposed to an ad where airline (A) compared itself to the negative attributes of airline (B). Both ads were based on “on-time performance” and “in-flight amenities” (p. 288). The respondents were then immediately asked to make a choice between the two airlines. In the second experiment, an additional variable was included.

One group was asked to make its brand choice immediately after seeing the ad, while the other was first asked to evaluate the ad, then to make its brand choice. In this way, the authors added “elaboration” and gave the respondents time to consider the ad, thus increasing their level of processing (p. 291). In the first study, respondents were more likely to pick product A after reading the ad that put down product B. In the second, the authors found that giving the respondents time to process and consider the ad before making an airline choice mitigated this effect. To further reinforce their conclusions, the authors ran the second study again, this time using laundry detergents as their test case, but with all other variables similar. They found the same result in that study as well (Shiv, Edell, & Payne, 1997).

In response to results of several studies that showed results conflicting with their initial study in the area of elaboration, Shiv, Edell and Payne conducted a follow-up experiment, this time focusing on “the moderating roles of motivation and opportunity-related variables on the effectiveness of negative versus positive message frames” (2004, p. 199). They hypothesized that, when the level of a consumer’s “processing motivation” (i.e. the consumer’s motivation to consider the product) is low and “processing

opportunity” (i.e. the consumer has ample time to consider the product) is high, a negatively framed ad will be less effective than one that is positively framed (p. 201). The authors hypothesized that when a consumer’s processing motivation is low and the processing opportunity is as well, then a negatively framed ad will be more effective than one that is positively framed (p. 201). Further, they hypothesized that, when a consumer’s processing motivation is high, a negatively framed ad will be more effective than one that is positively framed, regardless of the consumer’s level of processing opportunity (p, 201). Their studies were similar in nature to those in the first article, but with adjustments to manipulate the participants’ level of processing motivation and opportunity. They conclude that “a resolution to the seeming conflict lies in the way cognitive elaboration was manipulated by Shiv et al. (1997) and in previous research (p. 207).” Based on their data, the authors are able to accept their new hypotheses (2004).

### **Persuasion Theory and Overcoming Consumer Bias**

Once an opinion has been formed, however, the process of changing it is a different matter altogether. Overcoming consumer bias and changing opinions, sometimes long-held, can be a significant challenge, and the theories on how to do so are as varied in number and strategy as those on opinion formation.

In their study and discussion on persuasion routes, Arie W. Kruglanski and Erik P. Thompson compare the two main, dual-route persuasion models and put forth their own argument for a single-route process (1999). Kruglanski and Thompson first discuss the Elaboration Likelihood Model (or ELM). In this dual-route model, the central idea is that a subject can come to be persuaded through either a central route, in which all the related information is elaborated and the subject makes an active judgement based

thereon, or a peripheral route, in which the subject is exposed secondarily to information and persuasive arguments and is persuaded on a subconscious basis (p. 84). Although both result in the persuasion of the subject, the authors describe several key differences in the two paths. According to the authors, “The ELM holds that attitudes acquired via the central route differ in their consequences from those acquired via the peripheral route. The former are expected to manifest greater temporal persistence, be more predictive of behavior, and exhibit greater resistance to counterpersuasion than attitudes acquired via the peripheral route” (p. 86). In short, elaborated persuasion should, because of the active participation of the subject, form a stronger basis for persuasion (Kruglanski & Thompson, 1999).

Kruglanski and Thompson also examine the Heuristic Systematic Method (or HSM), which is similar in several ways to the ELM (1999). Like the ELM, the HSM maintains that the subject will follow one of two routes to persuasion. The first, systematic, route is very similar to the central route in the ELM in that the subject is exposed directly to information and persuasive messages and systematically processes them (p. 86). Whereas the ELM puts the focus on the exposure, however, the HSM centers on the systematic processing portion of this route. The second, heuristic, route would seem also to be very similar to the peripheral route of the ELM (p. 86). However, it is not nearly as subconscious as that peripheral route. The authors write, “When processing heuristically, people focus on that subset of available information that enables them to use simple inferential rules, schemata, or cognitive heuristics to formulate their judgements and decisions” (p. 86). Subjects, the HSM assumes, still make active considerations in the heuristic route, but do so based on information they can draw in

from their own inferential sources. Both the ELM and HSM, the authors assert, assume “that the dominant motivational concern of persons in persuasion settings is the desire to form or hold valid or accurate attitudes” (p. 84), and further, “that both heuristic [or peripheral] and systematic [or central] processing can occur in the service of this goal” (p. 84).

Kruglanski and Thompson reject the idea of a two-route process. Instead, they introduce a “unimodel” theory (1999, p. 84). Their unimodel, “adopts a more abstract level of analysis in which the two persuasive modes (of either ELM or HSM) are viewed as special cases of the same underlying process” (p. 84). Further, the unimodel “deconstructs the ‘Laswellian’ pertition between persuasively relevant categories” (p. 84). The unimodel, for all intents and purposes, says that any two routes to persuasion that might appear different to researchers still come as part of a single, fundamental persuasion process (Kruglanski & Thompson, 1999).

In their response to Kruglanski and Thompson, Richard Petty, S. Christian Wheeler and George Bizer question whether the former adequately understood the tenants of the ELM (1999). Petty, Wheeler and Bizer accept many of the arguments made by Kruglanski and Thompson, but clarify a key point. The ELM, they assert is a “dual-route but multiprocess theory” (p. 157). As Petty, Wheeler and Bizer compare and contrast the two ideas, they come to one fundamental difference. As they put it, “the unimodel is touted as superior to dual-process models because it ‘recognizes as relevant to persuasion a broader range of motivations’ and ‘distinguishes between the software and hardware aspects of cognitive ability’ ... That is, the unimodel splits the persuasion-relevant motivations into many categories whereas the ELM lumps them into just two —

those that influence motivation in a relatively objective way and those that influence motivation in a biased way” (p. 162). Although the authors reject the unimodel’s superiority, they do acknowledge that it offers a new viewpoint for discussion. “Readers,” they say, “will have to determine which lumping and splitting allows a superior understanding of persuasion” (p. 162).

In their study on emotional persuasion, David DeSteno, Duane T. Wegener, Richard E. Petty, Derek D. Rucker and Julia Braverman theorized that specific emotions can have a direct effect on the persuasion process (2004). As they put it, “it seems plausible that the ability to experience distinct emotions should result in their differential influence on many cognitive and motivational processes” (p. 44). The authors hypothesize that efforts to persuade a person or audience “would be more successful when messages were framed with emotional overtones” (p. 45). Through two studies they were able to accept that hypothesis, albeit with several caveats.

