Vision Zero Sandbox Design Competition Presents Innovative Solutions

Participating Teams

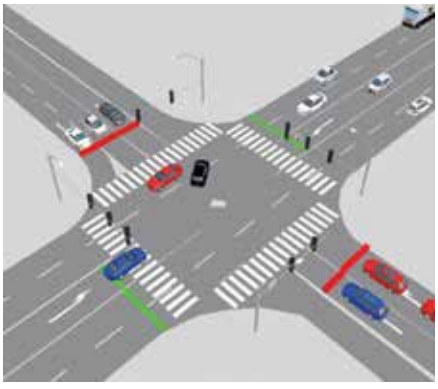
Student Competition
AggieVision
Florida International University (FIU)
Tennessee Cherries
University of Florida
UW-Madison
ZeroCrash

Professional Competition
AECOM Atlanta
Arcadis
Fehr & Peers
RK&K Safety
STV, Inc.
The Proactive Badgers
UFTI

Earlier this year, the ITE Consultants Council sponsored the Vision Zero Sandbox Design Competition, and winners were selected after finalist presentations during the 2021 ITE Annual Meeting.

The ITE Consultants Council encouraged teams to think beyond traditional ways of assessing crash data based on historic information and move toward a more proactive approach by leveraging new near-miss data analytics and technology. Teams were challenged to demonstrate how automated conflict data being collected through innovative technologies in Bellevue, WA, USA, can be used to gain new insights into safety problems and the selection of low-cost countermeasures at six different intersections. ITE thanks Transoft Solutions and the City of Bellevue for their assistance and participation.

Submissions were judged on their creativity and innovation in working with conflict data, the soundness of their technical approach, and the transferability of the methodology to other jurisdictions—not just on developing specific countermeasures. The selection process was difficult, as each team presented informative and thought-provoking solutions. Summaries of the winning presentations follow, and accompanying graphics are provided courtesy of respective teams. To read the final papers or watch the video presentations, please go to: https://bit.ly/3xJCoUl.



Example of Conflict in Simulation, using VISSIM software.

Student Competition Winner

Texas A&M

Team Members: Xiaoyu "Sky" Guo (S), Sruthi Ashraf (S), Zihao Li, Chaolun Ma, Xiao Xiao (S), Cheng Zhang (M)

Key information from the winning submission

A newly proposed approach was utilized, based on conflict-level data and intersection-level data to conventional approaches. The effectiveness of proposed solutions based on both approaches was evaluated, as well as the constructability and transferability of countermeasure selections.

VISSIM was utilized to create a simulated intersection to better analyze information.

This project successfully introduced and presented the new approach pertaining to the first three steps of safety management process: Network Screening, Diagnosis, and Countermeasure Selection. This new approach provides safety improvement and traffic improvement based on several indicators that have good transferability and adaptability for new sites.

What the judges said

I liked how this proposal described the conventional approach and their new proactive approach. This made it easier to understand the strengths of their proposed new approach.

Professional Competition Winner

The Proactive Badgers from Traffic Analysis and Design Inc. (TADI), Wisconsin DOT, and the City of Janesville, WI, USA

Team Members: John Campbell, IV, P.E., RSP2I (M) (TADI); Christian Stemke, P.E., RSPI (TADI); Kevin Scopoline, P.E. (Wisconsin Department of Transportation); Ahnaray Bizjak, P.E. (M) (City of Janesville)

Key information from the winning submission

The group introduced the Multimodal Intersection Severity Score (MiSS) method, which is a point scoring system that summarizes observed near-miss events. The goal of this technique is to put safety first by estimating crashes that have not yet occurred and finding targeted solutions.

Grant or federal aid money, if it became available on a widespread basis for this type of work, would make collecting and analyzing near-miss data substantially more feasible for many jurisdictions.

Pedestrian and bicyclists can specifically be accounted for in the MiSS method, and the crash type categories presented enabled targeted solutions. Given the transferability of MiSS to virtually any intersection with near-miss data, MiSS can identify cost-effective improvement options at top-ranking intersections, but also for targeted solutions for specific crash types at lower-ranking intersections.

