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Concept Paper

# Towards an Integrated Road Safety Management: The Institutional-Strategy-Environment (ISE) Model

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**Abstract:** The safe system approach is considered the best practice. Different international organizations highly recommend the implementation of such an approach to significantly improve their road safety performance. The safe system has become a normative approach, a way of thinking. It rests upon different pillars, which represent the framework to be implemented. Among the different dimensions, the management pillar is crucial, which calls for a detailed investigation. First, the aim of this contribution is to understand the implications and requirements of implementing a safe system management model (SSMM). This contribution presents this model and challenges its aims and its limits, especially the promoted management framework. Six main limits of the SSMM are discussed. The different limits of the SSMM emphasize the importance of thinking about singularities and contingencies of the institutional order as well as considering and understanding the context in which a policy is implemented. Second, this contribution proposes an alternative conceptual approach applied to the managerial dimension of the road safety system. It develops the institutional-strategy-environment (ISE) model for elaborating road safety public strategy. This conceptual elaboration is based both on a proven theoretical corpus and on numerous field observations, and expert activities carried out in various countries. The ISE dimensions are essential because they are seldom discussed, even though they are the underpinning of more and more public road safety policies. In this respect, this contribution proposes an alternative approach by considering these three interdependent dimensions. The institutional dimension rests upon a layered approach, while strategy is considered with an adapted SWOT matrix. The environmental dimension is assessed with a Pestel model. The application of such an approach to the road safety field and to test its explanatory power is particularly challenging but opens new avenues for implementing road safety public policy.

**Keywords:** safe system; road safety management; institution-strategy-environment; territory; model implementation



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## 1. Introduction

The systemic approach is consistent across all types of organizations, and can be understood as various components inserted into a systemic relationship, in which the interactions produce more than the simple addition of said components. Buckley claims that it has to be recognized that there are degrees of “systemness” [1]. Buckley then writes: “When we say that “the whole is more than the sum of its parts”, the meaning becomes unambiguous . . . : the “more than” points to the fact of organization, which imparts to the aggregate characteristics that are not only different from, but often not found in the components alone; and “the sum of the parts” must be taken to mean, not their numerical addition, but their unorganized aggregation”.

For some years now, the safe system approach has been established as a normative approach in the field of road safety. It is considered a “paradigm shift” to be adopted in order to improve road safety performance [2,3]. This approach consists of a generic model applicable to everywhere, which would allow, through the implementation of appropriate policies and action programs, a significant reduction in the number of fatalities in the near future [4]. Sweden and the Netherlands progressively adopted such an approach [5,6].

These countries have a good track record in road safety, which has led to the facilitation of the promotion of such an approach to other countries.

The safe system model aims at establishing a shared responsibility among the stakeholders, limiting large forces when a crash occurs because of the bodily limits of road users and supporting drivers who make frequent errors [2,7]. This model involves energy, informative and cognitive dimensions, which calls for a thorough investigation of its implications [8]. Moreover, the safe system model rests upon five pillars, including the management system, the safety of road infrastructure, vehicle safety, safe road behavior and the implementation of an emergency, medical and care response for victims. Each pillar is linked to specific activities, which raises the issue of interaction between them and how it could be addressed from a systemic perspective. The five main activities associated with the road safety management pillar are: create a road safety leading agency, define a strategy, set long-term targets, ensure the funding of road safety actions and implement an effective information system to enable the monitoring and evaluation of the implemented policy [9–12]. Then, performance indicators are defined and tailored for these objectives [13]. This model can be labeled as the Safe System Management Model (SSMM).

At the heart of this safe system approach rests upon a rather basic public management model and a simple view of what is involved with organizational dimensions while being a crucial issue from a perspective that suggests exporting such models abroad [14].

This paper is based mainly on a review of the current safe system literature with more than ten years of in-field expertise and a witness as being involved through different international expertise activities and research projects. The methodology can be considered as being mainly a case studies approach [15]. It is also supported by numerous academic studies that underline the importance to be given to the implementation process and to the territory and its components (institutions, rules, jurisdictions, actors, etc.).

