

Article Type 1: Peer-reviewed papers

Safe System in Practice: A Study of Practitioner Awareness, Support and Implementation

Michael Green¹^a, Carlyn Muir, PhD¹, Jennie Oxley, PhD¹, Amir Sobhani, PhD²

¹ Monash University Accident Research Centre, Monash University, ² Department of Economic Development Jobs Transport and Resources

Keywords: road safety, Safe System, practitioners, implementation, Victoria

<https://doi.org/10.33492/JRS-D-24-2-2286649>

Journal of Road Safety

Vol. 35, Issue 2, 2024

Abstract

In 2004, Australian jurisdictions adopted the Safe System approach to address road trauma. This approach seeks to prevent crashes on the road through harm minimisation principles that include a shared responsibility for safety. As an early adopter, the Victorian Government has encouraged practitioners, through guidance material and public policy, to implement Safe System. Yet, limited information exists regarding the degree of awareness of, or support for, the Safe System by individuals, whose role it is to influence and create the road safety outcomes expected by society. To understand practitioner awareness, perceptions and implementation of Safe System, an online survey was developed. Findings from completed surveys (n=469) indicate that one quarter of practitioners were unaware of the Safe System concept. Practitioners who had heard of Safe System, broadly agreed with the approach and believed that it positively contributed to their work. Importantly, practitioners believed that they were implementing Safe System and were likely to continue to do so in the future. A small subset of practitioners was not supportive of the approach, which alongside the low levels of awareness presents an additional challenge to policy implementation. Victoria's experience highlights to other jurisdictions seeking to apply Safe System that active and sustained engagement with practitioners is required to ensure they are aware of the concept, collectively understand it and are clear when, where and how it is to be implemented.

Key findings

- Existing research examining practitioner awareness and perceptions of Safe System is limited
- A forty-item online survey was developed that included a number of validated scales
- One quarter of respondents had not heard of Safe System
- Engagement is needed to reach those practitioners who are not aware of Safe System

Introduction

Road trauma is a global phenomenon, which is associated with 1.19 million deaths annually worldwide and an estimated 50 million injuries (WHO, 2023). Twenty years ago there was a significant shift in the way nations approached road safety (Belin et al., 2022; Hakkert & Gitelman, 2014), requiring practitioners to change and adapt the way they have traditionally viewed and addressed problems within the transport network. For governments, this process is ad-

dressed through the implementation of public policy measures which require concerted effort to develop and execute. In effect, practitioners provide the link between public policy and implementation (Winter, 2012), informing how approaches such as Safe System are utilised in practice. In many countries, and specifically in Australia, public policy approaches to road safety over the last twenty years have been underpinned by the Safe System approach (Mooren et al., 2011; Victorian State Government, 2020). However, as implementation has been identified as an on-

^a Corresponding Author: michael.green@monash.edu



Figure 1. Policy theory, creation and implementation interaction (adapted from Crosby (1996) and CDC (2018))

going challenge (S. Job et al., 2022; Muir et al., 2018), it is important to establish to what degree practitioners are aware of Safe System, their support for the approach and whether they are practically applying it. Exploring implementation from a practitioners' perspective is an important and under investigated area of research.

Safe System frames transport safety within the context of a system, consisting of multiple components. The approach is predicated on a series of principles that accepts human error and seeks to reduce fatalities and serious injuries by providing a forgiving road network that considers at its core, biomechanical human tolerances (ITF, 2008). To achieve trauma reduction outcomes, Safe System suggests collaboration between five pillars (vehicles, speeds, roads and roadsides, road user behaviour and post-crash care), where responsibility for safety is shared (WHO, 2017). Hoogerwerf (1990) describes approaches like Safe System as policy theory, as a way to explain assumptions and provide a theoretical foundation from which public policy can be developed.

However, Safe System lacks the specificity required for implementation, what Argyris (1996) described as internal validity, and therefore fails to bridge the gap from theory to practice (HakemZadeh & Baba, 2016). Safe System implementation requires integration into public policy, which initially occurs in the problem identification and policy analysis stages of public policy cycle models (CDC, 2018). The approach is then translated and interpreted to create strategies that are guided by Safe System, before the policy is formally adopted and implemented. Mazmanian and Sabatier (1983) define implementation as actioning a policy decision and Fixsen et al. (2005) stated that implementation is about undertaking a defined series of actions that result in a particularly identified program or activity.

Implementation, however, is not straightforward. Crosby (1996) suggested it includes six tasks: policy legitimisation; constituency building; resource accumulation; organisational design and modification; mobilising resources and action; and monitoring the impact of policy change (Figure 1). Abdullahi and Othman (2020) noted that practitioners play a significant role in the implementation of policy, however, as theories surrounding policy implementation are ambiguous, practitioners face the difficult role of translating policy into practice (O'Toole, 2000).

While Safe System has drawn some controversy regarding the limited degree of 'systems thinking' (Naumann et al., 2020) and its partially ambiguous nature (Schell &

Ward, 2022), it has been a fixture of Australia's road safety public policy since 2004 when the approach was ratified by national, state and territory governments (Australian Transport Council, 2004). Subsequent to this adoption, Safe System has been at least partially integrated into Victoria's road safety policy, which practitioners have been asked to implement (Green et al., 2023).

However, both the implementation of Safe System within policy and the practical application of Safe System by practitioners has not been without its challenges (Woolley & Crozier, 2018). Implementation is complex (Fixsen et al., 2005), in part due to the multi-causal, system-wide nature of the road safety problem and in part due to the adoption and implementation of Safe System itself (ITF, 2008). A number of challenges have been identified. For example, the International Transport Forum (2016) highlighted that there is no framework for the implementation of Safe System, with nations and states needing to approach implementation through a trial and error process. Additionally, Muir et al. (2018) described implementation as not "technical nor scientific ... [but rather] predominantly political and social" (p. i21). Howard (2004) framed the difficulties of implementation in terms of being able to distil these complexities into more manageable forms for political and public consumption. Furthermore, the rigidity of institutions and organisational behaviour has led to a failure to optimally implement Safe System in Australia (Woolley & Crozier, 2018).