The first involves anger, and the potential of that emotional reaction to backfire on the persuader. “The simple presence of anger,” they explain, “may sometimes prevent effortful consideration of a message” (p. 53). Effortful consideration being a key to successful persuasion, the potential for backfiring is obvious. Second, the authors found that sometimes “when participants were suspicious that emotions might bias their judgments and they had the ability to combat this bias, they are shown to engage in correction” (p. 53), which produced the opposite effect. Finally, the authors note that their narrow choice of emotions, and the strong arguments they used to support their emotional pleas, means that their results are directly applicable only in those cases they

studied. Still, despite these caveats, their data shows a clear link between emotion-based appeals and successful persuasion (DeSteno et al., 2004).

Robert G. Magee and Sriram Kalyanaraman assert that, “People have different ways of making sense of what they experience, and researchers can gain greater insight into human behavior by understanding how people interpret the world around them” (2009, p. 186). In their study, Magee and Kalyanaraman focus on “world view” and “mortality salience” (p. 173, 176) and how those factors influence persuasion. They define worldview as “a set of assumptions about physical and social reality that shapes the way a person perceives and interprets the world” (p. 173). In short, it is the way an individual sees the world around them and how they fit into it — how they “make sense” of the world. Mortality salience (the awareness of an individual of their own mortality) acts as a subhead of sorts. As Magee and Kalyanaraman define it, “Making a person aware of his or her mortality will result in an increase in habitual thought patterns.” Through their study, they find support for their hypothesis that, “a person’s worldview can be a significant predictor of how a persuasive message is processed” (p. 176). Further, they found that making mortality salient had the effect of changing “the way people process information” and lead to “an increased reliance on one’s worldview when evaluating persuasive messages such as ads” (p. 188) The researchers conclude that advertisers, in short, need to be constantly aware of the worldview of their audience and the effect their mortality awareness has on that view.

In their study, Rohini Ahluwalia and Robert E. Burnkrant seek to determine the effect of rhetorical questions on persuasion. Their study focused on rhetorical questions of the “agreement format” (i.e. “Did you know that Mizuno shoes can reduce your



incidence of arthritis?") (2004, p. 41). Their data suggests that rhetorical questions of this type do have an effect on consumers, to varying degrees. Ahluwalia and Burnkrant note, however, that further research needs to be done to account for other forms of rhetorical questions as well ("doubt format," for example) (Ahluwalia, & Burnkrant, 2004).

### **Consumer Perception of Diesel Engines and Clean Diesel Technology**

The history of diesel in automobiles is long and undulating. The Encyclopedia Britannica suggests that the theory of ignition by compression was first put forth by a French scientist named Sadi Carnot in 1824 (2010). The man credited with inventing the engine that made use of that theory, however, is Rudolph Diesel, who received a patent for his engine design in 1892. Though his early designs and prototypes showed great promise, Diesel never saw them implemented on a large scale. He drowned accidentally while crossing the English Channel in 1913 (Encyclopedia Britannica, 2010).

In the period following World War II, diesel engines began to find wider use in the automotive, heavy transport and industrial power industries (Encyclopedia Britannica, 2010). Its efficiency, compared to gasoline engines, made it attractive to a variety of consumers throughout the world, especially during fuel crises like those experienced in the 1970s and early 1980s (Mack, 2009). However, a series of events in the 1980s damaged the reputation of the diesel engine in the minds of American consumers. In the primary example, a diesel engine, developed and used by General Motors in its Oldsmobile car line, exhibited serious design flaws that lead to complete engine failure in numerous cases. The publicity from these cases and the ensuing class action lawsuit against General Motors heavily damaged the diesel's reputation (Mack, 2009).

Consumers in Europe, however, experienced neither the reliability issues nor the fuel cost fluctuations that influenced Americans (Mack, 2010). This led to a paradoxical relationship between the two markets. As American consumers rejected diesel power for their cars, Europeans embraced it, to the point where, by 2007, 53.3% of new cars in the European Union were diesel-powered (European Automobile Manufacturers' Association, 2008), compared to just 1.7% of the U.S. new car market in 2009 (U.S. Energy Information Administration, 2009).

Recent consumer studies show that, with the advent of high fuel prices and improved technologies, American perception may be turning back in diesel's favor. In one study, 62% of respondents said that diesel cars have "gotten better" in the last decade. Further, the same study found that 35% of respondents would consider a clean diesel vehicle as their next new car. Despite this strong showing, the same study found that most of those who would consider a diesel engine would do so in an upmarket luxury car or a pickup truck (Morpace, 2009). It would seem a paradox still exists, then, between European consumers, who use clean diesel in their small cars to squeeze out maximum efficiency (Mack, 2010), and Americans consumers, who would use it to improve mileage on luxury cars or trucks (Morpace, 2009), but have not accepted it as a small car alternative yet.

The challenge to American carmakers, then, will be to persuade consumers on several levels. As the above survey indicates, consumers are already starting to recognize diesel's feasibility as a high-efficiency option. Although some convincing may still be necessary, the continuing rise in fuel prices will likely make a natural contribution to the persuasion process on this front. There are two other areas, though, that will be key to

whether American consumers accept clean diesel engines. The first challenge will be to convince them that clean diesel engines are, as their name indicates, clean enough to be considered a viable green alternative to hybrids and the like. Second, manufacturers must persuade consumers that diesel-powered cars are just as reliable as other cars currently on the market, and not as prone to failure as the examples that damaged their reputation decades ago.

The data indicates that preconceptions consumers hold about diesel technology have been formed heuristically, with influence by the opinions of others à la Wooten and Reed (1998) and Hawkins and Hoch (1992). As carmakers attempt to change those preconceptions, they would do well to take into account the findings of Shiv, Edell and Paine (1997, 2004) regarding positive and negative message framing and DeSteno, Petty, Rucker, Wegener and Braverman (2004) regarding emotional responses to persuasive methods. Further, as Magee and Kalyanaraman (2009) found, world view and mortality salience have a direct effect on the persuasion process.

### **The Role of PR Messaging and Campaigns in Opinion Formation and Change**

In order to affect a change in existing opinions, or to establish new ones, those seeking to make the change must carry out a campaign. Public relations campaigns of this sort are as numerous and diverse as the opinions and attitudes they seek to form and change. Most, though, can be reduced to a fairly simple formula.