This contribution proposes a further elaboration of the system approach applied to road safety. The Institutional–Strategy–Environment (ISE) model provides a new perspective for understanding the systemic dimension of road safety. Such a model shares common contextual dimensions with the SSMM, but it differs in its foundations and the method by which it approaches them.

The objective is not to criticize the mobilization of a tool for road safety management as such but to identify some limits of the SSMM approach, when the reality of the territories and jurisdictions it plans to manage are not fully considered. Indeed, a safe system management policy has never been evaluated at the global level to justify its superiority, that does not mean such an approach could not be associated with high performance. Indeed, showing the overall performance superiority of a safe system model is not without methodological difficulties [16]. Moreover, it also raises the issue of how to conceive of the superiority of this approach over others and its criteria: road safety performance, cost-effectiveness (performance can be superior but extremely costly), population welfare, and fairness among the road users in terms of access to different services [17].

While issues related to the implementation and enforcement of public policies are crucial, they are generally not fully considered in such an approach. Moreover, it does not consider the organizational and institutional dimensions, the interplay of actors and the dynamics that operate within the systems.

Pointing out the limitations of the safe system management model also highlights the importance of considering and addressing these shortcomings. Scientific studies and investigations have shown the importance that should be given to the political context [18,19], the political order [20], the governance of the road safety system [21,22], strategy [23], organization [24–26], the actors and their role in the implementation of a road safety policy [23,27], the legal dimensions [28], the local institutional dimensions [29,30], the tools of intervention [8,16] and the territories in which the policies are conducted [29]. The territory must be understood as a delimited and organized social space [31].

This contribution proposes to further elaborate on this crucial issue. While most of these studies deal with one particular dimension, there is still a need for bringing

together all the dimensions and being able to consider the systemic dimension of the road safety system.

In the first part, the contribution presents the management tools, objectives and limits associated with the safe system approach. The second part demonstrates the need to take into consideration the territory and proposes to define an appropriate method for implementing public road safety policy and to propose a systemic approach to the road safety system. Some limits are considered.

## 2. The Safe System Management Model: An Outdated Model?

### 2.1. Philosophy and Tools of the SSMM

The SSMM is an approach that considers road safety as a product (a production), of which the factors of production and the outcomes can be measured. Therefore, the model considers road safety resources or inputs (i.e., police surveillance hours, number of ambulances), which make possible to achieve intermediate objectives or interim targets (i.e., helmet use rate for motorcyclists) and final objectives (injury) and achievements (social cost of accidents) or long-term goals. This model follows a result-focus-oriented approach. Indeed, road safety policy is justified by the high costs borne by the society related to the losses in terms of human life, health expenditures and productive disabilities [13].

The result focus approach implies, on the one hand, that organizations must and are able to both specify their targets (ensure the control of speeding behavior, for instance) and measure such targets (number of hours of monitoring on the motorway network, for example). Therefore, the main issue is concerned with the setting of targets and ensuring that the available resources and the implementation of the public policy make it possible for their achievement [12]. It is then a matter of organizing, arranging and planning the various key interventions, which is mainly the outcome of the administrative technique.

Another important task consists of measuring performance and carrying out benchmarking activities. The SSMM approach consists of the application of a new public management-inspired way of thinking with a hierarchical and top-down vision of road safety production. It implies a “ballistic” productive logic, where relationships are supposed to be clearly established between inputs and results, while organizational oppositions are neglected. Such a managerial approach has been challenged by new academic knowledge for many years [14].

The SSMM considers the road safety management component is a crucial element in the process of production of road safety. Indeed, road safety performance can be constrained by production techniques and implementation conditions, such as bureaucratic rigidities or administrative capacity limits [9], and can be improved by removing such barriers to performance [10].

