frontiers | Frontiers in Future Transportation

TYPE Perspective
PUBLISHED 24 November 2022
DOI 10.3389/ffutr.2022.982942

OPEN ACCESS

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SPECIALTY SECTION
This article was submitted to Transport Safety,
a section of the journal
Frontiers in Future Transportation

RECEIVED 30 June 2022
ACCEPTED 02 November 2022
PUBLISHED 24 November 2022

CITATION
Schell WJ and Ward NJ (2022), A process for change: The safe system approach and Vision Zero.
Front. Future Transp. 3:982942.
doi: 10.3389/ffutr.2022.982942

A process for change: The safe system approach and Vision Zero

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While vision zero has been widely accepted as a core goal of many transportation agencies, to date efforts to achieve this target provide mixed results. One path to improved performance is gaining more interest in the United States-the safe system approach. While a safe system approach has proven successful in other countries and has great potential in the United States, successfully using this method requires a significant paradigm shift. Specifically, for many stakeholder organizations, establishing the safe system approach to reach Vision Zero represents a fundamental change in how they 1) perceive the road transport system, 2) interpret their role in that system, 3) operate with other system elements (stakeholder organizations), and 4) define a vision of success for the system. This level of transformative change requires structured preparation and deliberate management of the change process to be successful. In this paper we present a perspective on a process to initiate and manage this change that can increase the odds of success.

KEYWORDS

safe system approach, vision zero, safety culture, change management, traffic safety

1 Preface

To support the vision of zero traffic fatalities (and serious injuries), there is growing interest in the "safe system approach" within the United States. Adopting the safe system approach will represent a transformative change in the culture and processes of many traffic safety stakeholder organizations. As these organizations begin discussing the safe system approach, we felt it may be useful to discuss the importance of managing change through a systematic process. Good intention is rarely enough to ensure change is successful. Instead, transformative change requires a managed process. In this regard, there are lessons from other domains showing that change is rarely successful or sustained unless it is managed. In this article, we share our perspective on some of these most important lessons. As this perspective represents just one opinion, we hope our article will encourage productive discussions on how best to support our collective adoption of the safe system approach to reach the vision of zero traffic fatalities.

In presenting our perspective, we must declare several underlying assumptions. First, we are interpreting "the safe system approach" from a system engineering perspective. This includes the systems thinking; namely, "the very essence of the system lies in the interaction between parts and the overall behavior that emerges from the interactions" (Ottino, 2002, p. 293). Second, we are not equating the safe system approach with "vision zero". Instead, we perceive vision zero is a moral principle and performance target,

whereas the safe system approach is a strategic framework to reach that goal (Ward et al., 2019). And third, we acknowledge that there may be many other barriers to adopting the safe system approach, such as sufficient resources, supporting policies, and necessary skills. However, it is our belief that even with these issues resolved, we cannot achieve and sustain the safe system approach without first establishing a supporting culture and then managing the change process.

2 Introduction

A system—such as the road transport system—is defined as "an interconnected set of elements that is coherently organized in a way that achieves something" (Meadows, 2008, p.11). Such a definition implies that any system outcome—whether intended (e.g., mobility) or unintended (e.g., crashes) is the result of complex interactions amongst all system elements. In the case of the road transport system, these elements are owned by multiple stakeholders, including those who design, manage, and use the system. By employing a systems thinking perspective we can see the complexity of ownership created by multiple elements with each element having multiple sources of influence which clearly illustrates the shared responsibility amongst all system stakeholders for traffic fatalities and injuries.

Thus, solutions to reduce fatalities and serious injuries in the road transport system require not just interaction but collaboration amongst the different stakeholders responsible for the design and operation of the system. Vision Zero cannot be achieved simply by adding additional resources to do more of the same thing within the confines of our stakeholder silos. Instead, our strategies must be "organized" by coordinating and combining stakeholder (actor) actions to achieve a common goal; namely, Vision Zero:

> "The safe system approach is more than individual actions; it is a coordinated set of strategies carried out by the many players responsible for delivering safe transportation systems." (Abel et al., 2021, p. 8).

> "Transport safety work is highly dependent upon cooperation and continued commitment and accountability among relative actors is crucial to its success. . . . Cooperation is essential to successful safety improvement." (Government of Sweden, 2016, p. 3).

