1

Embedded Values

Sagrario Gonzalez was at the Central Library on State Street in Springfield, Massachusetts, near closing time on December 3, 2014. As many loving adults are prone to do, she brought her niece and daughter to enjoy the library's children's section. Springfield was the home of Theodor Geisel, better known as Dr. Seuss. It has a great children's section.

It was lightly raining when they left the library, the December kind of rain that stings when the wind whips it against your neck. Their vehicle was in the library's parking lot, directly across the street from the front door. As Gonzalez walked down the front steps, two small children in tow, she made a fateful decision.

At the bottom of the library steps was a sidewalk. To get to her vehicle, Gonzalez could walk the 275 feet south to the traffic signal, push the button and wait for the light to turn in her favor, cross the four lanes of State Street, and then proceed back up the street another 275 feet to the parking lot.

She could do that, or she could do what most people seem to do when they leave the library. She could follow a well-worn path through the grass, step over a small decorative fence erected along the

side of the street, wait for a gap in the traffic, and then quickly walk, maybe run, across State Street to the parking lot.

The quickest path between two points is a straight line. With the rain coming down, darkness well established, and the bedtime hour fast approaching on a school night, Gonzalez chose the quicker route. It was the wrong decision.

The group was struck by a vehicle while crossing State Street. Sagrario Gonzalez's daughter and niece were taken to the hospital with serious injuries. Gonzalez survived, as did her niece. Tragically, Destiny Gonzalez, the seven-year-old daughter of Sagrario Gonzalez and her husband, Luis, was killed.

I will never forget that night. I was in Springfield, having just given a public lecture on behalf of the nonprofit Strong Towns. I was homesick for my family, especially my two daughters, who were roughly the same ages as the pair of young girls who had been struck. It was 10 days before Christmas. My heart ached, and it still does, for Sagrario Gonzalez.

It was not her fault.

The Crossing

What happened that night on State Street seems obvious. In a karmic world where we all, to one degree or another, must live with the consequences of our decisions, it's easy to see how Gonzalez made a series of bad choices.

She could have walked to the traffic signal, but she didn't. Traveling four feet per second with two kids in tow, it would have taken her roughly one minute and ten seconds to get there. Depending on her luck, she might not have had to wait at all to cross if the light happened to be green in her direction. If it was red, she might have been there another minute, perhaps longer. It would have taken an additional minute and ten seconds to walk back along the opposite sidewalk. To walk to the signal instead of crossing directly meant it would take an additional two to four minutes to get to her car.

Two to four minutes. That is what was saved by crossing directly in the middle of the block instead of walking to the signal — one dead, one seriously injured, and lives forever damaged. It seems like an

extraordinarily high price to pay for what could casually be described as impatience.

That's not to suggest that crossing the street mid-block was effortless. To cross in front of the library, Gonzalez had to walk around a row of shrubs. To reach the street, she also needed to step over a small fence, nothing more than a couple of decorative chains hanging between posts. These obstacles were put there to discourage people from crossing in this location, a fact that is self-evident to anyone who chooses that route.

We can think of these obstacles as a warning: DO NOT CROSS HERE. Gonzalez did not heed this clear warning.

From curb to curb, State Street is 40 feet wide in this location. At a normal walking speed, the three of them would be exposed to traffic for at least 12 seconds, assuming that they could proceed in one smooth crossing.

That is 12 seconds in an area where Gonzalez knew that a traffic signal would not be stopping oncoming traffic. She also had to have known that at least some of these drivers might not anticipate people crossing mid-block, especially at that hour. Those drivers would not be alert for the possibility that she and the girls would be there.

Of the four lanes on State Street, two convey traffic to the north and two to the south. Crossing safely here requires one to time a gap within the multidirectional traffic flow, a task made more difficult at night. What often happens in these situations is that the person crossing can anticipate the gap only in the two nearest lanes. They venture out and often find themselves trapped in a traffic lane, fully exposed, waiting for the furthest two lanes to provide the gap that they need to finish the crossing.

Sagrario Gonzalez had done this crossing many times. She knew all of this. Everyone in Springfield knows this, and most of us, if we visited the site and looked at it, would intuitively understand it as well.

What Gonzalez did was very dangerous. She did it despite the clear warnings. She did it to save a couple minutes of time. She did it despite having two small children in her care, young people who would face the risk with her and pay a heavy price.

This was Gonzalez's choice. It is easy to say this was Gonzalez's fault.

Too easy. It wasn't her fault.

Hidden Values

That night Sagrario Gonzalez made fateful decisions about how to navigate an environment where her existence was, at best, an afterthought, and at worst, a nuisance. The options she had available to her were the result of the underlying values applied to the design of State Street — values reflected in similar environments across North America and wherever around the world American design practices are being emulated.