In such an approach, the administrative response must be based on a clearly defined multiannual strategy and set of actions and coherent and comprehensive action plans for actors and organizations through ownership and accountability mechanisms.

This managerial approach logically leads to paying particular attention to the modalities of vertical cooperation in order to adapt the national intervention to local scales (communication and coordination between the different levels of government and different types of government) and to work on intersectoral integration in order to produce concerted and effective action.

Then, vertical coordination and intersectoral integration require the setting up of a road safety leading agency. The promoted organizational form is based on a centralized response, which should make it possible to support different institutional functions and should be able to promote cooperation and steer the road safety field [11]. The generic form of the leading organization is expected to perform seven main institutional functions: coordination, performance follow-up, regulation activity (monitoring and proposal of legislation change), funding and allocation of resources, road safety promotion (education, communication), performance monitoring and evaluation, research activity and operational

transferability. Such agency is at the center of this SSMM and should be implemented to expect a good performance.

Implementing such a strategy and setting up a leading agency supposes carrying out a diagnosis that supports the need for change first. This requires the implementation of a procedure for assessing the current policies and institutional arrangements. It is a matter of passing these through the sieve of a normative and standardized procedure, namely capacity reviews [10], which, approaching the issue from this standpoint, calls for appropriate change. In short, the procedures for assessing administrative capacity and judging organizational and institutional quality use checklists that consist of validating the normative model. It is, therefore, not a question of assessing the quality of a specific organizational choice, which lets the possibility to consider appropriate alternative institutional arrangement [32], but of comparing it with the generic model, which is regarded as being the benchmark.

## 2.2. Some Flaws of the SSMM

### 2.2.1. An Outdated “One Size Fits All” Approach

First, the management challenges raise another issue concerning the compatibility of the management with the institutional arrangements. Indeed, whatever the country, the state apparatus and the institutional organization frame a particular regulation regime for mitigating road risk [33]. The performance management approach (or result focus) is a way of proceeding, but it is not exclusive from other approaches based on different values (fairness, justice, reputation). Moreover, institutional arrangements can be diverse. They cannot be limited to the sole modality of a public bureaucratic production. Other modalities, such as private production (i.e., road safety policy provided by company) or hybrid forms (public service delegation with roadworthiness test carried out by a company on behalf of the State, outsourcing and contracting out if speed control activity) must be fairly considered [34]. In fact, the SSMM assumes a rational legal approach, which favors bureaucratic management of road safety affairs. A rational legal approach refers to a form of domination through codification and a type of leadership in which the authority of an organization is based on legal rationality, legal legitimacy and bureaucracy [35].

It assumes, implicitly, that there is a normative way to proceed from which any deviation has to be corrected and that there are some best practices which must be adopted to improve the road safety performance. This model is considered as “the default position”, which can be “compromised” only “by exception” [7].

Second, although road safety management can be considered as a more recent pillar of the safe system that is complementary to the interventions carried out concerning the vehicle, infrastructure, road user and post-crash [36], it must be integrated into a broad transport and (urban and land) planning policy [16]. This consideration leads to the creation of different institutional combinations and potential exchanges between different professions (planners, designers, urban planners, engineers, etc.), which belong to different levels of intervention [37,38]. In this respect, there are probably different possible institutional arrangements with an SSMM, so that institutional diversity must be considered before implementation [39]. In this case, it becomes quite hard to determine a best practice recommended for other jurisdictions [40]. It is likely that further academic research needs to be conducted concerning the transferability of effective measures. The diversity of the model found concerning the leading agency in Benin, Ghana and Ethiopia [11] appears not as a deviation from a best practice but adaptation to local and institutional characteristics.