What the judges said

The approach could be used for both screening/prioritization, analysis of potential crash types, and cost-benefit calculations, so it was very versatile.

Student Competition Honorable Mention

University of Wisconsin-Madison

Team Members: Erynn Schroeder (S), Hesham Alyamani, Kentin Brummett (S), Ian Hargrove (S)

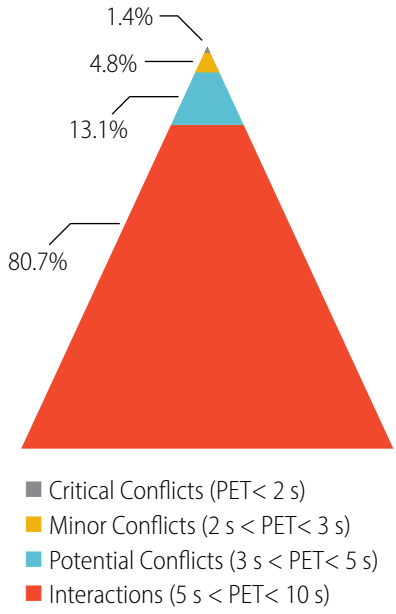
Key information from the submission

Proposed a methodology that focused on a process to select low-cost countermeasures and evaluate the effectiveness of countermeasures after implementation using Extreme Value Theory (EVT).

The approach integrated traditional and alternative data keeping so application could be transferable and adaptable to other communities. Data analysis facilitated the process to identify safety targets and evaluate potential safety improvements by type of collision, crash severity, location, and users involved. CMFs and cost of implementation for several proven low-cost countermeasures in the literature were considered.

What the judges said

Innovative approach using Extreme Value Theory to assess the effectiveness of countermeasures after implementation.



Selection Conflict Types	Sketch	Possible Crash Types	Road Users and Movements
Car-Car-Thru-Left		Approach Turn	Through car vs. left-turn car
Car-Car-Thru-Thru		Right Angle (T-bone)	Through car vs. through car
Car-Peds-Right-Cross		Pedestrian	Right-turn car vs. crossing peds (same or the other leg)
Car-Peds-Thru-Cross		Pedestrian	Through car vs. crossing peds
Car-Peds-Left-Cross		Pedestrian	Left-turn car vs. crossing peds (same or the other leg)
Car-Bicycle-Left-Thru		Bicycle	Left-turn car vs. through bicycle

UFTI's List of Common Conflict Types

Professional Competition Honorable Mention

University of Florida Transportation Institute (UFTI)

Team Members: Sivaramakrishnan Srinivasan (M), Karla Cristina Rodrigues Silva (M), Gustavo Riente de Andrade (M), Rui Guo

Key information from the submission

Utilized a four-step approach to identify and evaluate low-cost countermeasures using traditional and new data. Step 1: Serious Conflict Identification; Step 2: Screening & Prioritization of Intersections; Step 3: Analysis of Conflict Types; and Step 4: Countermeasures & Evaluations.

Emphasis was placed on engineering solutions involving changes to signal phasing and timing. The evaluation of the tradeoff between safety and operational performance measures was performed using the HCS software developed by the University of Florida Transportation Institute McTrans Center, which incorporated a novel model for crash prediction in addition to implementing the HCM methods for capacity determination.

What the judges said

Thoughtfully documented literature review; relevant research including Bellevue reports.

Behind the Scenes

Amir Rizavi, P.E., ENV, SP (F), Chair of the Consultants Council and the judging panel for the Vision Zero Sandbox Design Competition, shares insight on the value of the competition to ITE and the transportation industry.