The professionals who design streets follow a practice codified in the decades since the Great Depression. Engineers who do this work learn it as a practice, as a body of technical knowledge that has been amassed over generations. While one book or another of engineering standards is often referred to as "the bible" by those who use them, that reference is due more to their centrality to the practice of engineering than to the type of wisdom imparted.

While the religious debate passages of the Bible, contrasting different teachings in a search for deeper truth, the codes of an engineering manual are more like a cookbook. If you wish to make a certain type of chocolate cookie, a cookbook will provide the common ingredients found in cookies and the specific way to arrange them for a particular recipe. Likewise, if you wish to build a certain type of street, an engineering manual will explain the way to assemble all of the components so that you get the desired outcome.

What is expected in a religious text, but not in a cookbook, is deeper meaning. Few people question the underlying values contained in a fruit salad recipe. None search for hidden truth in the list of ingredients for a souffle. The recipes in a standard cookbook do not have an underlying ideology or belief system attached to them. A cookbook is viewed as value free. It is merely instructions for assembling ingredients into finished foods.

Transportation professionals consider their texts, and by extension their entire profession, as being similarly value free. This is wrong.

At the foundation of traffic engineering is a collection of deeply infused values. These values are so deep, and so core to the profession, that practitioners do not consider them values. They bristle at the suggestion. For practitioners, these values are merely self-evident truths — something like gravity that it is not necessary to believe in because it just is.

These values are expressed in the range of options that engineers consider, the way that they discuss different approaches, and the transportation systems that they build. This would not be a problem, and we could allow this entire profession to retain their sacred texts and practices unchallenged by heretical viewpoints, if they could find a way to address the damage traffic engineering is doing to our communities.

They cannot do this for a simple reason: The damage being done is the culmination of those values. The injuries and deaths, the destruction of wealth and stagnating of neighborhoods, the unfathomable backlog of maintenance costs with which most American cities struggle, are all a byproduct of the values at the heart of traffic engineering. Addressing the damage requires addressing the values, but you cannot address something that you deny even exists.

The underlying values of the transportation system are not the American public's values. They are not even human values. They are values unique to a profession that has been empowered with reshaping an entire continent around a new, experimental idea of how to build human habitat.

Let us identify those values.

The Design Process

When an engineer sits down to design a street, they begin the process with the design speed. I have been in countless meetings where engineers presented technical design sheets and even in-depth studies for a street project. Never, and I mean never, was any elected official or any member of the public asked to weigh in on the design speed.

Never once did I hear one of my fellow professional engineers say, "So, what are you trying to accomplish with this street in terms of speed?"

No. The design speed is solely the purview of the engineering professional, with a preference for accommodating higher speeds over lower.

Why?

Choosing a design speed is, by its nature, an application of core values. When we pick a speed, we are selecting among different, competing priorities. Is it more important that peak traffic move quickly, or is it more important to maximize the development potential of the

street? Do we compromise the safety of people crossing on foot in order to obtain a higher automobile speed, or do we reduce automobile speed in order to improve safety for people outside of a vehicle?

These are policy decisions, and like all policy decisions, they should be decided by some duly elected or appointed collection of public officials. In a democratic system of representative government, representatives of the people should be provided the full range of options and be allowed to weigh them against each other. That rarely happens, and I have never heard of an instance where it has happened for a local street.

Many of my engineering colleagues will reply that they do not control the speed at which people drive — that travel speed is ultimately an enforcement issue. Such an assertion should be professional malpractice. It selectively denies both what engineers know and how they act on that knowledge.

For example, professional engineers understand how to design for high speeds. When building a high-speed roadway, the engineer will design wider lanes, more sweeping curves, wider recovery areas, and broader clear zones than they will on lower-speed roadways. There is a clear design objective — high speed — and a professional understanding of how to achieve it safely.

There is rarely any acknowledgment of the opposite capability, however: that slow traffic speeds can be obtained by narrowing lanes, creating tighter curves, and reducing or eliminating clear zones. High speeds are a design issue, but low speeds are an enforcement issue. That is incoherent, but it is consistent with an underlying set of values that prefer higher speeds.

Once the engineer has chosen a design speed, they then determine the volume of traffic they will accommodate. How many motor vehicles will this street be designed to handle? This is the second step of the design process, and the second instance where the design professional independently makes a decision that is, at its heart, a value decision.