### 2.2.2. A Generic Model for Different Approaches

Third, the concept of SSMM itself appears quite confusing. Indeed, it seems that there is not a single model. It is more appropriate to assert that it exists as a broad family of SS models that agree on basic principles [41]. From a standpoint, it can be considered that the conceptualization process is not stabilized and evolves with new knowledge. The sustainable, safe traffic model developed in the Netherlands, where the focus is on the

design of road infrastructure to forgive the road user's error (functionality, homogeneity, predictability, forgiveness, etc.) and to provide protection of the fragile body, is one of them [42,43]. The Anglo-Saxon promotes more strongly the managerial dimension, including performance indicator, organization dimension and cost-benefit approach [44], while the Vision Zero approach, defending an ethical approach, first implemented in Sweden, gives priority to the elimination of all severe injuries and fatalities by giving the full responsibility to the system designer [45]. Such models are not congruent, for instance, concerning the economic role given inside the regulation while the Anglo-Saxon approach considers the performance, Vision Zero excludes such a trade-off by giving priority to ethical consideration [46]. Again, further investigation could be usefully undertaken to compare the different approaches.

### 2.2.3. The Absence of Dynamics

Fourth, another important issue concerns the dynamics of the model, its diffusion and implementation. The diffusion of such a model is conceived as a part of a linear temporality, consisting of successive phases (establishment, growth and consolidation) [10,45], reflecting both an optimistic and naïve position, as if breaks or backward process for the implementation of a public road safety policy and some loops inside organizations were not possible [14]. Such an approach neglects both the possibility of committed errors or misspecifications and how the system can correct them through the implementation process [47]. In a way, the safe system conception of temporality is a comparatively static approach in which collective learning and feedback processes are not fully considered. Conceiving errors possible involves the necessity of thinking about dynamic adjustment and historical developments, which are crucial issues for understanding implementation [48]. It also suggests considering the involvement of stakeholders and the need to ensure their cooperation for the successful implementation of the SSMM strategy [45]. The organizational dynamics probably impact the road safety performance of the system. Such impacts remain to be investigated.

### 2.2.4. A Model with No Institutional Territorial and Organizational Design

Fifth, the SSMM appears to lack institutional foundations. Indeed, governance is not considered. Relations between actors are not fully integrated or conceptualized, such as the country's institutional arrangements, while it is showed the importance of taking them into consideration because they frame institutional orders, which constrain the operation of the system at large [34,49]. However, the SSMM does not address such a dimension because it is presented as a tool that can be applied and replicated anywhere [50] without considering the institutional framework, which could require local adaptations and adjustments. Here the model faces a kind of paradox by legitimizing the importance of institutional functions while not taking into consideration the institutional order. The difficulty in holding a good overview of the jurisdiction characteristics and its operating remains to be fully explained.

Sixth, the approach does not consider the territorial dimensions. Indeed, the constraints related to the territory (specificities, size, population density, etc.) are not taken fully into consideration when assessing the impact of the different road safety measures. Again, it is a consequence of the generic approach. Consequently, the costs of transactions and the constraints for building cooperation among actors are completely neglected, while it is well-know that more individuals or organizations are involved, costlier and more difficult it is to coordinate them and to promote cooperation, especially for large countries involving numerous stakeholders and administrative layers [51]. Indeed, the same costs of coordination are not to be expected for a country such as the USA or South Africa compared to Luxembourg or Estonia.

Seventh, the model also lacks a sociological side to the extent that the actors are subsequently absent in such a model [37,52]. Relationships, trade-offs and negotiations with stakeholders, their preferences, cultural dimensions are not considered by the SSMM, while they had influence on the design of the public policy. The way of thinking, the

commitment of politicians for a higher level of safety and cultural values could be barriers or levers for implementing a public policy, so that it is urgent to associate such a dimension to the analysis and the implementation process [48,53]. Organizational relationships are also absent, while they are important to consider for having a full picture of interests, rivalries, incentives at play and for being able to understand the logic of choice and public policy [16,38,54]. In fact, it would suggest that the whole people are simple automatons reacting to some stimulus. When such behavior is erroneous and harmful, organizations have to intervene to reduce the consequences by proposing mechanical intervention, following some previously validated guidelines, guides or measures. At the foundations of the SS approach, the road user is assumed to commit errors that have to be forgiven by framing an adapted system [2].