Anthony Fulginiti and Don Bagin (2005) suggest that every PR campaign should, in its most basic form, have three distinct phases of development: “learn,” “think” and “plan” (p. 321). According to Bagin and Fulginiti, during the first, learning, phase, the practitioner must become familiar with the history of the issue and collect data on it so

that they can develop an accurate “real state” description of it (p. 321-322). During the second, thinking, phase, practitioners must first describe the issue in the “ideal state” — how the practitioner believes the issue should be (p. 322-323). In the process of determining whether the ideal state can realistically be achieved, they must identify their audience, dividing it into segments to the greatest degree possible. Then practitioners can begin to construct the message designed to target each segment. Practitioners should make sure they have the resources to carry out the plan and also plan for competing messages during this phase (p.323-325). Finally, during the plan phase, practitioners can put their thinking phase into focus. At this point practitioners should state a goal and “fashion objective, design strategies and select tactics” (p. 326) necessary and prudent to reaching it. This phase is ongoing for as long as the plan is in effect. Practitioner should constantly evaluate the success of the plan and adjusting to compensate where it is lacking. The final step is an evaluation of the entire effort at the completion of the campaign, including each individual piece, so that both the practitioner and other future practitioners can learn what did and did not work for future reference (p. 325-330).

Though Fuliginiti and Bagin assert that every campaign or program should have these basic phases, they do acknowledge that each case is different and every individual will approach the same problem a little bit differently. The authors state, “because public relations is an art applied to a science, it’s important to know how to evaluate each aspect of the plan. Given the same challenge (goal), two groups of planners should theoretically come up with the same objectives... But strategies and tactics are part science and part art. The two groups of planners will almost certainly not come up with the same strategies and tactics.” (p. 331).

According to Fraser P. Seitel (2001), “marketing, literally defined, is the selling of a service or product through pricing, distribution, and promotion. Public relations, liberally defined, is the marketing of an organization” (p. 227). Simple marketing, on its own, may be enough to drive demand for many products, but, “marketing success can be nullified by the social and political forces public relations is designed to confront” (p. 227). Those social and political forces are precisely what must be addressed for modern diesel engines to begin to gain greater acceptance.

When engaging in opinion formation it is important to keep the campaign within ethical guidelines. This is important not only to protect the practitioner and the organization from legal recourse, but because unethical behavior is likely to elicit a negative reaction from the consumer — a rejection of the product. As Mark P. McElreath (1997) frames the issue, “The wise public relations practitioner is well aware not only of all the various factors that can create professionally dangerous situations, but also of how to manage them systematically and ethically” (p. 96). The issue of ethics parallels the questions examined by Shiv et al. (1997, 2004) regarding positive and negative message framing, and DeSteno et al. (2004) regarding emotional manipulation. It will be incumbent on the practitioner to consider the ethical implications of negatively framing a message or competing product. If the public views the message as one of poor ethical taste, the reaction will likely be negative, no matter the potential value of the product. Likewise, appealing to the wrong emotion in an audience can produce a powerful negative reaction. Therefore, in the learning and thinking phases, the practitioner must determine all of the potential ethical pitfalls and address them early in the planning process. This is where segmented publics become increasingly important as well. As

McElreath points out, “cultural differences can exist between communities located side-by-side within one small regional area” (p. 108). McElreath asserts that having a clear view of the divisions within the target public will help the practitioner determine what is ethically acceptable in each segment.

Taking into account all of the above examples, the importance of public relations campaigns, and the messages contained in them, becomes clear. A great deal of research must be done before a plan is even begun, in order to determine everything from what balance of simple marketing and in-depth public relations should be used to what groups should be targeted and with what message or messages. In the case of clean diesel cars, a simple marketing campaign may not be enough to overcome the social and political forces pointed out by Seitel (2001).

## **Chapter 3: Methodology**

### **Research Design**

Research shows that American perceptions of diesel engines have been largely negative over the past two decades, especially in relation to the usage of diesel engines in passenger cars. When faced with this attitude, combined with relatively strict emissions standards, most manufacturers decided to refrain from manufacturing diesel cars for the American market. Dramatic advancements in clean diesel technology, however, combined with increased demand for fuel efficient vehicles, has made the small diesel engine a viable option for the American car market once again. As other studies have indicated, the struggle for manufacturers seeking to entice American buyers continues to be negative preconceptions.

The author first gathered data to draw a consensus opinion of experts in the field of automotive public relations in regards to American consumer attitudes toward diesel engines and clean diesel technology by use of a modified Delphi study.

The second portion of this study focused primarily on young consumers (students between the ages of 18 and 25). This group was chosen because it represented a sample of a generation that was both technologically savvy and environmentally aware. They are also likely, at some point in the course of the next five to ten years, to consider purchasing a car.

This portion of the study helped determine whether young car buyers actually harbor negative or positive preconceptions of diesel engines, and clean diesel technology more specifically. It also helped determine how familiar young consumers are with current clean diesel technology, its benefits and its costs.

The author attempted to show the attitudes of young consumers toward clean diesel engines and their level of understanding of the technology behind modern clean diesel. This provided an indication of how much information, and of what kind, was needed to challenge any negative preconceptions of this group of consumers and assure that they were knowledgeable enough to make an informed decision when considering the purchase of a car equipped with a diesel engine.

### **Data Source**

For the first portion of this study, the author selected a sample group of eleven experts in the field of automotive public relations. Participants in this group were drawn from the specialty group “Automotive Public Relations Council” on the LinkedIn professional networking web site.

For the second portion of this study, the author drew a convenience sample of Rowan University students between the ages of 18 and 25 from six class sections in the Public Relations and Advertising Department of the College of Communication.

### **Data Acquisition**

The data for this study was collected in two parts. In the first part, the researcher conducted a modified Delphi study. A modified Delphi study is “a systematic method to seek and collect judgments on a particular topic through a set of carefully designed sequential questionnaires interspersed with summarized information and feedback of opinions derived from earlier responses” (Fulginiti and Bagin, 2005, p. 79). Put more simply, the Delphi study is a “group process and its goal is to help a group reach a consensus” (p. 79). The data collected is not, therefore, scientifically predictive. However, it does offer rich qualitative data and, since the participants are usually



considered experts in the field being discussed, their given opinions carry more weight than would those of just any other person.

In this study, the researcher sought to gain a consensus opinion from experts in the field of automotive public relations. The research was conducted via electronic mail (email). The researcher emailed a list of four broad questions regarding American consumer attitudes toward diesel engines and clean diesel technology to the chosen participants. The participants responded, whereupon the researcher compiled the responses to each question into a general consensus.

Once a consensus was reached for each topic, the researcher then emailed the findings back to each of the participants. The participants then commented on the findings and returned those comments to the researcher. The researcher further fine tuned the consensus for each question before sending the refined consensus statements back out for the final round of comments. The researcher then confirmed the comments and determined a final consensus for each topic.

Based on the consensus data acquired in the modified Delphi study, the researcher drafted a survey to be administered to the selected sample of Rowan University students in their respective class sections. A survey, according to Fulginiti and Bagin questions “an audience through a questionnaire in writing, over the phone, or in person” (2005, p. 66). Further, “survey versatility and reliability give PR practitioners three important aspects of audiences - knowledge, attitudes and behavior.” As such, “a survey is one of the most effective research techniques available to practitioners” (p. 72-73). A survey with a truly random sample of respondents (a probability sample) will be generalizable to the whole group represented by the survey. A convenience sample (or non-probability

sample), because it is not drawn scientifically, is not representative of anything but those respondents who took the survey. Though not generalizable, a convenience sample is a quicker, easier way to gather information and the data yielded is still valuable.