Standard practice is to design the street to handle all of the traffic that routinely uses it at present, plus any increase in traffic that is anticipated in the future. There is no consideration given as to whether that is too much traffic for the street, and rarely is there a conversation of whether other alternatives should be considered. If traffic is present, it is the traffic engineer's calling to accommodate it. No nonprofessional is given an opportunity to suggest otherwise.

Now that they have identified the design speed and traffic volume, the traffic engineer consults one of the books of standards to determine how to assemble a safe street. Given a certain speed and volume, how does the design cookbook indicate the street's ingredients be assembled? Within the design process, the answer to that question is, by definition, safe. Any other design would generally be considered a compromise of safety.

The final step of the design process then is to take the "safe" design and determine how much it will cost. This dollar amount is the price for a responsible street design. Any questioning of this minimum effort would be considered a reckless endangerment of human life.

Now we have the traffic engineering profession's values as expressed in the design process. In order of importance, those values are traffic speed, traffic volume, safety, and cost.

I have presented the profession's values in this way to dozens of audiences, comprising thousands of people, across North America. I then ask them to identify their values. These are mixed audiences of professionals and nonprofessionals, people involved in local government decisions and those who are not. There is always a broad consensus (Table 1.1).

I ask them to think about a street where they live, or one where they shop or like to go out to eat. I then ask them to shout out, in unison, which value they consider most important as applied to that street. The answer, overwhelmingly, is safety.

And of course, it is. Most humans, including most traffic engineers when they stop to consider what is being asked, would sacrifice much of the street's performance in terms of speed or volume in order to make it safer. Safety is the top value nearly all people apply to street design.

As we continue, I ask for them to shout out their second most important value. Again, there is no real ambiguity. Nearly everyone chooses "cost."

Again, most Americans today would sacrifice the ability of someone to drive at speed, and the capacity of a street to accommodate a specific volume of traffic, to have a more cost-effective design. I acknowledge that this collective response may differ from the preferences of the individual driving the street,[1] but there are always competing interests between an individual and society. In public policy, we routinely ponder such tradeoffs.

While safety and cost are the top values for nearly everyone, the third value expressed by the groups with whom I have interacted is perhaps the most telling. I ask, "In a tradeoff between speed and

Table 1.1 Values Applied to the Design of Streets*

Current Practice	Most Humans
Design Speed	Safety
Traffic Volume	Cost
Safety	Traffic Volume
Cost	Design Speed

* In order of priority, highest priority first.

volume, would you prefer a design that moves fewer vehicles at a higher speed, or one that moves more vehicles but at reduced speed? Would you emphasize speed or volume?" The answer, overwhelmingly, is "volume."

And that makes sense. To the extent that the street is used to convey traffic,[2] sacrificing the number of cars that can pass through in a given time frame just so those drivers can go faster is counterproductive by any meaningful measure. If we can slow down traffic speeds, and it means that more vehicles can pass through and people arrive at their destinations sooner, why would we not do that? Most people would.

The values of the design process — the values applied to street design —are not values that most people would identify with. I would assert that this includes most traffic engineers, which suggests that design professionals are not morally deficient people but simply that they have accepted these underlying values without debate, internal or otherwise.

State Street was designed using a process that values speed and volume above safety. Sagrario Gonzalez was expected to overcome this design. A different set of values, a more human set of values, would not have put that burden on her.

Biased Language

As an engineer, I have worked on any number of improvement projects. I've improved roads. I've improved streets. I've improved parking lots, frontage roads, and alleys. Like King Midas, everything I and my fellow engineers work on, we seem to improve.

At least that is how we describe what we do. As I write this, my city is seeking bids for what they say in the official notice is a "street improvement project." It does not seem like an improvement to me, nor to many people who unsuccessfully fought against it, yet formally it is called an *improvement*.

The project involves the widening of a residential street. The many young families who live there believe that the changes will dramatically increase automobile speeds, which already seem too fast. To widen the street, quite a few mature trees will be removed, and the city has acquired part of the front yards of many of these neighbors, often against their will. To add insult to injury, to help fund the project, these aggrieved property owners are being forced to pay the city a special assessment fee of thousands of dollars. This is the kind of experience that makes my "Conversation with an Engineer" video seem universal.[3]

What makes this project an improvement? In my eyes, it is a diminishment. Yet, from beginning to end, it has been presented by the city engineer as an improvement project. The subtle bias of this language provides another glimpse at the values embedded within the engineering profession.

From the perspective of the design professional, the current street is "substandard" because, given the design speed the professional has chosen and the number of vehicles they want to accommodate, it does not meet the recipe in the design cookbook. The way to "fix" the "substandard" street is to "improve" it to be consistent with the recipe.