While the SSMM defends a holistic approach to risk management, it limits its management side to a simple operational system with a low opening to the environment and minimal interaction between components and actors so that it could remain tractable for the public decision-maker and interventions [45]. Indeed, a true systemic approach to risk management becomes very challenging and raises the issue of the capacity of fully understanding its operative logic and its dynamics.

#### 2.2.5. The Absence of Thought about Effectivity and Implementation

Eighth, the existence of managerial structures does not prove anything about the effectiveness of road safety measures or interventions or the adequacy of the level of used resources. Thus, a road safety steering structure can exist and be ineffective if resources are not devoted to it. Indeed, sustainable and adequate funding appears to be a crucial dimension to ensure the implementation of a policy [40,55]. Similarly, regulations may be passed but not implemented [29]. However, the ineffectiveness of a regulation or the lack of resources could not refer to a poor management situation but to a regulatory deficit or a lack of resources [56]. In short, the formal (or legal) existence of managerial structure has to be distinguished from operational existence or in-field operation.

#### 2.2.6. No Proof of a Performance Superiority

The last criticism results from the very foundations of the model, which rest upon an inductive and empirical approach. While the model is presented as a generic and normative form, it results from the study of empirical cases considered as best practices due to showing good road safety performance [44]. However, the criteria upon which they could be considered as being best practices remains unspecified so that no formal proof is provided for showing the reasons for such good performance. From the scientific point of view, it requires, at least, taking into consideration the confounding factors and to bring a causal explanation between the characteristics and performance. A scientific approach remains possible with the mobilization of adequate modelling, such as time series analysis and other econometric models testing [37,52].

Moreover, it has not been formally demonstrated that it is impossible to achieve good performance when such a model is not implemented [40]. It appears that many factors, such as the income level, cultural and ecological dimensions, play a significant role in influencing the road safety performance of countries so that it cannot logically be attributed only to the management factor [34]. Moreover, nothing is said about the overall and relative impact of the SSMM on road accidents compared with those of other factors, such as economic development, culture, the development of mobility and motorization, that play a role [57]. It does mean that an appropriate road safety management model, and the SSMM in particular, has no influence, but its contribution to the overall performance has to be compared with other macro factors and confirmed by empirical investigations.

### 3. Why Does Territory Matter and How Should We Assess It?

#### 3.1. Understanding the Importance of Contingency and Singularities

##### 3.1.1. Management and Administrative Apparatus to Consider

A public road safety policy requires the definition of objectives, mobilized means and the institutional, organizational and operational modalities to achieve them [19,58,59]. It, therefore, implies that the objectives and resources are territorialized. The territory is a crucial dimension to consider because it is both the delimited space considered for intervention, but also the expression of political sovereignty authorizing this public intervention [28,35]. The territory is, therefore, the support on which the management model will be operated to organize the intervention. Whether it is a city, a region, a province, a country or a group of countries (case of road corridors), this territory can take different forms and must be characterized, as it will influence and shape both the implementation of the management model and the interventions that must be carried out. In this way, it constitutes the foundation on which the management model is established.

Management systems are part of state arrangements and a broader administrative apparatus [27,58]. These public policies address transport, safety and public health and many others. In this respect, these systems are dependent on both the political and institutional structures in which they are embedded. They depend on social orders that are also political and institutional orders [49]. The implementation of such policies has to be conceived as a change inside the social order [60]. It is, therefore, necessary to take into consideration the contingencies and singularities of each country, which involves a good understanding of the implementation context [61]. The point here is not to state that there are no identifiable good management practices but to consider the appropriate conditions for implementation [62]. In this, there is a possibility of thinking about the implementation, something between a generic model which does not consider particularities and extreme positivism preventing any generalization. An intermediate or middle-of-way position can be defended.