The implementation of Safe System by practitioners has received some attention, in part due to the large quantity of guidance documents produced by road authorities and research institutions (Woolley et al., 2018). These documents are intended to provide guidance on what Safe System looks like in practice, however, the degree to which these documents align with Safe System has received less investigation (Hughes et al., 2015). Additionally, in implementing Safe System, nations have had to address who is responsible for Safe System implementation (S. Job et al., 2022). The World Road Association (PIARC) (2019) highlighted that under a Safe System model, achieving a shared responsibility for safety requires a commitment from all stakeholders to ensure a safe road network. This is echoed by the International Transport Forum (2016) that suggests that *everybody* bears responsibility for the reduction in trauma on the roads. However, neither of these definitions assists in determining what is to be implemented or who is responsible for the actual implementation of Safe System. Whilst con-

trol structures have been articulated within a road safety context (Bliss & Breen, 2009; Salmon et al., 2016), clearly delineating who is answerable for practical implementation has received less attention.

Safe System has been the principal approach to road safety in Victoria over the last twenty years (Cockfield et al., 2020), yet there is limited research examining awareness of Safe System and how it is perceived by practitioners. This study aims to determine to what degree practitioners are aware of Safe System, their level of support, and self-reported practical application of the approach as it appears in public policy. By investigating practitioners' perspectives of Safe System, the research provides greater insight into the implementation process and identifies issues that might otherwise not have been discovered. Based on these findings, potential implementation solutions can be developed to improve road safety policy and increase the likelihood of policy success.

Method

This was an exploratory study using a cross-sectional online survey. The survey was designed to assess road safety practitioners' awareness, understanding and perceptions of Safe System. Ethics approval was granted through the Monash University Human Research Ethics Committee.

Respondents and recruitment

Eligibility criteria included: (i) self-identification as a road safety practitioner, (ii) the majority of the individual's role related to road safety work in the state of Victoria, and (iii) aged 18 years old or older.

Road safety practitioners are responsible for the implementation of actions that reduce crashes that result in deaths and serious injuries on the road network (WHO, 2017). As Safe System is intended to be a holistic approach (Muir et al., 2018), a broad definition for practitioner was adopted for this study:

A person whose role can influence, or relates to, reducing the number of people killed or seriously injured on Victorian roads. The role of these individuals involves developing, interpreting or implementing government policy into road safety program or campaign delivery.

Using the definition as a guide, the minimum sample size was determined through a power calculation. The total practitioner workforce size in Victoria was estimated by reviewing the most recently available annual report employment numbers for relevant organisations including but not limited to the Department of Transport, local government and advocacy groups. A calculated total population size of 174,200 was approximated. To achieve an 80 percent power for detecting a medium effect, at a significance criterion of $\alpha = 0.05$, a minimum sample size of was $N = 385$ was adopted.

Data collection and study instrument

The online survey was in field between November 2021 and April 2022. Respondents were recruited through industry newsletters, email lists, social media and author contacts. No incentives were offered and responses were anonymous. Respondents were provided a study description on the first page, and advised that by completing the survey, they consented to take part in the study.

Questions were developed, with an initial round of testing undertaken by a panel of subject matter experts, followed by multiple rounds of pilot testing. The instrument was divided into seven sections, as follows.

Section 1: Perceptions of government intervention examined respondents' perceptions of the acceptable degree of government policy intervention. Items were drawn from the Australian Perceptions of Prevention Survey (AUS-POPS) (Myers & Vickers, 2016), one of the few instruments that measures attitudes towards government intervention in health and safety (Grunseit, 2021). The section consists of three items using three and five-point Likert scales. Scores for the five-point Likert scale items were grouped into very low/low, neutral and high/very high.

Section 2: Personal control over outcomes measured personal control using the brief locus of control validated scale (Lumpkin, 1985). This shortened locus of control scale contains six items, measured using a five-point Likert scale ($\alpha = 0.68$) (Lumpkin, 1985). To measure locus of control, the six item scores were added and averaged (ranging on a scale from 0–6).

Section 3: Knowledge (awareness and understanding) of Safe System investigated respondents' knowledge of Safe System asking a series of questions about awareness and whether respondents had participated in any education related to Safe System.

Section 4: Implementing Safe System determined whether respondents were implementing Safe System using six items measured using a series of Likert scales and single and multiple-choice categorical responses.

Section 5: Perceptions (support) towards Safe System focused on respondents' perceptions of Safe System and included a scale adapted from a Tasmanian road safety strategy public consultation survey (Road Safety Advisory Council – Tasmania, 2016) regarding support of each of the Safe System principles. Items were measured using Likert scales and categorical responses and the section included four items.

Section 6: Practical implementation of Safe System explored respondents' practical implementation of Safe System which included a survey item based on project management lifecycle (Institute Project Management, 2021) regarding the time-point within projects that had used Safe System. The section consists of twelve items, measured using Likert scales and single and multiple-choice categorical responses.

Section 7: Demographics asked about individual demographic variables, including age, gender, education level, experience, employment organisation, role, organisation size and work location.

Data analysis

In total, 691 respondents commenced the survey, with 540 completions (78.1% completion rate). Of the 540 completions, 71 were removed as they did not meet the respondent eligibility criteria or through the data cleaning process, leaving a total of 469 responses for analysis.