The safe system approach has been already implemented successfully in many countries outside of the United States, including Sweden, Australia, Norway as well as the Netherlands and New Zealand (Belen et al., 2022). Each country's vision and implementation of this approach was dependent on their national culture and associated transportation policies. Similarly, the level of success achieved in each country was dependent on the amount of innovation and acceptance with the strategies employed to realize the Safe System approach goals. These international examples demonstrate that the changes needed within a country's roadway transportation to successfully implement the Safe System approach are not always obvious or simple to make.

Engaging in the safe system approach to reach Vision Zero represents a fundamental change in how many stakeholders (1) perceive the road transport system, (2) interpret their role in that system, (3) operate with other system elements, and (4) define a vision of success for the system. Creating a successful paradigm shift like this is complex, difficult, and susceptible to failure. To improve the odds of being successful, the effort requires structured preparation and deliberate management of the change process. Thankfully, the literature is rich with a myriad of change management methods that can be leveraged (Cady et al., 2008). The following sections outline a recommended process for engaging in this change based on best practices from other domains and utilization of systems thinking approaches.

To provide clarity to the steps needed for a successful change, we break change efforts into two distinct phases: 1) Understanding the need and preparing for change and 2) Change execution. For a change effort like implementing the safe system approach, we argue that the first of these phases is the more important step. Unfortunately, this is also the step that is least understood, filled with the most ambiguity, and often the most difficult to successfully complete.

3 Preparing for the change

To complete this phase, the leaders of the change effort must build clarity regarding what the adoption of a safe system approach will mean for their unique set of circumstances (e.g., state of infrastructure, funding availability, driver behavior, etc.) and provide this clarity to a wide range of audiences (e.g., administrators, elected officials, road users, etc.). When done successfully, the preparation phase provides four distinct outcomes: 1) A robust community of participants interested in adopting the change; 2) A shared understanding of the system; 3) A unified vision of what defines success when the change is complete, including measurable outcomes; 4) A clear understanding of the gaps between the current system and the desired state.

3.1 Robust community

Successful adoption of the safe systems approach is predicated on engagement of a wide swath of system stakeholders—a robust community. Building such a community begins by building a clear picture of who is

FIGURE 1
The safe system approach (U.S. Department of Transportation, 2022).

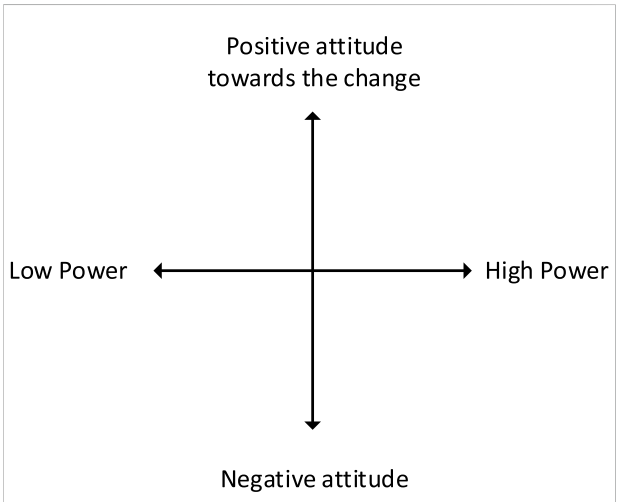

FIGURE 2
Stakeholder grid framework.

included in the system's stakeholders—those who can impact the change or will be impacted by it (Freeman, 2018). Change leaders should work to identify all stakeholders by thinking of both internal and external parties. Internal parties could include Department of Transportation employees and vendors responsible for design, construction, or marketing. While external parties are likely to include road users, elected officials, taxpayers, and others. Ultimately, these stakeholders will include representatives from all sectors of the safe system approach shown in Figure 1 (FHWA, 2022)

Once the stakeholder list is identified, the power structure and attitudes that each group brings to the proposed change should be analyzed. As represented in Figure 2, this analysis can be effectively completed using a 2 x 2 matrix, or stakeholder grid. This tool is used to chart the stakeholder's power over the change on one dimension and their attitude toward the change on the second dimension. By thinking through these dynamics while beginning to define the change, the team will be better prepared to successfully work with and manage stakeholders during the execution phase of the project.

3.2 Unified vision

Creating a vision is an important step in preparing for change. When done well, an organization's vision "forms the basis for extraordinary human effort"; "provides a context for strategic and tactical decisions"; and "creates cohesion, teamwork, and community" (Collins, 2020, p. 95). Certainly, the vision should be inclusive of Toward Zero Deaths, but that broad vision is likely to be insufficient.