In this respect, three levels must be taken into consideration [34]. The first concerns the environmental level and refers to issues relating to the existence of networks, competition or rivalry procedures, and power games of actors [63]. Thus, implementing a management system may benefit from the support of certain ministries that wish to pursue a reform policy or, on the contrary, generate opposition from organizations that would lose prerogatives through its implementation. The second level concerns the organizational dimension, dealing with the resources that can be mobilized and are available [58]. The implementation of a management system requires funding to collect data, technologies, trained staff and capabilities, such as auditors and infrastructure inspectors or statisticians, for instance. Cost is also crucial to understanding its implementation. The third level is the one relating to the individual, which makes it possible to understand attitudes towards this change, to grasp possible resistance to the evolution and the required skills from the individuals. However, all these levels of analysis remain focused on the purpose of change [64].

##### 3.1.2. Economic Dimensions at Play

Beyond these contextual dimensions, other considerations come into play, such as the economic development of jurisdictions and the business cycle. Favorable economic conditions increase risk exposure and worsen the road safety situation, while a slowdown or economic recession artificially improves the road safety record [65]. Moreover, the level of development of a country affects the level of accidents observed, so that a Kuznets curve for road safety is at play [57]. The Kuznets curve applied to road safety states that there is a relationship between the level of economic development and road accidents and takes the form of an inverted "U". It also raises some issues concerning the measurement of economic development (e.g., GDP per capita) and accident rates (the number of road fatalities in general). In the long run, such a relationship suggests that the richer a country is, the safer it is [66–68]. Indeed, a higher economic development situation makes it possible for the government to invest in road infrastructure, post-crash services and governmental



interventions and to overcome the increased risk related to the development of mobility. On another side, the improved economic situation of people provides the means for accessing better motorized vehicles (better quality, higher standard, better maintained) and higher value motorized vehicles (from mopeds and motorized two-wheelers to cars at large). The economic dimension is probably an important factor for explaining the difference in road safety performance between the LMICs and the HMICs [69].

### 3.1.3. The Importance of Institutional Framework

The institutional agency reflects the influence of history, and it is one by-product. A road safety policy is also the result of past choices [60,63]. For example, the implementation of an automated speed control program is not only about implementing a new deterrence production technique; it also involves reorganizing responsibilities, changing the law, changing the way things are done and possibly the conception of road safety [34]. Traditions also influence the way the institutional arrangement operates. Then, there is a path dependency, which constitutes some constraints to policy change and evolution [58]. Resistance to change could be explained by conservative policy coalitions, which consider such a change as a danger or a threat to their own interests and routines and organizations. In short, administrative policy innovation implies some evolutions not only for the actors involved in the field but also out of the field [63,70]. Innovation could generate opposition from the people and organization concerned directly by the policy goals [71], but spillover effects, affecting other sectors, also have to be considered. Finally, the initial institutional arrangement is a crucial constraint for understanding the implementation of new road safety policy guidelines. For example, there is a true difficulty for police organizations to enforce the Highway Code in Tunisia, because ten years after the revolution, they have always been associated with the former dictatorial government [72]. An additional example is related to countries with no-fault law legislation, which states some organizations hold a monopoly on personal injury compensation. Such organizations have real incentives to invest in road safety policies for reducing the payment of damages, such as in Victoria (Australia). The institutional order is important and must be taken into consideration for implementing a new management system, not only as an administrative tradition but also as an institutional framework designing the intervention [32,60]. The institutional order can both help and hinder action in the road safety field, depending on the context or the measure. Indeed, the road safety field interacts with other public policies, such as public security (e.g., the automatic license plate recognition for terrorism surveillance), public health (e.g., access and caring of road injuries), mobility (e.g., the introduction of demerit point system for the driving license), urbanism and land management. The institutional order also crystallizes social, demographical and political dimensions (see, for instance, the opposition of a part of the population to the recent implementation of the 80 Km/h speed limit in France).