For the analysis, statistical tests with a significance value of $p < .05$ were considered to be significant. Screening for extreme scores/outliers was undertaken by examining standardised residual, with outliers retained. Normality was measured using Kolmogorov-Smirnov test, with the output effecting the choice of statistical test.

Statistical analysis

The data were analysed using SPSS v25 (IBM). The three research aims and statistical analysis used are listed below.

Research aim 1: The degree of practitioner awareness of Safe System

A series of Chi Square tests of independence for categorical variables, and Mann-Whitney U tests for continuous variables, were conducted alongside analysis of the adjusted residuals to measure differences between actual and expected counts, when accounting for sample size.

Research aim 2: The degree of practitioner support of Safe System

Measured using a series of descriptive and Chi-square tests, Mann-Whitney U test (for continuous variables) and qualitative thematic analysis of free text responses.

Research aim 3: Practitioner implementation of Safe System

Practitioners were asked to identify if they applied Safe System within their work and the frequency of that application. While it is recognised that this does not measure the degree to which Safe System is integrated into public policy (which will have an effect on implementation), this is an appropriate proxy. Descriptive statistics and Chi-square test were utilised. Additionally, where there were lower frequencies, Fisher's exact test was used for analysis. Thematic analysis was also undertaken on free text fields, allowing for the categorisation of results.

Results

The results are presented in four sections: 1) Respondents' socio-demographic characteristics 2) practitioner awareness of Safe System 3) practitioner support of Safe System and 4) Safe System implementation.

Respondents' socio-demographic characteristics

The online survey was completed by 469 respondents. Just over a quarter of respondents were between the ages of 36 and 45 years (25.8%; $M = 44.0$ years, $SD = 12.6$, Range = 20.0–80.0 years); and were predominantly male (64.6%). Almost 40 percent had completed an undergraduate degree (38.4%), and more than half were employed within non-

government organisations (53.7%). Respondents had a mean of 14 years of professional road transport experience ($M = 14.0$ years, $SD = 11.7$, Range = 0.0 – 56.0 years); and more than 40 percent reported that their work was predominantly located state-wide rather than in one defined area (43.3%) (Table 1).

Examination of the sample characteristics showed that age and gender were comparable to the broader Australian transportation workforce (Stanford & Grudnoff, 2020), although qualification levels in the survey population were considerably higher (National Skills Commission, 2021). This can generally be explained by the professional nature of the work (ABS, n.d.). Organisation size was aligned with general characteristics of the transport industry, with organisations that typically address or have an interest in road safety being larger (i.e., government agencies, research institutions etc) (Peden, 2004; Salmon et al., 2016). Based on the sample's characteristics, it is reasonable to suggest that the sample and the results are representative of the broader road safety practitioner community and align with the road safety practitioner definition applied in this study.

Practitioner awareness of Safe System

Of the 469 respondents, the majority ($n=348$, 74.2%) reported having heard of Safe System. This means that a quarter of participants have not heard of Safe System. Of the respondents who had not heard of Safe System ($n = 121$, 25.8%), most were male (56.2%), aged between 36 and 55 years (54.6%), held a bachelor degree or higher (58.7%) and have a median of 10 years of professional road transport experience. These respondents were typically non-government employees (64.5%) working in very large organisations (64.5%), with the majority of their work located across the state (47.1%). Respondent gender, level of education and location of work were all associated with being aware of Safe System (Table 2).

Post hoc tests of the adjusted residuals were conducted to determine if there was a significant relationship between awareness and gender, education, government employment and work location. Three sub-variables were significant, suggesting that females were more likely to have not heard of Safe System than expected, adjusting for sample size ($\chi^2(2, n = 51) = 7.84, p = .020$). Similarly, when adjusting for sample size, diploma-educated practitioners who had not heard of Safe System ($\chi^2(7, n = 23) = 14.44, p = .044$) and government employees who had heard of the Safe System approach ($\chi^2(2, n = 174) = 7.29, p = .007$) were larger than expected.

Practitioner support of Safe System

Of the 348 respondents who had heard of Safe System, the majority reported that they agreed with the approach (82.8%, $n = 288$). Of the 121 respondents who had not previously heard of Safe System, after being provided with a short description of Safe System, 71.9 percent ($n = 87$) of practitioners stated that they agreed with the approach, with a larger proportion of those practitioners being un-

Table 1. Socio-demographic characteristics of respondents (N = 469)

Variable	n	%
Age (years)		
18-25	22	4.7
26-35	117	24.9
36-45	121	25.8
46-55	115	24.5
56-65	74	15.8
66-75	18	3.8
76+	2	0.4
Gender		
Male	303	64.6
Female	149	31.8
Prefer not to say	17	3.6
Education		
No formal education	1	0.2
High school	21	4.5
Trade / apprenticeship	3	0.6
Other TAFE / Technical certificate	25	5.3
Diploma	47	10.0
Bachelor degree	180	38.4
Post-graduate degree	178	38.0
Other	14	3.0
Professional road transport experience (years)		
<1	26	5.5
1-5	128	27.3
6-10	80	17.1
11-15	73	15.6
16+	162	34.5
Government employee		
Department of Health	6	2.8
Department of Justice and Community Safety	3	1.4
Department of Transport	128	59.0
Transport Accident Commission	28	12.9
Victoria Police	33	15.2
Other	19	8.8
Non-Government employee		
Advocacy group / Community road safety / Road safety educator	17	6.7
Driving instructor	11	4.4
Local council	57	22.6
Private contractor / consultant	59	23.4
Private road operator / Public transport operator	17	6.7
Research organisation / University / Education	12	4.8
Road contractor	16	6.3
Traffic management	8	3.2
Vehicle manufacturer / Vehicle dealer	9	3.6
Other*	46	18.3
Organisation size		
Sole practitioner	22	4.7

Variable	n	%
Small (2-19 employees)	40	8.5
Medium (20-199 employees)	56	11.9
Large (200-500 employees)	36	7.7
Very large (501+ employees)	315	67.2
Work location		
Urban	91	19.4
Inner metro	67	14.3
Outer metro	48	10.2
Inner regional	36	7.7
Outer regional	24	5.1
Statewide	203	43.3

*Other includes: Emergency service (excluding police): Fleet operator, taxi / bus operator; Media and Utilities supplier categories.
Abbreviations: TAFE, Technical and Further Education.