For the organization's vision to be most useful it should first describe the fundamental reason for the organization's existence. But it must also be based on a nearly timeless system of core beliefs that define a system of fundamental principles that members of the organization will consistently follow by both word and action (Collins, 2020).

From there, the organization must define a bold and compelling goal—e.g., zero deaths—that has a clear finish line and a specific timeframe. This should include defining "how you will know" that the goal is reached. This is accomplished by defining a set of metrics that map out performance against the goal, including when and how they will be collected. Defining the vision before documenting the current system state allows change managers to build a more honest picture of what the future should be, unencumbered by the limitations of the current system.

3.3 Shared understanding

Armed with a future vision and understanding of stakeholder dynamics, the team begins to build a detailed understanding of the nature of the system by building a systems map. Stroh (2015) outlines three key steps to developing this map:

1) Identify people to interview about the current situation and clarify questions.
2) Organize and begin to improve the quality of the information.
3) Develop a preliminary systems analysis of how different factors interact and support or undermine achievement of the vision.

In step 1, the team should begin the process of identifying potential interviewees using the stakeholder grid. We encourage

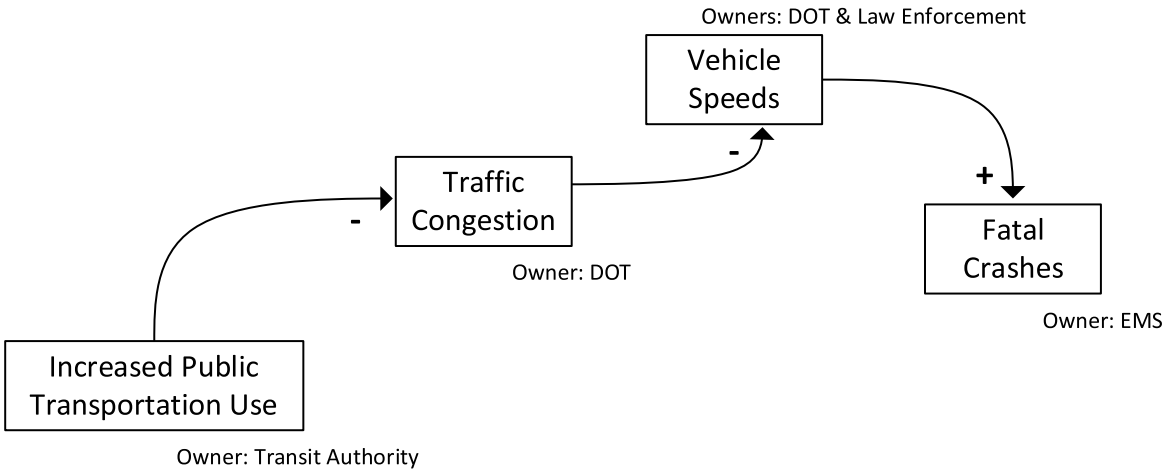

FIGURE 3
Example systems archetype diagram for traffic safety with four components.

teams to include a wide range of stakeholders in these interviews and ensure that any group with high power be included in the interview process, especially if their attitudes toward the potential change are unknown or negative.

These interviews can be one-on-one or in small groups and should investigate the problem's behavior (e.g., declining, growing, oscillating), what system components already work well, how the interviewed group relates to the problem (i.e., controls part of it) and how do they think other stakeholders relate to it. Stroh (2015), p. 95 notes that a key question is to have participants complete the following sentence "Why has X been happening despite our best efforts to achieve a different goal?" This work provides a foundation for understanding the current state of the system, continues building the community of stakeholders needed to make the change, and serves to further clarify the vision built in earlier stages.

In the next step, the information from interviews should be combined into an initial model of the system.

Like Naumann et al. (2020), we advocate for development of a systems archetype map (Senge, 1990) as systems thinking approaches are shown to be effective in areas of social change and safety improvement (e.g. Malfabon et al., 2015; Stroh, 2015; Newnam and Muir 2021; Read et al., 2021).