This is merely a reinforcement of the underlying values already discussed, but in a way that manipulates the conversation in favor of the engineer's perspective. Who would want something to be substandard? Who could possibly be against improving things? Yet, obviously, whether a project makes things better depends entirely on a person's perspective.

Instead of a "street improvement project," why not just call it a "street project." Or, if we need an adjective, how about a "street modification project." If the profession is free of values, as its practitioners claim, such a change in language should not be the least bit threatening.

The same goes for the word "enhancement." For example, when we "enhance the clear zone," what we really mean is that we are removing all of the trees within a certain distance of the roadway edge. This may indeed be an enhancement to the person wanting to drive quickly through that area, but it may also be a huge diminishment for the person who uses those trees as a sound and visual buffer between their home and the traffic. Why don't we just say, "remove the trees"?

I think the reason is abundantly clear. For the design professional with speed of travel as the highest value, removing the trees from alongside the road is an enhancement. It allows traffic to move at higher speeds. In the eyes of the traffic engineer, "remove the trees" focuses on a negative, and "enhance the clear zone" focuses on a positive, all while being an equally valid yet still value-free, description.

Even deeply technical terms like "Level of Service" are projections of the underlying value system. When evaluating the performance of a street using Level of Service, the traffic engineer will consider how well things are operating from the perspective of the driver. The street is then given a grade, like an academic course, with A being the best and F signifying failure. Level of Service A means that traffic flows freely with no hindrance, while Level of Service F merely means that travel time for the driver is not predictable.

Never mind that Level of Service A is often horrific for people trying to cross a street on foot. And never mind that a high level of service generally means a lower level of financial productivity for the community (higher costs, lower financial return), especially on local streets.[4] For the engineer who values traffic speed above all else, there is no conflict in using this grading system to prioritize "improvements."

When engineers do not recognize their own values and how they are being projected in the words they use, we must do that for them by correcting their language to remove the bias.

Understanding the Bias

One of my colleagues who has repeatedly done that is Ian Lockwood. Ian is a transportation engineer with Toole Design, one of the country's leading engineering firms working outside of the current transportation paradigm. His work on changing the language within the profession has inspired and informed me and many others. In a 2017 essay for the *ITE Journal*, he wrote:

> The field of transportation engineering and planning has its own biased language. Much of the technical vocabulary regarding transportation and traffic engineering was developed between 1910 and 1965. The foreword of the Highway Capacity Manual, first published in 1965, states, "Knowledgeable professionals, acting in concert, have provided the value judgements needed to. . .and have established the common vocabulary. . ."

> Notice the acknowledgment of making "value judgments" and the purposeful development of a "common vocabulary." The period prior to 1965 was the golden age of the automobile in the United States. Automobiles were equated to freedom, mobility, and success. Accommodating automobiles at high speeds became a major priority in society and, thus, a major priority for the transportation engineering profession. It is no coincidence that these values were built into the transportation vocabulary.[5]

While civil engineering itself is one of the oldest professions, with techniques and insights dating back thousands of years, the subspecialty of traffic engineering is very young. Some of its earliest practitioners are still alive today. This was an entirely new pursuit, developed on the fly, in a period of tumultuous change.

Coming out of the Great Depression and World War II, the United States desperately needed a program that would keep the economy going. While the war had created jobs and economic output, demobilization threatened to shift the economy right back into depression. The redirection of American industry and capital from war-making into suburbanization created a kinetic growth machine that fueled a postwar boom.

We built a new version of America, one centered around the automobile, transforming an entire continent in a generation. Traffic engineers were tasked with making transportation in this newly imagined approach work. To do that, they needed to standardize nearly every component of this system so that it could be recreated, at scale and with urgency, across a vast continent. It is difficult to overstate how monumental an undertaking this was, nor how astounding their success was in accomplishing it.

In those early days, significant gain in travel speed could be achieved merely by improving driving surfaces and roadway conditions. With new highways connecting distant places, an increase in speed also meant an increase in overall mobility; people could reach more places with the same amount of time investment. Distances previously unheard of were now being routinely traveled by millions of Americans. Under these conditions, focusing on increasing speed was an easy proxy for increasing mobility.

In the decades immediately after World War II, increased mobility was driving economic growth. Whether it was families living in new housing in the suburbs, the ability of employees to switch jobs more easily, or the capacity for farmers, loggers, and miners to get their materials to distant markets, the fact that Americans could reach more places in less time provided accelerating levels of prosperity.