Table 2. Safe System awareness and demographic variables (N = 469)

Variable	Safe System		Not aware of Safe System		χ^2
	n	%	n	%	
Gender					$\chi^2(2, N = 469) = 9.06, p = .011^*$
Male	235	77.6	68	22.4	
Female	98	65.8	51	34.2	
Prefer not to say	15	88.2	2	11.8	
Education					$\chi^2(7, N = 469) = 34.87, p < .001^{***}$
No formal education	0	0.0	1	100.0	
High school	10	47.6	11	52.4	
Trade / apprenticeship	1	33.3	2	66.7	
Other TAFE / Technical certificate	16	64.0	9	36.0	
Diploma	24	51.1	23	48.9	
Bachelor degree	147	81.7	33	18.3	
Post-graduate degree	140	78.7	38	21.3	
Other	10	71.4	4	28.6	
Government employee					$\chi^2(1, N = 469) = 7.55, p = .006^{**}$
Yes	174	80.2	43	19.8	
No	174	69.0	78	31.0	
Organisation size					$\chi^2(4, N = 469) = 2.03, p = .731$
Sole practitioner	15	68.2	7	31.8	
Small (2-19 employees)	30	75.0	10	25.0	
Medium (20-199 employees)	38	67.9	18	32.1	
Large (200-500 employees)	28	77.8	8	22.2	
Very large (501+ employees)	237	75.2	78	24.8	
Work location					$\chi^2(5, N = 469) = 12.55, p = .028^*$
Urban	72	79.1	19	20.9	
Inner metro	45	67.2	22	32.8	
Outer metro	39	81.3	9	18.8	
Inner regional	23	63.9	13	36.1	
Outer regional	23	95.8	1	4.2	
Statewide	148	71.9	57	28.1	

*p < .05, **p < .01, ***p < .001

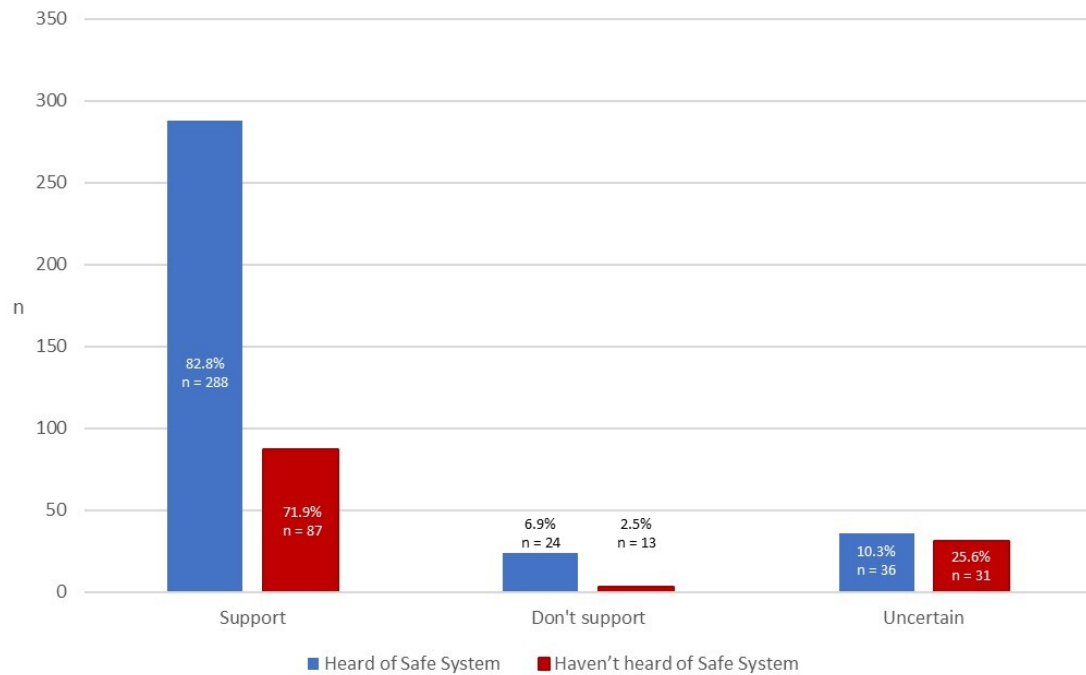


Figure 2. Practitioner support of Safe System

certain (heard of Safe System 10.3%, $n = 36$; hadn't heard of Safe System 25.6%, $n = 31$) (Figure 2). Respondents who were aware of Safe System were more likely to agree with the approach than those that had not heard of the approach ($\chi^2(2, N = 469) = 19.03, p < .001$).

Practitioners who were not supportive of Safe System tended to be older and have more professional road transport experience than respondents who were supportive of Safe System. There was a significant relationship between support and government employment, with practitioners who were not supportive of Safe System predominantly working for non-government entities. Additionally, there was a significant relationship between support and organisation size, with practitioners who supported the approach more likely to work in very large organisations (Table 3).

Examination of respondents' perceptions of government intervention revealed a statistically significant relationship between the quantity or level of government intervention and support of Safe System (heard of Safe System - $\chi^2 = 25.37, p < .001$, Cramer's $V = .349$; hadn't heard of Safe System - $\chi^2 = 29.16, p < .001$, Cramer's $V = .213$). Respondents who believed that there is the right amount of government intervention in Australia were more likely to agree with the Safe System approach regardless of whether they had heard of Safe System (84.5%, $n = 164$) or not (80.6%, $n = 50$). No relationship was found between locus of control scores and support of Safe System.