Figure 3 shows an example of a simplified partial systems archetype map that might be developed. Creating this diagram is the final step in building a deep understanding of the current state of the system. This example depicts four components of the system and one effect each has on one other. In these diagrams, a "-" indicates that when one component increases, the other decreased, while a "+" indicates that both components move in the same direction. So, in this example, when public transportation use increases, traffic congestion decreases. Conversely, when vehicle speeds increase, fatal crashes increase as well. It is important to note that this map presents a very simplified example to allow for easy understanding. A complete map would include all system components and all of the impacts each component has on any other.

3.4 Gap analysis

In the final step of preparing for the change, we need to compare the performance of the current system against the future vision–development of the gap analysis. For our gap analysis, we should examine each component of the system and its impact on overall system performance for our key metrics discussed in Section 3.2. This will allow the team to understand which components are helping the system to move in the direction of the end goal and which are hindering it. From there we can begin to outline a plan to augment the effect of the positive components while minimizing or eliminating those with negative impact. Armed with such an outline, we are ready to move into the phase of executing on our change to implement a safe system approach.

4 Executing the change

As stared earlier, we find that organizations that complete the robust preparation process discussed in the prior section are well positioned for success in their change efforts. However, even with a robust preparation phase, a roadmap for executing the change effort is necessary. To guide this process, we refer to the Kotter's model of change (Kotter, 1995). The process discussed in Section 3.2 provides a culture and systems focused approach to the early steps in Kotter's model, for the execution phase we adopt what is typically

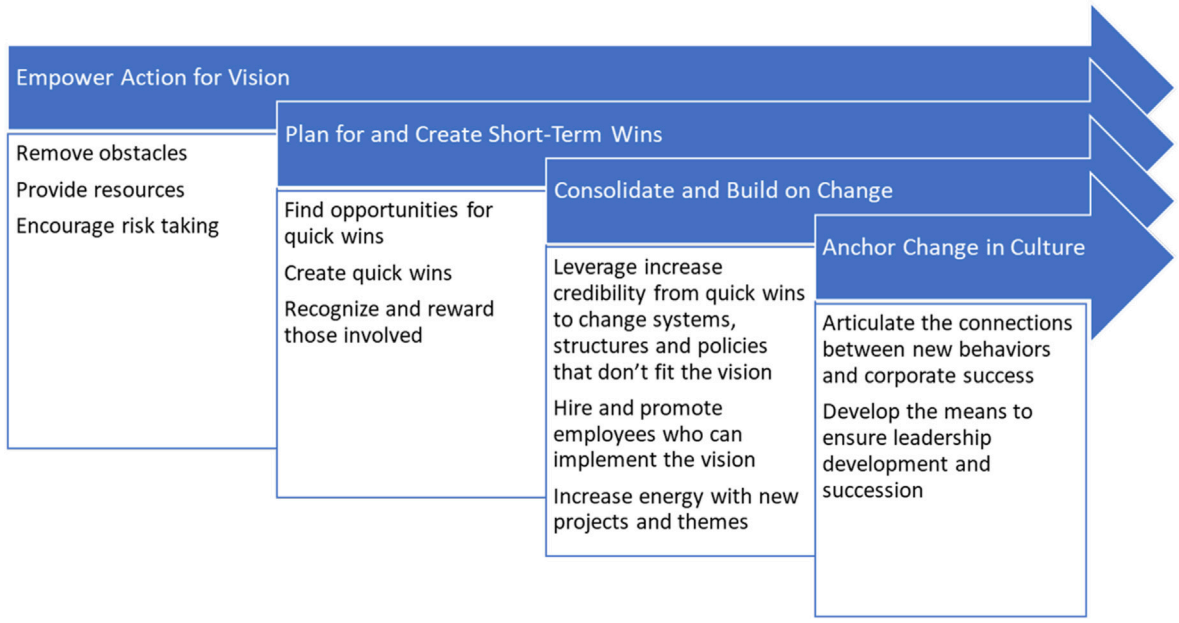

FIGURE 4
Model for executing the change.

depicted as the final four steps of Kotter's model. Figure 4 provides an overview of these remaining steps.