This notion became a self-evident truth embedded within the traffic engineering profession. Out of it sprung many beliefs that are now orthodoxy. These include the following:

- Faster speeds are better than slower speeds.
- Access to distant locations by automobile is more important than access to local destinations by walking or biking.
- Accommodating a full range of movement for large vehicles is more important than minimizing construction costs and increasing safety for people walking.
- At intersections, minimizing delay for automobile traffic is more important than minimizing delay for people walking or biking.
- Economic growth is a greater priority than community wealth preservation or financial productivity.

Today, the American transportation system is fully mature. We finished building the interstate system over four decades ago. The easy mobility gains have long been tapped. We are now left almost exclusively with expensive modifications that provide comparably modest changes in travel time, a theoretical benefit that is quickly denuded by shifting traffic patterns. To the extent that it once was, designing for speed is no longer a proxy for increasing mobility.

Yet these core insights of the early profession persist. State Street was designed for speeds far in excess of what is even legal there. The entire street is built to favor commuters driving into Springfield from distant locations in the morning and departing in the opposite direction at the end of the workday, prejudicing the person who lives close to the downtown and commutes on foot in the process. This is not only dangerous, but it has also had a disastrous impact on property values within the core of the city.

The lane widths, recovery areas, and turning radii at the intersections are designed for the ease of large vehicles, even though they are infrequent, and even though this design makes State Street more dangerous for drivers at nonpeak times, and more dangerous at all times for people walking and biking. Each intersection where assistance to cross the street is provided, the burden of delay is shifted away from the driver on State Street and to the person walking, even at the hour when Sagrario Gonzalez was making her decision on where to cross.

We cannot in good conscience blame Sagrario Gonzalez for the tragedy that occurred on State Street. She was navigating a space that

was, at best, indifferent to her and her children's safety. At worst, it was outright hostile. It remains that way to this day, as do most local streets in the United States.

We can be generous in our interpretation of history and thereby more understanding of how the traffic engineering profession came by its core set of values. Even so, these values must be acknowledged if only so that they can be consciously set aside in favor of a more modern and universal set of human values.

The Strong Towns Approach

Traffic engineers are a critical part of designing transportation systems, but the values of the public need to dominate decision-making. Value decisions need to be stripped out of the design process and given over to nonprofessionals, preferably elected officials and the people living within the community— those directly affected by the design.

Table 1.2 gives an example of who should make what kind of decision during a street design process.

Elected officials must be given the ability to set the values for the project. It is their responsibility, on behalf of the people they serve, to establish the automobile design speed, the number of vehicles that should be accommodated, the size of vehicle that should be considered in the design, and the degree of deference that should be shown to people walking or biking at a given intersection. These are not design decisions; they are value decisions.

We must also insist that engineers use value-free descriptions for the work they are doing. If they are proposing to widen the street, it should be called a "street widening" and not a "street improvement." If they are cutting down all of the trees adjacent to the street, it should be

Table 1.2 Who Makes the Decision?

Nonprofessionals	Technical Professionals
Design Speed	Pavement Thickness
Design Volume	Pavement Cross Slope
Design Vehicle Size	Lane Width
Intersection Priority	Bituminous Mixture

called "tree removal" and not brought forth as an "enhancement." The goal for everyone is to communicate as clearly, factually, and value-free as possible. Elected officials must insist on this.

The burden and responsibility of making value decisions should not rest with technical professionals. Traffic engineers are incapable of representing the complexity of human experience that needs to be considered in a street design. That is especially true when industry orthodoxy is adhered to. This is not so much a statement on the engineering profession as it is an acknowledgment that city streets are the frameworks of human habitat, a complex-adaptive environment that must harmonize many competing interests.

As I will demonstrate in upcoming chapters, if we align the design approach with the values of the community, we can reduce death, create places of greater prosperity, spend less money on transportation, and get a better functioning system. We can do all of this, but only if we address the underlying values of the design process. To build a strong and prosperous community, local leaders must assert their community's values and see them reflected in the transportation system.

State Street in Springfield is designed with the wrong values. Its purpose is to move a high volume of automobiles at speeds much higher than what is safe for that area. Instead, it should be redesigned to prioritize safety. The value decisions for State Street were made without presenting the value options to elected officials, let alone the community at large. Both almost certainly have different priorities.

More information on State Street in Springfield, including maps, photos, and supporting documentation, is available at www.confessions.engineer.

Notes

1. This will be discussed in greater detail in Chapter 7, "Intersections and Traffic Flow."
2. There is way more to a street than moving traffic. We'll discuss this more in Chapter 5, "Great Streets."
3. See the Introduction for more on this video.
4. More on this in Chapter 5.
5. *ITE Journal*, January 2017. https://tooledesign.com/wp-content/uploads/2019/02/ite_language_reform-by-ian-lockwood-pdf.pdf