A similar relationship exists between fixed and open-ended response questions. Fixed response questions require the respondent to choose between a series of set answers to a specific question. This gives the researcher concrete, scientific values that can be analyzed. When paired with a probability sample, these responses can be generalized to the larger body. Open-ended questions do not yield scientific data, but give the researcher a qualitative look in to what respondents are actually feeling. Though not generalizable, the information gathered from this type of question is generally richer and can help a researcher understand the hard data gathered in fixed response questions.

The survey conducted by the researcher included questions about the respondents' attitudes toward clean diesel, its applicability in the American car market and their general knowledge of the technology itself, as well as several basic demographic questions.

The survey was comprised of a combination of multiple answer questions, Likert-scale questions, and simple yes-or-no questions. Open-ended questions were included in the survey to record any additional thoughts of the respondents.

In covering six class sections, the researcher drew a sample size of approximately 90 to 110 respondents.

### **Data Analysis**

For the first portion of the study, the researcher evaluated and determined a consensus to each of the topics in the manner discussed in the previous section.

For the second portion of the study, the researcher codified the responses given in the surveys. The researcher then used the data to determine attitudes toward clean diesel, its applicability in the American car market and the general knowledge of the respondents regarding the technology itself.

This codification and interpretation allowed the researcher to determine if a negative or positive bias existed among Rowan Students, to what extent that bias affected their opinions of the use of clean diesel engines, and their general level of understanding of diesel technology.

### **Summary**

The research design discussed in this chapter was used to determine attitudes toward clean diesel, its applicability in the American car market and the general knowledge of the respondents regarding the technology itself.

Chapter 4 provides the results of this two part study. It includes a comprehensive breakdown of all the data obtained, both quantitative and qualitative. The responses to the Delphi questions were evaluated and combined to form a general consensus for each general topic. The statistical data from the surveys was examined for broad trends and cross-tabulated demographically to see if there were certain subgroups within the larger sample that differ from the overall population sampled. Charts, tables and graphs were provided where necessary or convenient. Chapter 4 contains only strict data. Further interpretation and discussion can be found in Chapter 5.

## Chapter 4: Results

### Modified Delphi Study Results

The researcher contacted 123 public relations professionals who indicated on their PRSA (Public Relations Society of America) profiles that they practice in the automotive field. Their names were chosen through a basic search of the PRSA directory. The participants were asked to list their responses to four questions:

Question 1: *Please list the reasons that you believe clean diesel engines have seen more success in small cars in other markets than in the U.S.*

Question 2: *Please list the preconceptions that you believe American consumers harbor regarding automotive diesel engines, positive or negative.*

Question 3: *Please list the primary factors you believe contribute to the conditions addressed in the previous two questions.*

Question 4: *Please list the primary steps you believe manufacturers must take to overcome the conditions discussed in the previous questions.*

A copy of all email correspondence can be found in Appendix A of this document.

Eleven respondents sent their responses in list form. The researcher took their lists and rank-ordered the responses in order of frequency. That rank-ordered list was then returned to the participants with instructions to place the items in the order they believe the items exist in actuality.

Of the original eleven respondents, five responded to the second round. For each question, the researcher found the mean score of their ranking number and reordered the lists accordingly.

Question 1: *Please list the reasons that you believe clean diesel engines have seen more success in small cars in other markets than in the U.S.*

*Responses based on popularity of initial response:*

1. Diesel fuel is lower in price and more widely available in Europe and other parts of the world.
2. Most U.S. consumers are unfamiliar with diesel as a fuel for cars.
3. In some other countries there is an adjusted fuel tax that provides diesel with a competitive advantage.
4. U.S. emissions standards exceed European ones. It is expensive to produce diesel cars that meet these standards.
5. Other developed markets (Europe especially) have been more environmentally conscious than the US for years and they continue to be.
6. American consumers harbor a mindset that is negative toward diesel fuels.
7. Hybrid/electric power is viewed as the 'next wave' of automotive energy efficiency.
8. The U.S. is still a 'big car' market, so advancements in small cars are only of interest to a small segment of the U.S.

*After rank-ordering exercise:*

1. Most U.S. consumers are unfamiliar with diesel as a fuel for cars.
2. Diesel fuel is lower in price and more widely available in Europe and other parts of the world.
3. Hybrid/electric power is viewed as the ‘next wave’ of automotive energy efficiency.
4. U.S. emissions standards exceed European ones. It is expensive to produce diesel cars that meet these standards.
5. In some other countries there is an adjusted fuel tax that provides diesel with a competitive advantage.
6. American consumers harbor a mindset that is negative toward diesel fuels.
7. The U.S. is still a ‘big car’ market, so advancements in small cars are only of interest to a small segment of the U.S. Hybrid/electric power is viewed as the ‘next wave’ of automotive energy efficiency.
8. Other developed markets (Europe especially) have been more environmentally conscious than the US for years and they continue to be.

The opinion of the participants in this area is that the two biggest factors affecting the success of diesel engines in the United States compared to other areas of the world are consumer familiarity with diesel as a fuel option and the price and availability of diesel fuel at the pump. Additionally, the respondents felt that American consumers viewed hybrid and electric vehicles as the direction in which energy efficient vehicles are going in the future.

Although the respondents believe that a negative mindset towards diesel fuels is a contributing factor to this question, they do not believe it to be as influential as the factors mentioned previously. In fact, of the four attitude-related factors listed (negative mindset, the perception of hybrid/electric power as the “next wave,” the perception of the U.S. As a “big car” market, and environmental consciousness) three were ranked at the bottom of

the list by the respondents. Only the perception of hybrid/electric vehicles as the “next wave” was ranked in the top three factors.

Instead, the respondents indicated that they believe the reasons lie more in familiarity and cost issues.

Question 2: *Please list the preconceptions that you believe American consumers harbor regarding automotive diesel engines, positive or negative.*

*Responses based on popularity of initial response:*

1. Diesel is dirty, noxious, or sooty.
2. Diesel is more expensive to purchase than regular gasoline.
3. Diesel is not as widely available in the U.S. as regular gasoline
4. Diesel engines are noisy.
5. Diesel engine cars have lower performance and are slow.
6. Diesel is mainly for large trucks and a limited number of more expensive specialty cars.
7. Diesel engines are more economical.
8. Diesel engines last longer.
9. Diesel fuel usage does not reduce our dependence on foreign oil.
10. Diesel engines are hard to start, especially in the cold.