This model recognizes that to achieve and sustain change, organizations need to work through a set of defined steps in the change process. The work we have outlined in the preparation phase provides grounding in the systems perspective needed to adopt a safe systems approach. We recognize that change is best motivated by focusing on the gap between current and desired states, for instance emphasizing the perils of the status quo, such as the loss of 35,000 lives every year in traffic crashes. Through the development of our vision and gap analysis we have identified key measures that should "fuel" the idea that change is necessary. Our goal is to change people's beliefs and actions to support Vision Zero by adopting the safe system approach. For example, we can focus on the number of lives lost in terms of relative meaning and cite evidence that the number of traffic fatalities are *increasing* despite our current efforts. Similarly, we can show evidence that the safe system approach is a viable and effective solution as demonstrated in other countries (Safe System Consortium, 2021). In the following sections we outline how to operationalize the preparation work through the later steps of Kotter's model.

Empower for Action. This phase of execution is where change really begins to happen—building from the initial ideas outlined when the systems archetype diagram was created. At this time, the coalition should be selecting initial actions to take, identifying core limitations that must be addressed, and enabling team members and partners to remove those limitations. A key part of this enablement is encouraging team members to take risks by piloting solutions that may work but are not guaranteed.

Short-Term Wins. Some of the elements of change selected for pilot testing should be chosen based on the expectation that they will create quick opportunities for visible change—even if that change is small. By getting some changes in quickly, the coalition will build momentum and show both supportive and skeptical stakeholders that positive impacts are possible with relatively little time or effort. These quick wins begin to build on each other leading to the next step.

Build on Change. In this step the momentum built from the quick small-scale wins is used to justify and inform more complex, risky, or longer-term changes. At this time the coalition should see where quick wins are running into resistance or being eroded by poor policies and use that evidence to make enduring changes to these support structures. These changes will improve the odds of success for the larger changes and set the stage for continued success of future change.

Anchor Change. In this step, the changes made are codified in such a way that they will maintain in perpetuity (or at least until they need to be improved upon!). A key way that sustainable changes are attained is removing the old way of doing things once the new way is implemented. For instance, physical infrastructure might be changed to prevent drivers from interacting with cyclists, or social norms that show disdain for speeding might be regularly reinforced after an initial advertising

campaign that helped drive that behavior change. At an organizational level, new employee orientation should be updated to reflect changes in attitudes about safe systems and perhaps systems thinking should become a job requirement for all new hires. When done well, these changes reinforce the importance of the safe systems approach through cultural artifacts like storytelling and policies and procedures (e.g., developing Strategic Highway Safety Plans predicated on the safe system approach). Taken together these are the elements that make it easy for a road user to "do right" and hard to "do wrong."

5 Conclusion—The path forward

The unpresented increase in traffic fatalities reported in some countries, including the United States, demands that the time is now for traffic safety stakeholders to use a new and different approach to this public health issue. We recommend that this new way be the Safe Systems approach. This new way requires us to view traffic safety as the outcome of a system comprised of many organized and interacting elements that must work together to promote traffic safety.

This is not a natural change. This approach requires new values including the priority of safety over mobility and insurance of safety for all road users (equity). This approach also requires stakeholders to collaborate rather than operate only in their silo of responsibility because a system perspective advocates that traffic safety is a shared responsibility. These changes are transformative because we are not only changing what we do, but also how and why we do it. It represents a change in both culture and operations.

Accordingly, such change is complex requiring coordination of many elements. Such complexity requires that the change be managed by a process to ensure both meaningful improvement and enduring success. Here, we discuss some of the steps in such a change process that should be used to increase the opportunity for success. It will take great effort to succeed, and our future road transport system will look very different. But if our society truly values life above all things, then we all should be willing to make that effort.

Presently, there are too few examples of the safe system approach that has been completely implemented in the United States In fact, there are barely any that refer to the "safe system approach" in their current strategic highway safety plans. And yet, we are starting to see some progress that can help others see the way forward to adopting the safe system approach. For example, in this special edition of this journal, the Washington Traffic Safety Commission reports how they have begun to transform their culture to better align with the safe system approach and the vision zero goal (Otto et al., 2022). Admittedly, WTSC is a unique case because the operate as a commission which is *de facto* a system of stakeholders. But shared experiences such as these can help others see how to being their own change processes. And as more of these examples emerge, we may be able to start developing cases studies and recommendations for best practices. Working together as a system of traffic safety stakeholders, one thing we can all do is to share and learn from each other as we each begin to explore our own processes for changing to the safe system approach.

Data availability statement

The original contributions presented in the study are included in the article, no additional data is available, further inquiries can be directed to the corresponding authors.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

WS was employed by the company Golden Trout Design LLC. NW was employed by the company Leidos.

Publisher's note

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