ITE Journal: **How did ITE determine the topic of Vision Zero for this year's design competition?**

RIZAVI: The success of the 2020 Micromobility Sandbox Design Competition was a tough act to follow, and we needed a topic that would be relevant, impactful, and timely. A few of us had exchanged thoughts on potential topics like effective curbside management, unique data collection techniques, shared parking, use of technology in transportation, and safety. We had barely started this conversation when a parallel conversation with the City of Bellevue, WA, USA ensued where the city had recently utilized innovative near-miss technology to perform safety studies and graciously agreed to share the data with ITE.

This brought together the elements of safety and innovative technology, and commemorated the United Nations General Assembly's proclamation of 2021-2030 as the Decade of Action for Road Safety. We felt that Vision Zero was the thread that tied all these aspects together, and it felt appropriate to have it as the theme of our design competition in 2021.

ITEJ: **Can you explain the process involved in developing the competition parameters and criteria?**

RIZAVI: Once we had identified the topic as Vision Zero, our immediate next step was to develop the competition parameters and criteria along with subject matter experts. For this, we collaborated with ITE's Safety Council and worked with three safety experts–**Cynthia Redinger, P.E., RSP1, PTOE (M)** (City of Ann Arbor, MI, USA), **Eric Tang, P.E., RSP2B (M)**

(VHB), and **Nithin Agarwal, RSP1 (M)** (University of Florida) to review and understand the data provided by the City of Bellevue, WA, USA, and Transoft Solutions. Based on the data review, a select number of intersections were identified for the competition. Once this was complete, the competition parameters and the scoring criteria were established. Transoft Solutions then prepared a video explaining the data provided. All of this was uploaded to ITE's website for use in the competition.

ITEJ: **What was the process of selecting judges?**

RIZAVI: We were looking to identify experienced leaders in the transportation industry who would bring multiple perspectives to the judging table. These individuals were knowledgeable either in the field of safety, or in implementing aspects of safety, or in developing/implementing technology. We were successful in bringing together an outstanding mix of individuals representing the public and private sectors, non-profit and research institutions, and ITE leaders. We were fortunate that we were able to find such a terrific group of individuals, which speaks to the depth of knowledge and diversity available within ITE.

ITEJ: **What innovative ideas did the judging committee see from participants?**

RIZAVI: The submissions were impressive across the board, and it is difficult to list them all. One idea that jumps out was the application of applied machine learning (XG Boost) with machine vision to automate the munching of data toward performance metrics that could be utilized for safety and conflict analysis. This elevates the potential to make the vast array of video available for more detailed safety analysis.

Pairing tools like this with other visualization tools (such as Microsoft Power BI) has the potential to provide outcome-oriented solutions to complex analyses, sort of like what smartphones have done to telephones in communication.

ITEJ: **Why is this competition so important to the Consultants Council?**

RIZAVI: In 2020, the Consultants Council, along with the Industry and Public Agency Councils, sponsored the Micromobility Sandbox Design Competition as part of the Annual Meeting. We felt this event saw a terrific response with great ideas, and it was important for us and ITE to continue an event like this. After discussions with ITE, we felt the Consultants Council could take ownership and sponsorship of the Sandbox Design Competition moving forward.

We worked with ITE leadership to identify the topic for 2021 on Vision Zero, collaborated with the Safety Council to get subject matter experts and with public and private entities to obtain the data required to get the competition afoot. We were involved with judging the competition and rewarding the winners with the registration costs for the Annual Meeting along with some well-deserved recognition. The Consultants Council feels that encouraging and promoting activities such as these is extremely important to our industry, and it aligns well with our guiding principle of communicating and sharing ideas and trends with our membership. **itej**

Judges

Amir Rizavi, P.E., ENV, SP (F)
Chair of the Consultants Council, VHB

Hardik Shah, P.E., PTOE (M)
Vice Chair of the Consultants Council, Structurepoint

Robert Wunderlich, P.E. (F)
Texas A&M Transportation Institute

Darcy Akers, P.E. (M)
City of Bellevue, WA, USA

Noah Budnick
Together for Safer Roads

Franz Lowenherz
City of Bellevue, WA, USA

Randy McCourt, P.E., PTOE (F)
Immediate Past President of ITE