Of the 24 practitioners who did not agree with the Safe System approach, 22 provided additional information in free text responses on why this was the case. Whilst the responses were varied, the majority ($n = 16$) conceptually disputed how Safe System could reach road safety outcomes (i.e., "Simplistic and unachievable") while the remaining responses ($n = 6$) highlighting implementation-based issues

(i.e., "The way the Safe System approach has been implemented in Victoria solely focuses on vehicles...").

Safe System implementation

Practitioner implementation of Safe System

Of the practitioners who were aware of Safe System, the majority said that they use the approach (88.5%, $n = 308$), 3.2 percent reported they did not ($n = 11$) and 8.3 percent ($n = 29$) were uncertain. When examining frequency of application, 44.5 percent ($n = 137$) of practitioners stated that they 'frequently' applied the approach, while 23.7 percent ($n = 73$) confirmed that they 'always' applied Safe System. There were no statistically significant relationships between any of the demographic variables and implementation of Safe System.

Respondents who described frequency of Safe System application as frequent or always were more likely to access tools and resources to guide them in the use of Safe System (80.9%, $n = 173$). The main resource accessed were guidelines (75.9%, $n = 126$) followed by engaging with co-workers and managers (60.8%, $n = 101$).

None of the items that measured practitioners' perceptions of government intervention were associated with respondents' application of Safe System. Locus of control scores did not significantly differ between those practitioners who reported that they applied Safe System and those who did not.

Practical implementation of Safe System

Respondents were asked to identify at what stage they applied Safe System during the program/project they last worked on (respondents were able to select multiple cat-

Table 3. Safe System support and variables (N = 402)

Variable	Support Safe System		Don't support Safe System		χ^2
	n	%	n	%	
Gender					$\chi^2(2, N = 402) = 1.11, p = .575$
Male	237	92.9	18	7.1	
Female	123	94.6	7	5.4	
Prefer not to say	15	88.2	2	11.8	
Education					$\chi^2(7, N = 402) = 4.85, p = .679$
No formal education	1	100.0	0	0.0	
High school	15	88.2	2	11.8	
Trade / apprenticeship	2	100.0	0	0.0	
Other TAFE / Technical certificate	19	86.4	3	13.6	
Diploma	33	97.1	1	2.9	
Bachelor degree	142	94.0	9	6.0	
Post-graduate degree	151	93.8	10	6.2	
Other	12	85.7	2	14.3	
Government employee					$\chi^2(1, N = 402) = 5.41, p = .020^*$
Yes	184	96.3	7	3.7	
No	191	90.5	20	9.5	
Organisation size					$\chi^2(4, N = 402) = 44.94, p < .001^{***}$
Sole practitioner	18	85.7	3	14.3	
Small (2-19 employees)	23	67.6	11	32.4	
Medium (20-199 employees)	43	91.5	4	8.5	
Large (200-500 employees)	31	100.0	0	0.0	
Very large (501+ employees)	260	96.7	9	3.3	
Work location					$\chi^2(5, N = 402) = 8.42, p = .134$
Urban	71	92.2	6	7.8	
Inner metro	57	100.0	0	0.0	
Outer metro	35	82.1	3	7.9	
Inner regional	32	100.0	0	0.0	
Outer regional	19	90.5	2	9.5	
Statewide	161	91.0	16	9.0	

*p < .05, **p < .01, ***p < .001

Table 4. Application of Safe System based on project/program stages

Stage	n	%
Initiation stage	99	45.6
Development/design stage	134	61.5
Implementation stage	56	25.7
Evaluation stage	40	18.3
Program/project completed	24	11.1
Throughout the program/project	102	46.8

egories). The majority of respondents identified that Safe System had been used during the development and design stages of the program/project (61.5%, n = 134) (Table 4).

With regard to future implementation of Safe System, most respondents reported that they were likely to use it in the future (83.6%, n = 291), whilst only 4 respondents (1.1%) reported they would not. Of concern, 15.2 percent (n = 53) were uncertain. There was a significant relationship between support and future implementation ($\chi^2(4, N = 348) = 87.00, p < .001$). Despite 6.9 percent (n = 24) of respondents not agreeing with the Safe System approach, 41.7 percent (n = 10) of those stated they would still utilise it in the future.

Additionally, practitioners were asked if they believed Safe System contributed (either positively or negatively) to the last project that they worked on. The majority of respondents (84.9%, n = 186) stated that Safe System did contribute, whilst 4.1 percent (n = 9) said it did not and 11.0 percent (n = 24) said they were uncertain. Classifying the free text responses from respondents indicated that 73.6

percent ($n = 106$) believed Safe System made a positive contribution (i.e., *“Helped guide my thinking”*), whilst 20.8 percent ($n = 30$) were neutral (i.e., *“Road safety was a key consideration regardless of Safe System”*) and 5.6 percent ($n = 8$) were negative (i.e., *“It added nothing that hadn’t already been added...”*). Additionally, there was an association between support of Safe System and the perceived contribution made to the last project respondents worked on ($p < .001$, Fisher’s exact test).

Discussion

The aim of this study was to investigate professional road safety practitioners in Victoria to understand their awareness of Safe System, support for the approach and self-reported implementation. The majority of respondents supported Safe System, reporting that it was often used within projects and programs and positively contributes to their work. However, one quarter of respondents had not heard of Safe System.