*After rank-ordering exercise:*

1. Diesel is dirty, noxious, or sooty.
2. Diesel is not as widely available in the U.S. as regular gasoline.
3. Diesel engines are noisy.
4. Diesel is more expensive to purchase than regular gasoline.
5. Diesel engine cars have lower performance and are slow.
6. Diesel engines last longer.
7. Diesel engines are more economical.
8. Diesel engines are hard to start, especially in the cold.
9. Diesel fuel usage does not reduce our dependence on foreign oil.
10. Diesel is mainly for large trucks and a limited number of more expensive specialty cars.

Of the ten responses given, the first five in ranking order are negative in nature. The respondents indicated that they believe American consumers hold a negative view of diesel engines in regards to cleanliness, cost, availability and performance.

Although the respondents indicated that they believe some consumers recognize diesel engines as more economical and longer-lasting, those factors were listed significantly lower on the list.

The list also indicates that the respondents believe that stereotypes (i.e. diesel is mainly for large trucks, diesel engines are hard to start, diesel engines are slow) still play a significant role in the opinions of consumers.

Question 3: *Please list the primary factors you believe contribute to the conditions addressed in the previous two questions.*



*Responses based on popularity of initial response:*

1. The limited visibility from marketing of diesel cars in the U.S.
2. The posted pricing of diesel fuel at gas stations often exceeds other options (i.e. regular gasoline).
3. The lack of availability of diesel fuel in the U.S. compared to gasoline.
4. The black smoke that emanates from older diesel cars and large trucks and rigs.
5. A lack of understanding among American consumers about what diesel is and what it offers.
6. Past issues with diesel cars in the American market
7. Lack of any serious education about diesel cars in the U.S.
8. Actual use of diesel cars in the U.S. is low, but usage is high in Europe and elsewhere.
9. Stricter U.S. emissions standards drive up the price of compliance for diesel vehicles.
10. Concerns about safety of diesel fuels in the event of an accident.

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8. The posted pricing of diesel fuel at gas stations often exceeds other options (i.e. regular gasoline).
9. Stricter U.S. emissions standards drive up the price of compliance for diesel vehicles.
10. Concerns about safety of diesel fuels in the event of an accident.

The top three responses in this section all relate to consumer understanding and acceptance of diesel engines. Respondents indicated that the most important factor regarding the negative opinions discussed in question two is a lack of consumer understanding. However, with the following two items, the respondents indicate that the reason for that lack of understanding is a lack of exposure and lack of effort to expand that understanding.

A significant portion of the list also deals with general exposure of consumers to diesel fuel and diesel cars. For instance, respondents indicated that consumers don't see very many diesel cars in the U.S., but they do observe the lower availability of diesel fuel and the higher price at the pump for diesel than for regular gasoline.

The respondents also indicated that past experiences (i.e. negative experiences with older diesel cars and the black smoke sometimes seen emanating from older big rigs) play a role as well.

Question 4: *Please list the primary steps you believe manufacturers must take to overcome the conditions discussed in the previous questions.*

*Responses based on popularity of initial response:*

1. A marketing campaign highlighting advances in diesel technologies that boost performance and efficiency and dramatically reduce emissions.
2. A massive education program that explains what diesel is and highlights its strengths.
3. Highly promoted special events focusing on diesel cars and diesel power.
4. A campaign to demonstrate the positive cost-benefit relationship of diesel cars.
5. A large research effort to determine actual consumer attitudes and habits.
6. A lobbying effort aimed at getting the government to provide federal subsidies for purchase.
7. A campaign targeting people who already bought small cars, highlighting benefits of diesel engines.
8. Develop an association of car manufacturers and fuel manufacturers to act in the interest of both where diesel is concerned.
9. Manufacturers should offer financial purchase or trade-in incentives.
10. Product placement of diesel cars in popular movies or TV shows.

*After rank-ordering exercise:*

1. A large research effort to determine actual consumer attitudes and habits.
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7. A campaign targeting people who already bought small cars, highlighting benefits of diesel engines.
8. Manufacturers should offer financial purchase or trade-in incentives.
9. A lobbying effort aimed at getting the government to provide federal subsidies for purchase.
10. Product placement of diesel cars in popular movies or TV shows.

The top response to this question was a research effort to determine actual consumer attitudes and habits. The remaining four of the top five responses to this question all deal with education and exposure.

The respondents also list unity among manufacturers, targeted marketing and lobbying efforts as important steps to overcome the issues discussed in the previous two questions.

### **Student Survey Results**

In this survey, the researcher used a convenience sample, drawing from Rowan University communication students across six classroom groups. Though this will not be

generalizeable to a larger public, it will give an indication of what this particular group of students thinks.

### Demographics

A total of 96 students took the survey, with 32 indicating that they are male, 63 female and one who did not note gender. Of the 96 respondents, five (or 5.2%) indicated that they were age 17 to 19, 64 (or 66.7%) indicated that they were age 20 to 22, 21 (or 21.9%) indicated that they were age 23 to 24 and six (or 6.2%) indicated that they were 25 years of age or older. Further, of the 96 respondents, 88 (91.7%) indicated that they own a car and 8 (8.3%) indicated that they do not.

### Analysis by Question

Question 4: *When considering the purchase of a car, how important is its fuel mileage (MPG rating) to you?*

Mean	5.895833333
Standard Error	0.09876337
Median	6
Mode	6

A 7-point Likert scale was used for this question. The interval for this question is from 5.702 to 6.088, indicating that respondents believe fuel mileage is important when considering the purchase of a car.

This is confirmed by both the median and mode scores as well.

Question 5: *When considering the purchase of a car, how important is it that the car be considered environmentally friendly?*

Mean	3.90625
Standard Error	0.142870114
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.628 to 4.184. Since 4 falls within this interval, the researcher cannot determine conclusively how respondents rate the importance of a car’s environmental friendliness when considering it for purchase.

This is confirmed by both the median and mode scores as well.

Question 6: *Would you consider purchasing a car equipped with a diesel engine?*

Mean	1.635416667
Standard Error	0.049381685
Median	2
Mode	2

This was a simple yes or no question, with 1 being “yes” and 2 being “no.” The interval for this question is from 1.539 to 1.731, indicating that the majority of respondents would not consider purchasing a car equipped with a diesel engine.

This is confirmed by both the median and mode scores as well.

Question 7: Using the scale beneath each, where 1 represents “strongly disagree” and 7 represents “strongly agree,” please indicate your level of agreement with each description.

Question 7a: *Diesel engines are dirty, noxious, or sooty.*

Mean	4.21875
Standard Error	0.156162256
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.913 to 4.525. Since 4 falls within this interval, the researcher cannot determine conclusively whether the respondents agree that diesel engines are dirty, noxious or sooty.