### 3.2. *Towards a New Conceptualization for Grasping Reality: The ISE Model*

Developing and describing an appropriate alternative model requires it to be capable of being sensitive to the complex context in which a road safety program is implemented. To take into consideration the institutional context and the governance system, it is necessary to analyze and focus on the institutional architecture of the road safety system, to characterize its strategic dimensions and to fully understand some functions associated with the policy [73]. The ISE model (institution-strategy-environment) is a three-level model that corresponds to previously identified challenges: the institutional, strategic and environmental levels. It has its origins in applied research dealing with the road safety performance in Africa [56]. Its practical application in the field shows that it is an operational model. The strengths of the model lie in its operability and its sound foundations aligned with the public policy and strategic analysis knowledge [58,63,74]. In addition, the model considers the context of implementation by questioning the notion of territory, and by providing a means for understanding it. Its advantage regarding the

SSMM lie in its ability to consider, to analyze and to provide an assessment of the context of implementation. Decomposing the institutional dimension is not a new approach [74]. Numerous authors have mobilized a three-level model approach: the lowest level is the closest to field action, while the highest-level concerns strategic choices. However, there are no such applications in the field of road safety. The premises of this approach can be found in a study on automated speed enforcement programs [34]. Other initial elements can also be found in research dealing with the evaluation of road safety policies in Africa [56]. The institutional component of the ISE model incorporates this articulation between three dimensions: institution, strategy and environment. These dimensions are supported by various academic studies that have proven their importance in understanding the implementation process and the steering of a public policy (see Section 1). The following sections detail each dimension.

### 3.2.1. The Institutional Level

Then the institutional level (I) refers to the arrangements for the implementation of public policy. It consists of a three-scale dimension: constitutional, organizational and operational. This approach in terms of level is quite common within the public policy literature [74], where concepts such as nested games and multi-level governance can be mobilized to assess a particular context. Such an approach is inspired by an economic approach deals mainly in terms of coordination and tradeoff. Some links with other alternative approaches are possible when they model risk at the societal [37] or the organizational level [75], for which risk management or control is the main issue.

The constitutional scale concerns the design of strategic orientations, the arrangement of organizations between them, etc. The organizational scale deals with the functioning of organizations working in the field of road safety and their mutual relations, and the operational scale include the modalities of intervention in the field mobilizing process, skills and means of action. Therefore, the constitutional level is about producing the rule and the policy framework to carry out the intervention. More specifically, it takes into consideration the country's constitutional, political and administrative frameworks. Thus, it deals with some issues related to the existence of a federal or confederal organization of a country, the specificities of its administrative organization (centralization, decentralization and regionalization) and policies (ministerial organization, parliamentary or autocratic regime, etc.) [34].

The organizational level consists of questioning the distribution of resources and obligations concerning the implementation of the policy. It deals with the organizational modalities of the implementation of an intervention. For instance, does it come under a specific ministry or an inter-ministerial action? The planning activity and organizational modalities require resources, accountability mechanisms, the signature of MOUs, etc.

The operational level is not the least important one. Indeed, it is very much a condition for the successful implementation of the intervention and the achievement of objectives. In addition to the agent's opposition to the implementation of the policy for ideological or practical reasons, the intervention can be diverted from its initial objective due to a misunderstanding of the defined objectives, a lack of skills or means, but also by a work of reinterpretation (street-level bureaucracy) or even diversion of the policy in question or because of problems of relevancy with local constraints [76,77].

It has to be emphasized that these three levels are not independent of each other. They are tied, and respective influence has to be considered. Each level can be conceived of as a constraint for the agent's action by defining certain rules of the game to be respected, but they also represent solutions for challenges and problems [51,78]. This approach departs from the Rasmussen model, for instance, in which the different embedded levels define a control structure to manage risk [37].