Considering Safe System is the formal approach to road safety in Victoria and has been integrated into the policy environment for almost twenty years, the finding that a quarter of practitioners were not aware of it indicates that more work could be done to support awareness. Awareness plays a critical role in achieving road safety outcomes, with the UN recommending that road safety agencies ensure that practitioners are both well informed and understand ‘good practice’ (Bliss & Breen, 2009). Additionally, it also affects how and where Safe System is implemented, as without awareness, it cannot be used in practice (Fixsen et al., 2005). Whilst educational offerings about Safe System have increased (Cosgrove, 2018; R. Job & Sakashita, 2012) as has the proliferation of Safe System guidance (ITF, 2022), the results suggest that further education and/or training on holistic road safety approaches is required.

The lack of awareness amongst a substantial proportion of respondents highlights a broader concern facing road safety. While as a practice, road safety has been undertaken for over one hundred years, it has not resulted in a clearly defined career pathway with academic qualifications. Additionally, in the case of Safe System, education is further impeded by not being a cognate field of study. Given the multi-disciplinary nature of road safety and Safe System, incorporating educational materials within the curriculums of traditional disciplines, such as civil engineering and behavioural science, can prove to be difficult. While road safety capacity and knowledge transfer continue to be an ongoing challenge (Alavi et al., 2023; ITF, 2008) these are unlikely to be addressed until road safety, including Safe System, is defined as a legitimate educational field with identifiable road safety career channels.

While the survey utilised a broad definition of ‘practitioner’, additional consideration of who implements Safe System is required. As a concept, Safe System does not define the boundaries of the system other than to state that it is holistic (U.S. Department of Transportation, 2022). While Safe System has a historical link to systems theories (Larsson et al., 2010), the limited theoretical underpinnings re-

sult in an inability to return to source materials to determine the scope of, in this case, the breadth and width of the proposed system. It is therefore incumbent on academics, policy-makers and practitioners themselves to define the system. Without a consistent understanding of the implementation of Safe System, including how it is to be applied, who is to apply it and when it is to be applied, it is difficult to target educational offerings to ensure all practitioners are aware of the concept.

Importantly for the implementation of Safe System, the survey results indicate only a small proportion of practitioners did not agree with the approach. This aligns with Andersson and Pettersson (2008) who noted policies and concepts that hold a visionary goal of reducing road fatalities and injuries to zero are difficult to oppose. The primary reason for opposing Safe System was related to conceptual disputes and implications for implementation. The free text fields provide rich qualitative data on potential opposition to Safe System, but additional research is required to understand how to address these practitioners’ concerns. Majority support for Safe System on the other hand, is consistent with the general public’s perceptions of Safe System (Road Safety Advisory Council - Tasmania, 2016) and road safety managers (Turner et al., 2009). The survey findings suggest that perceptions of Safe System are linked to both prior and future implementation of Safe System.

Limitations

In the context of this study, there are limitations in the method used to measure implementation. As an exploratory study, the aim was to explore if practitioners believe Safe System implementation is occurring. Safe System is described as comprising of a vision, a series of principles and tools (Muir et al., 2018) which can be used within practice. Additional research is required to extend the survey findings to determine what practitioners are implementing, whether this aligns with the Safe System vision, principles and tools and if implementation is optimal. Successful implementation has been linked to achieving policy outcomes (Durlak & Dupre, 2008) and the work undertaken by practitioners plays a critical role in affecting implementation. Implementation of Safe System has been an ongoing challenge with many of these difficulties found in the policy and high-level operating environment (Woolley & Crozier, 2018). The findings presented in this research indicate that practical implementation may be occurring, but also draw attention that practitioners’ use of Safe System may impact these broader policy challenges.

Conclusions

In summary, the results of this study highlight that three-quarters of practitioners are aware of Safe System and most of those individuals use it within their work. However, there remains a substantial number of practitioners who have not heard of Safe System. Existing studies typically report that practitioners are already aware of Safe System, which means that the initiation point for studies examining Safe System implementation may be missing an important co-

hort who have no awareness of Safe System. Importantly, as one of the earliest adopters of Safe System, Victoria should be in a position for widespread policy diffusion. The findings presented in this research have implications for all jurisdictions seeking to implement Safe System – while education, training and guidance materials already exist, a rethink of how practitioners are targeted and what messages they are receiving is required for all practitioners to ensure successful awareness and implementation.

Additionally, the survey results indicate that there is a relationship between awareness, perceptions and application. Those practitioners that were aware of the approach were likely to support it, and practically apply it to their work. By capitalising on these relationships, it suggests that improving awareness can lead to increased usage of Safe System by practitioners.

The results suggest implementation can improve through increased awareness, however practitioners and policy-makers must also contend with the complexities of translating Safe System into practice. These challenges extend beyond how practitioners interpret Safe System and conduct themselves in the field, to broader systems-based issues such as organisational structures, governance and accountability (Woolley & Crozier, 2018). While Woolley & Crozier (2018) suggest that Safe System is not being “honoured ‘in the field’” (p. 5), with goals, resourcing and application being misaligned, as indicated within this research, practitioners believe they are implementing Safe System. Additional research is therefore required to understand how Safe System application is occurring and the effect these broader systems issues have on implementation.

The findings have international implications for jurisdictions that have already implemented Safe System or system-based approaches or are seeking to implement them in the future. Practically, if a jurisdiction such as Victoria, which has a long history of investing in road safety and Safe System, has a quarter of its practitioner population unaware of Safe System, this suggests that a concerted effort is required to disseminate Safe System knowledge among individuals whose roles can impact road safety outcomes. As noted by Durlak and Dupre (2008), expecting perfect or near-perfect implementation of a policy, program or concept is unrealistic, but improving awareness and percep-

tions should assist how practitioners’ approach Safe System.

Acknowledgements

The authors wish to thank respondents for taking the time to complete the survey and their contributions to addressing Victoria’s road safety.