This is confirmed by both the median and mode scores as well.

Question 7b: *Diesel engines get good fuel economy.*

Mean	3.854166667
Standard Error	0.171410024
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.519 to 4.189. Since 4 falls within this interval, the researcher cannot determine conclusively whether the respondents agree that diesel engines to get good fuel economy.

This is confirmed by both the median and mode scores as well.

Question 7c: *Diesel engines are noisy.*

Mean	4.947916667
Standard Error	0.152011218
Median	5
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 4.650 to 5.246, indicating that the respondents do agree that diesel engines are noisy.

This is backed up by the median score (5) as well, although the mode indicates a clear neutral center among the respondents.

Question 7d: *Diesel engines are durable and long-lasting.*

Mean	4.583333333
Standard Error	0.116290119
Median	4
Mode	4



A 7-point Likert scale was used for this question. The interval for this question is from 4.356 to 4.810, indicating that the majority of respondents agree that diesel engines to be durable and long-lasting.

This is not backed up by the median score, however, which indicates no clear opinion. The mode shows a clear neutral center among respondents.

Question 7e: *Diesel-engined cars are slow and/or underpowered.*

Mean	3.489583333
Standard Error	0.141262161
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.213 to 3.765, indicating that respondents do not agree that cars equipped with diesel engines to be slow and/or underpowered.

This is not backed up by the median score, however, which indicates no clear opinion. The mode shows a clear neutral center among respondents.

Question 8: *Using the scale beneath each, where 1 represents “strongly disagree” and 7 represents “strongly agree,” please indicate whether you agree that a diesel engine is an appropriate motor for each type of car.*

Question 8a: *Small economy cars*

Mean	3.0625
Standard Error	0.191263401
Median	3
Mode	1

A 7-point Likert scale was used for this question. The interval for this question is from 2.787 to 3.339, indicating that the majority of respondents do not agree that diesel engines are an appropriate motor for small economy cars.

This is backed up by both the median and mode scores as well.

Question 8b: *Midsized cars*

Mean	3.4375
Standard Error	0.167418807
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.110 to 3.764, indicating that the majority of respondents do not agree that diesel engines are an appropriate motor for midsized cars.

This is not backed up by the median score, however, which indicates no clear opinion. The mode shows a clear neutral center among respondents.

Question 8c: *Large sedans*

Mean	3.96875
Standard Error	0.161851354
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.651 to 4.287. Since 4 falls within this interval, the researcher cannot determine conclusively whether the respondents agree that diesel engines are an appropriate motor for large sedans.

This is backed up by both the median and the mode scores as well.

Question 8d: *Luxury cars*

Mean	3.458333333
Standard Error	0.166172513
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.133 to 3.783, indicating that the majority of respondents do not agree that diesel engines are an appropriate motor for luxury cars.

This is not backed up by the median score, however, which indicates no clear opinion. The mode shows a clear neutral center among respondents.

Question 8e: *Light trucks and pickup trucks*

Mean	5.427083333
Standard Error	0.166059062
Median	6
Mode	7

A 7-point Likert scale was used for this question. The interval for this question is from 5.102 to 5.752, indicating that the majority of respondents agree that diesel engines are an appropriate motor for light trucks and pickup trucks.

This is backed up by both the median and mode scores as well.

Question 9: *Using the scale beneath each, where 1 represents “strongly disagree” and 7 represents “strongly agree,” please rate your agreement with each descriptor.*

Question 9a: *Diesel fuel is expensive.*

Mean	5.71875
Standard Error	0.140255973
Median	6
Mode	7

A 7-point Likert scale was used for this question. The interval for this question is from 5.445 to 5.993, indicating that the majority of respondents agree that diesel fuel is expensive.

This is backed up by both the median and mode scores as well.

Question 9b: *Diesel fuel is cleaner than gasoline.*

Mean	3.739583333
Standard Error	0.151197553
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.443 to 4.035. Since 4 falls within this interval, the researcher cannot determine conclusively whether the respondents agree that diesel fuel is cleaner than gasoline.

This is backed up by both the median and mode scores as well.

Question 9c: *Diesel fuel is harder to find than gasoline.*

Mean	3.84375
Standard Error	0.177907011
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.495 to 4.193. Since 4 falls within this interval, the researcher cannot determine conclusively whether the respondents agree that diesel fuel is harder to find than gasoline.

This is backed up by both the median and mode scores as well.

Question 9d: *Diesel fuel burns more efficiently than gasoline.*

Mean	4.115789474
Standard Error	0.149551893
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.823 to 4.403. Since 4 falls within this interval, the researcher cannot determine conclusively whether the respondents agree that diesel fuel burns more efficiently than gasoline.

This is backed up by both the median and mode scores as well.

Question 9e: *Diesel fuel is not as clean as gasoline.*

Mean	4.231578947
Standard Error	0.141542163
Median	4
Mode	4

A 7-point Likert scale was used for this question. The interval for this question is from 3.954 to 4.510. Since 4 falls within this interval, the researcher cannot determine conclusively whether the respondents agree that diesel fuel is not as clean as gasoline.

This is backed up by both the median and mode scores as well.

Question 10: *Which of the following do you believe are the cleanest cars?*

Mean	3.287234043
Standard Error	0.071941314
Median	3
Mode	3

The median and mode scores both indicate that the majority of respondents believe electric cars are the cleanest of the four cars listed (regular gasoline, clean diesel, electric and hybrid).

This is backed up by the mean score as well.

Question 11: *Which of the following cars do you believe get the best fuel mileage?*

Mean	3.268817204
Standard Error	0.109334962
Median	4
Mode	4

The median and mode scores both indicate that the majority of respondents believe hybrid cars get the best mileage of the four kinds of car listed (regular gasoline, clean diesel, electric and hybrid).

This is not verified by the mean score, however, which indicates that the average response was close to 3, which would have been electric cars.

Question 12: *If you saw more advertisements for cars equipped with diesel engines, would you be more inclined to consider buying one?*

Mean	1.457446809
Standard Error	0.051659475
Median	1
Mode	1

This was a simple yes or no question, with 1 being “yes” and 2 being “no.” The interval for this question is from 1.355 to 1.559. Since 1.5 falls within this interval, the researcher cannot determine conclusively whether the respondents would consider purchasing a car equipped with a diesel engine if exposed to more advertising.

However, this is not verified by the mean or mode scores. Both indicate that the majority of respondents would consider purchasing a car equipped with a diesel engine if exposed to more advertising.



## **Hypotheses**

H1: *The Majority of Rowan students between the ages of 18 and 25 will have a negative opinion of clean diesel automotive technology.*

Based on their responses during the modified Delphi study, the automotive PR experts, in general, gave responses to support this hypothesis. Their assessments are affirmed through much of the student survey as well, though there was ambiguity in the data for some of the questions.

Therefore, the researcher accepts this hypothesis with caveats to be discussed in Chapter 5.

H2: *In the majority of cases, the attitudes of Rowan students between the ages of 18 and 25 negatively affect their opinions of clean diesel automotive technology.*

Based on their responses during the modified Delphi study, the automotive PR experts again gave responses to support this hypothesis. That was further generally supported by the survey responses regarding potential buying practices.

If it is generally accepted by the researcher that H1 is true, then, based on the opinions of the automotive PR experts and the survey responses to questions regarding potential buying practices, the researcher accepts this hypothesis as well.

## Chapter 5: Discussion

### Hypotheses

H1: *The Majority of Rowan students between the ages of 18 and 25 will have a negative opinion of clean diesel automotive technology.*

Based on their responses during the modified Delphi study, the automotive PR experts, in general, gave responses to support this hypothesis. This is especially evident in their rank-ordered responses to the second question (regarding consumer preconceptions), where the top five responses were all negative in nature. Of the remaining five, only three were positive in nature. As one respondent put it in discussion of his responses, “Diesels have a long and successful history in Europe and other global markets, thus a favorable public perception and much greater use... Diesels are perceived by Americans as dirty and noisy. They feel diesels are really best for trucks, not cars. Diesel fuel seems to be more expensive than gasoline, isn't readily available at my local gas station, and is mostly found at truck stops.”

This assessment was affirmed in much of the student survey. The survey showed that a majority of the respondents believe that diesel engines are noisy, diesel fuel is expensive, and that diesel engines are appropriate for use only in trucks and the like. On other questions, like diesel's cleanliness and its fuel efficiency, no clear conclusion could be drawn.

It should be noted, though, that some positive opinions were exhibited as well. Although the mode and median scores did not correspond, the mean response to question 7d, regarding the durability of diesel engines, was positive. The same was true of their response to question 7e, the assessment of diesel-powered cars as slow or under-powered.

Although the median and mode were unclear, the mean score indicated that the majority disagreed with that negative assessment.

However, since negative opinions of respondents outweigh the positive and neutral ones, the researcher accepts this hypothesis with the caveat that, although the prevailing opinion regarding diesel technology and engines is negative, positive opinions exist as well.

*H2: In the majority of cases, the attitudes of Rowan students between the ages of 18 and 25 negatively affect their opinions of clean diesel automotive technology.*

Again, the modified Delphi respondents seemed to support this hypothesis with their own responses. As another respondent framed the issue, “Clearly, there is a lack of understanding about what diesel offers as a fuel. Right now, everyone is entranced with hybrid electric vehicles because they're considered ‘the new thing.’ Diesel, because it has a long history, is fighting an image of something that's been around for a long time and is, therefore, ‘old fashioned.’”

The survey responses appear to bear that out.

The clear majority response to question six on the survey (Would you consider purchasing a car equipped with a diesel engine?) was “no.” Further, the majority of respondents also indicated in question 8 that they believe diesel is not an appropriate engine choice for small cars, midsize cars or luxury cars.

However, in response to question 12 (If you saw more advertisements for cars equipped with diesel engines, would you be more inclined to consider buying one?), there was no clear conclusion to be drawn from the mean. The median and mode, though,

indicate that the majority of the respondents may have been leaning towards “yes.” Without broader research, though, this cannot be definitively determined.

If it is generally accepted by the researcher that H1 is true, then, based on the overall response to additional questions regarding potential buying practices, the researcher accepts this hypothesis as well.

### **Research Questions**

*Q1: Do Rowan students between the ages of 18 and 25 have a positive opinion of clean diesel automotive technology?*

Based on the statistical analysis of questions 7d and 7e, the researcher can determine that Rowan students between the age of 18 and 25 do have some positive opinions of clean diesel automotive technology. There were additional questions where a clear opinion could not be determined.

*Q2: Do Rowan students between the ages of 18 and 25 have a negative opinion of clean diesel automotive technology?*

Based on the statistical analysis of questions 7c, 8a, 8b, 8d, 8e and 9a, the researcher can determine that Rowan students between the ages of 18 and 25 do have many negative opinions of clean diesel automotive technology. Again, there were additional questions where a clear opinion could not be determined.

*Q3: Do preconceived attitudes about diesel technology found among Rowan students between the ages of 18 and 25 positively affect their perception of clean diesel technology?*

Although a majority of respondents indicated some positive opinions about diesel engines, the majority also indicated that they would not consider purchasing a car equipped with a diesel engine. Therefore, even if some positive attitudes exist, the survey indicates that those attitudes do not positively affect their overall perception of clean diesel automotive technology.

*Q4: Do preconceived attitudes about diesel technology found among Rowan students between the ages of 18 and 25 negatively affect their perception of clean diesel technology?*

Since the majority of respondents indicated that they would not consider purchasing a car equipped with a diesel engine, and since the researcher determined in that the majority of respondents do not believe diesel is an appropriate engine type for most passenger cars, it stands to reason that those negative attitudes also reflect a negative perception of diesel automotive technology.

### **Limitations**

The modified Delphi study presented the researcher with a number of challenges from the outset. The researcher sought at least 12 to 15 participants. Even with a list of over 120 names of public relations professionals, however, only 11 responded to the initial round of the survey.

Of those 11, only 5 responded to the rank-ordering round, despite several courteous reminders. This severely limited the quality of the rank-order process.

For instance, one ranking outlier frequently changed the ranking of a single statement significantly. In order to mitigate this, the researcher eliminated the highest and lowest ranking from each question, thereby limiting the outlier effect. Unfortunately, this reduced the number of ranking responses to three for each statement.

The conclusions of the study, and more so its generalizability, are therefore shaky at best.

The survey process faced limitations as well. Because of time and ability constraints, a convenience sample of students in five class sections in the College of Communication was the only viable sampling option. Although the surveys offered rich data, they are not random and therefore cannot be generalized to any larger populace.

Further, participant ignorance with regards to automotive technology in general limited the wording and content of the questions on the survey. Although this is also a reflection of a broader challenge faced by automotive advertisers and therefore a finding in and of itself, it also served as a limiting factor in gaining clearer information on attitudes.

### **Researcher's Suggestions**

Despite the limitations, the researcher was able to gain a great deal of insight from both the modified Delphi and survey studies. The goal of this research was to determine whether established attitudes (negative or positive) exist in consumer minds and whether those attitudes have an impact on perception.

Since the researcher was able to determine that that negative attitudes dominate the consumer mindset when it comes to the use of diesel engines in cars and those attitudes do, in fact impact perception, the groundwork has been laid for future research in to the topic.

More specifically, future research should be done to determine how to overcome those attitudes.