Author contributions

Michael Green: conceptualisation, methodology, investigation, data curation, writing – original draft, visualisation. Carlyn Muir and Jennie Oxley: conceptualisation, methodology, writing – review and editing, supervision. Amir Sobhani: writing – review and editing, supervision.

Funding

This research was funded through an industry-funded PhD scholarship from the Department of Transport, Victoria.

Human Research Ethics Review

Study protocols were reviewed and approved by the Monash University Human Research Ethics Committee (Project number: 282825) on 23 July 2021.

Data availability statement

The authors declare that the raw data is not available as the study participants are potentially identifiable through the survey responses.

Conflicts of interest

The authors declare that there are no conflicts of interest.

Submitted: December 28, 2023 AEST, Accepted: March 15, 2024 AEST



References

- Abdullahi, M., & Othman, N. (2020). Bridging the gap between policy intent and implementation. *Journal of Science, Technology and Innovation Policy*, 6(1), 1–10.
- Alavi, H., Jones, C., & Hunter, C. (2023). Embedding Safe System in Victoria: Blockers, enablers and improvement roadmap. *Journal of Road Safety*, 34(2), 38–45. <https://doi.org/10.33492/IRS-D-22-00022>
- Andersson, F., & Pettersson, T. (2008). The vision thing: Actors, decision-making and lock-in effects in Swedish road safety policy since the 1990s. *Umeå Papers in Economic History*, 17. <http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-1487>
- Argyris, C. (1996). Actionable Knowledge: Design Causality in the Service of Consequential Theory. *The Journal of Applied Behavioral Science*, 32(4), 390–406. <https://doi.org/10.1177/0021886396324004>
- Australian Bureau of Statistics (ABS). (n.d.). *Education and Work, Australia*. Retrieved 2021, from <https://www.abs.gov.au/statistics/people/education/education-and-work-australia/latest-release#:~:text=In%20May%202021%2C%2016%25%20of,the%20rest%20were%20at%20school>
- Australian Transport Council. (2004). *Joint communicate*. <http://www.atcouncil.gov.au/communicate/atc20.aspx>
- Belin, M., Hartmann, A., Svolsbru, M., Turner, B., & Griffith, M. (2022). Applying a Safe System Approach across the globe. *Public Roads*, 85(4). <https://highways.dot.gov/public-roads/winter-2022/07>
- Bliss, T., & Breen, J. (2009). *Country guidelines for the conduct of road safety management capacity reviews and the specification of lead agency reforms, investment strategies and Safe System projects*. The World Bank. <http://hdl.handle.net/10986/12706>
- Centre for Disease Control and Prevention. (2018). *The CDC policy process*. <https://www.cdc.gov/policy/polaris/training/policy-cdc-policy-process.html>
- Cockfield, S., Healy, D., Harris, A., McIntyre, A., & Cavallo, A. (2020). The development of the “Vision Zero” approach in Victoria, Australia. In K. Björnberg, M. Belin, S. Hansson, & C. Tingvall (Eds.), *The Vision Zero Handbook: Theory, Technology and Management for a Zero Casualty Policy* (pp. 475–506). Springer International Publishing. https://doi.org/10.1007/978-3-030-23176-7_17-1
- Cosgrove, L. (2018). Road safety education: improving outcomes through community collaboration. *Australasian Road Safety Conference*.
- Crosby, B. (1996). Policy implementation: The organizational challenge. *World Development*, 24(9), 1403–1415. [https://doi.org/10.1016/0305-750X\(96\)00050-2](https://doi.org/10.1016/0305-750X(96)00050-2)
- Durlak, J., & Dupre, E. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology*, 41(3–4), 327–350. <https://doi.org/10.1007/s10464-008-9165-0>
- Fixsen, D., Naoom, S., Blase, K., & Friedman, R. (2005). *Implementation research: A synthesis of the literature*. The national implementation research network.
- Green, M., Muir, C., Oxley, J., & Sobhani, A. (2023). When policy hits the road: Safe System in Victoria’s policy environment. *Accident Analysis and Prevention*, 189, 107129. <https://doi.org/10.1016/j.aap.2023.107129>
- Grunseit, A. (2021). *AUSPOPS 2016–2021: Third national report*. The Australian Prevention Partnership Centre. https://preventioncentre.org.au/wp-content/uploads/2021/10/AUSPOPS-2016_2021-Third-National-Report.pdf
- HakemZadeh, F., & Baba, V. (2016). Measuring the actionability of evidence for evidence-based management. *Management Decision*, 54(5), 1183–1204. <https://doi.org/10.1108/MD-01-2015-0001>
- Hakkert, A., & Gitelman, V. (2014). Thinking about the history of road safety research: Past achievements and future challenges. *Transportation Research Part F: Psychology and Behaviour*, 25, 137–149. <https://doi.org/10.1016/j.trf.2014.02.005>
- Hoogerwerf, A. (1990). Reconstructing policy theory. *Evaluation and Program Planning*, 13(3), 285–291. [https://doi.org/10.1016/0149-7189\(90\)90059-6](https://doi.org/10.1016/0149-7189(90)90059-6)
- Howard, E. (2004). Implementing a ‘Safe System’ approach to road safety in Victoria. *Proceedings of the Australasian Road Safety Research, Policing and Education Conference*, 8(2), 1–14.