The survey data showed, for instance, that fuel mileage is important to the majority of respondents when considering the purchase of a car. Since small diesel engines are often significantly more efficient than their gasoline counterparts, research should focus on how to use that positive trait to overcome a negative attitude.

Further, the survey showed that the majority of respondents believe electric cars and gas/electric hybrid cars are the cleanest, most efficient vehicles available. Since electric cars still must draw their charge from a power grid and hybrid vehicles still use gasoline motors for a significant portion of their power, research should be done to determine how clean diesel technology can be better portrayed as a green alternative.

In response to question 6 on the survey (Would you consider purchasing a car equipped with a diesel engine?), one participant who selected “no” also commented, “Too expensive and I have no need for the heavy duty diesel,” reflecting the preconception affirmed in question 8 - that diesels belong in heavy-duty applications and not cars. Another said, “Not sure what the difference is. I would rather stick with gasoline because I’m familiar with it.” Another stated, “Diesel always seems more expensive.”

In response to question 12 on the survey (If you saw more advertisements for cars equipped with diesel engines, would you be more inclined to consider buying one?), one

respondent who indicated “yes,” commented, “I would then trust them more.” Another pointed out, “I have no idea how diesel works in an engine - if it’s cleaner. If I saw more and it was positive, I would consider buying.” Another simply said, “Yes, because I would have more information about it.”

Based on the contrasting responses to those two questions, there appears to be an opportunity to bridge the communication gap. If data from the suggested research mentioned earlier can be applied in a scientific way, it stands to reason that auto manufacturers could find a way to do just that.



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## **Appendix A**

### **Modified Delphi Study Emails**

## Delphi Round 1 Email

Email Subject: Could you spare a few moments to help with my master's research?

Mr./Ms. <Last Name>,

My name is Chris Nelson and I am master's degree student in PR at Rowan University. I am in the process of carrying out research for my thesis, which examines the communication and public relations challenges faced by auto manufacturers who want to introduce small diesel engines to their American-market car lines.

As a part of my research, I am conducting a modified Delphi study. I found your name in the PRSA directory for professionals in the automotive industry and I hope that you are willing to help me. In stage one I will give you a scenario and ask you to list your responses to four relatively basic questions. Once I have received responses from all the participants, I will compile and rank-order them. I will then send the lists to you for comment. Once I have received all the comments back, I will modify the lists as needed and send them back out for one more round of comments.

I hope that you can spare a few moments to help me. If you can, the study is below:

For the purposes of this study, consider the following scenario: You work for a private firm and your group has been hired by an auto manufacturer that is going to introduce a small clean diesel engine to its popular small car line. The manufacturer is concerned about American consumer perception of diesel engines. Technical issues will not be a concern for you in this case, only perception.

As a part of your preparation, the manufacturer has asked you to first consider the following questions:

Question 1: Please list the reasons that you believe clean diesel engines have seen more success in small cars in other markets than in the U.S.

Question 2: Please list the preconceptions that you believe American consumers harbor regarding automotive diesel engines, positive or negative.

Question 3: Please list the primary factors you believe contribute to the conditions addressed in the previous two questions.

Question 4: Please list the primary steps you believe manufacturers must take to overcome the conditions discussed in the previous questions.

Please contact me with any questions. Also, if you have any additional thoughts or insight, please feel free to add comments as you see fit. Thank you again for your help. I look forward to your responses.

Chris Nelson  
908-209-2047  
[chrisn81@lycos.com](mailto:chrisn81@lycos.com)

## **Delphi Round 2 Email**

Email subject: My Delphi Results and Round 2

Mr./Ms. <Last name>,

Thank you again for participating in my study. I deeply appreciate your time and assistance.

I have received and compiled all the answers to the first round of the study. In round two I simply ask that you rank order the information.

Attached to this email are the results from round one. The results for each question are ranked in order of popularity from most to least. In this phase, you will look at each list and reorder it the way you think it should read in actual, real-world terms. You may also comment as you see fit.

Keep in mind, in order to keep the study quantifiable I had to reduce some of your thoughts and points to shorter, more measurable language. This does not mean that I have disregarded your other thoughts, however. You have given me a wealth of information to use in the discussion and conclusions section of my paper as well.

Please return your responses to me as soon as possible, but no later than the end of the day Tuesday, March 29. As always, if you have any questions or concerns, please don't hesitate to email them to me.

Thank you again.

Chris Nelson

**Appendix B**  
**Rowan Student Survey Instrument**





7. Using the scale beneath each, where 1 represents “strongly disagree” and 7 represents “strongly agree,” please indicate your level of agreement with each description.

	Strongly disagree				Strongly agree		
	1	2	3	4	5	6	7
a. Diesel engines are dirty, noxious, or sooty.							
b. Diesel engines get good fuel economy.							
c. Diesel engines are noisy							
d. Diesel engines are durable and long-lasting							
e. Diesel-engined cars are slow and/or underpowered							

8. Using the scale beneath each, where 1 represents “strongly disagree” and 7 represents “strongly agree,” please indicate whether you agree that a diesel engine is an appropriate motor for each type of car.

	Strongly disagree				Strongly agree		
	1	2	3	4	5	6	7
a. Small economy cars							
b. Midsize cars							
c. Large sedans							
d. Luxury cars							
e. Light trucks and pickup trucks							

9. Using the scale beneath each, where 1 represents “strongly disagree” and 7 represents “strongly agree,” please rate your agreement with each descriptor.

	Strongly disagree				Strongly agree		
	1	2	3	4	5	6	7
a. Diesel fuel is expensive.							
b. Diesel fuel is cleaner than gasoline.							

- |   |                   |   |   |   |   |                |   |
|---|-------------------|---|---|---|---|----------------|---|
|   | Strongly disagree |   |   |   |   | Strongly agree |   |
| c. Diesel fuel is harder to find than gasoline      | 1                 | 2 | 3 | 4 | 5 | 6              | 7 |
| d. Diesel fuel burns more efficiently than gasoline | 1                 | 2 | 3 | 4 | 5 | 6              | 7 |
| e. Diesel fuel is not as clean as gasoline          | 1                 | 2 | 3 | 4 | 5 | 6              | 7 |

10. Which of the following do you believe are the cleanest cars?

- |                          |                      |
|--------------------------|----------------------|
| a. Regular gasoline cars | b. Clean diesel cars |
| c. Electric cars         | d. Hybrid cars       |

11. Which of the following cars do you believe get the best fuel mileage

- |                          |                      |
|--------------------------|----------------------|
| a. Regular gasoline cars | b. Clean diesel cars |
| c. Electric cars         | d. Hybrid cars       |

12. If you saw more advertisements for cars equipped with diesel engines, would you be more inclined to consider buying one?

Yes                      No

Why or why not? (Indicate below or on the back of this sheet)