- Hughes, B., Newstead, S., Anund, A., Shu, C., & Falkmer, T. (2015). A review of models relevant to road safety. *Accident Analysis & Prevention*, 74, 250–270. <https://doi.org/10.1016/j.aap.2014.06.003>
- Institute Project Management. (2021). *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Seventh Edition and The Standard for Project Management*. Project Management Institute.
- International Transport Forum (ITF). (2008). *Towards zero ambitious road safety targets and the Safe System approach*. OECD. <https://doi.org/10.1787/9789282101964-en>
- International Transport Forum (ITF). (2016). *Zero road deaths and serious injuries: Leading a paradigm shift to a Safe System*. OECD Publishing. <https://doi.org/10.1787/9789282108055-en>
- International Transport Forum (ITF). (2022). *The Safe System Approach in action*. OECD Publishing. <https://doi.org/10.1787/ad5d82f0-en>
- Job, R., & Sakashita, C. (2012, October 4–6). Combining safe system principles and road safety education in schools: an opportunity for improved demand on road system operators and a broader understanding of risk and safety. *Australasian Road Safety Research Policing Education Conference*.
- Job, S., Truong, J., & Sakashita, C. (2022). The ultimate Safe System: Redefining the Safe System approach for road safety. *Sustainability*, 14(5), 2978. <https://doi.org/10.3390/su14052978>
- Larsson, P., Dekker, S., & Tingvall, C. (2010). The need for a systems theory approach to road safety. *Safety Science*, 48(9), 1167–1174. <https://doi.org/10.1016/j.ssci.2009.10.006>
- Lumpkin, J. (1985). Validity of a brief Locus of Controls Scale for survey research. *Psychological Reports*, 57(2), 655–659. <https://doi.org/10.2466/pr0.1985.57.2.655>
- Mazmanian, D., & Sabatier, P. (1983). *Implementation and public policy*. University Press of America.
- Mooren, L., Grzebieta, R., & Job, S. (2011, September 1–2). Safe System - comparisons of this approach in Australia. *Australasian College of Road Safety Conference*.
- Muir, C., Johnston, I., & Howard, E. (2018). Evolution of a holistic systems approach to planning and managing road safety: The Victorian case study, 1970–2015. *Injury Prevention*, 24(Suppl 1), i19–i24. <https://doi.org/10.1136/injuryprev-2017-042358>
- Myers, P., & Vickers, N. (2016). *Australian Perceptions of Prevention Survey – Technical Report*. The Social Research Centre. <https://preventioncentre.org.au/resources/australian-perceptions-of-prevention-survey-technical-report-july-2016/>
- National Skills Commission. (2021). *Australian jobs 2021*. Australian Government. https://www.nationalskillscommission.gov.au/sites/default/files/2021-12/NSC21-0025_Australian%20Jobs%202021_ACC-FA2_0.pdf
- Naumann, R., Sandt, L., Kumfer, W., LaJeunesse, S., Heiny, S., & Lich, K. (2020). Systems thinking in the context of road safety: Can systems tools help us realize a true “Safe Systems” approach? *Current Epidemiology Reports*, 7(4), 343–351. <https://doi.org/10.1007/s40471-020-00248-z>
- O’Toole, L. (2000). Research on policy implementation: Assessment and prospects. *Journal of Public Administration Research and Theory*, 10(2), 263–288. <https://doi.org/10.1093/oxfordjournals.jpart.a024270>
- Peden, M. (2004). *World report on road traffic injury prevention*. World Health Organization.
- Road Safety Advisory Council - Tasmania. (2016). *Towards Zero - Tasmania road safety strategy 2017–2026 (Stakeholder and public consultation report - Stage 1)*. The Department of State Growth. http://www.towardszero.tas.gov.au/home/public_and_stakeholder_consultation
- Salmon, P., Read, G., & Stevens, N. (2016). Who is in control of road safety? A STAMP control structure analysis of the road transport system in Queensland, Australia. *Accident Analysis and Prevention*, 96, 140–151. <https://doi.org/10.1016/j.aap.2016.05.025>
- Schell, W., & Ward, N. (2022). A process for change: The Safe System approach and Vision Zero. *Frontiers in Future Transportation*, 3, 982942. <https://doi.org/10.3389/ffutr.2022.982942>
- Stanford, J., & Grudnoff, M. (2020). *The future of transportation work: A summary report*. Centre for Future Work at the Australia Institute. <https://australiainstitute.org.au/wp-content/uploads/2020/12/the-future-of-transportation-work.pdf>
- Turner, B., Tziotis, M., Cairney, P., & Jurewicz, C. (2009). *Safe System infrastructure: National roundtable report (ARR 370)*. Australian Road Research Board.
- U.S. Department of Transportation. (2022). *What is a Safe System Approach?* <https://www.transportation.gov/NRSS/SafeSystem>

Victorian State Government. (2020). *Victorian road safety strategy 2021-2030*.

https://www.tac.vic.gov.au/_data/assets/pdf_file/0020/502166/RoadSafetyStrategy_DEC2020.pdf

Winter, S. (2012). Implementation. In B. Peters & J. Pierre (Eds.), *Handbook of Public Administration* (2nd ed., pp. 255–264). Sage Publications. <https://doi.org/10.4135/9781446200506>

Woolley, J., & Crozier, J. (2018). *Inquiry into the national road safety strategy 2011-2020*.

https://www.roadsafety.gov.au/sites/default/files/2019-11/nrss_inquiry_final_report_september_2018_v2.pdf

Woolley, J., Stokes, C., Turner, B., & Jurewicz, C. (2018). *Towards Safe System infrastructure: A compendium of current knowledge* (AP-R560-18).

Austroads. <https://austroads.com.au/publications/road-safety/ap-r560-18>

World Health Organization (WHO). (2017). *Save LIVES – a road safety technical package*.

<https://www.who.int/publications-detail/save-lives-a-road-safety-technical-package#:~:text=Save%20LIVES%3A%20a%20road%20safety%20technical%20package%20is%20an%20evidence,laws%20and%20post%2Dcrash%20Survival>

World Health Organization (WHO). (2023). *Road traffic injuries*. <https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries>

World Road Association (PIARC). (2019). *Road safety manual*. <https://roadsafety.piarc.org/en>