### 3.2.2. Intervening with a Strategy

The strategic level (S) makes it possible to qualify the functioning of the institutional level by making a judgment on the value on some dimensions of context. Public intervention takes place in a more or less favorable context or environment that should be assessed and appraised. This context is composed of dynamic and short-term elements. Such conditions could be appraised by distinguishing positive or negative impacts upon the policy, by differentiating the short-term (transitional) dimension from the long-term (structural) one.

When these elements are negative, they constitute barriers and obstacles to policy implementation. The assets are their positive counterparts. Thus, a police strike is an obstacle to the implementation of a policy, while long-term support from an association of victims of road accidents for a measure will be considered as an asset [79]. The Yellow Jacket movement in France during the period of the end of 2018 has been considered as a social movement protesting against the declining living conditions. The protesters decided to destroy, or make inoperative, the radar devices [80]. Indeed, this situation drove to the destruction or the out-of-order of roughly three or four speed radar devices. Some statistics show that one consequence is the increase in the number of speed offenses, and it probably had an impact on the number of road injuries. Such an event illustrates that road safety policies can be very sensitive from a political standpoint, which constitutes a barrier to having an efficient policy.

Both structuring and longer-term phenomena must also be considered. They may be favorable or unfavorable towards the implementation of the policy conducted. These structuring elements can be described as strengths, contributing positively to the achievement of the policy, such as a high-quality motorway network, competent and skilled police force able to enforce the requirements of the Highway Code. On the other hand, elements detrimental to this objective can be described as weaknesses, such as drivers with little or very poor driving training, an obsolete vehicle fleet, the absence or lack of staff to carry out road audits and inspections [81]. By combining the different dimensions, it is possible to build a matrix, which could be filled in for the different components of the public policy (Table 1). The matrix approach is quite common and developed in organizational strategy [73]. Table 1 can be considered as an adaptation of the SWOT approach, which is itself the result of numerous works in organization strategy [82].

Consequently, such an approach makes the identification of constraints for action and the opportunity for intervening possible. Barriers and weaknesses are costs for action, while assets and strengths contribute as real resources. All have to be considered for designing the public policy.

**Table 1.** Matrix of values.

	Conjectural Component	Structural Component
Positive contribution	Asset (economic growth, political commitment, media support, short-term enforcement policy)	Strength (good public health infrastructure, high quality road network, efficient road agencies)
Negative contribution	Barrier (social contest, public finance crisis, legal contest)	Weakness (poor road network, poor administrative capabilities, corruption, old car fleet, etc.)

### 3.2.3. Intervention Takes Place in Environment

The environmental level (E) must be understood as the consideration of macro-environmental factors in shaping road safety policy and its performance, which the Pestel approach could help in assessing. Environment could be assumed here as an expression of the territory on which the SSMM has to perform.

Pestel is an acronym for political, economic, social, technology, ecological and legal [82]. The approach that follows from this model makes it possible to identify and assess the

external factors, whether they are opportunities or threats, which can have an impact on an organization. Originally, this approach was used to perform strategic analyses of a firm. I propose here an application of this approach to the road safety system. This approach allows both the diversity of opportunities and threats to be highlighted, to specify them but also to be able to apprehend different combinations of contradictory factors that can have an impact on the road safety system. The Pestel approach is not an additional model. On the contrary, it constitutes a complementary tool by allowing one to specify the characteristics of the strategic environment, which have been previously identified as assets, barriers, strengths and weaknesses. This specification of the environment makes it possible to grasp the specificities of certain domains, for instance, the weaknesses identified in the technical, legal or political domain will not call for the same solutions and cannot be addressed in the same way. The aim is to integrate the functional factors: the political, economic, social, technological, ecological (here, for road safety, understood as climatic and geographical data) and legal components, and to reinterpret them both by their integration into one of the institutional scales and their strategic qualification. They are functional factors because they can be a source of risk generation or mitigation (countermeasures). Then it is proposed to mobilize the Pestel model for understanding the different dimensions of the environment, which could impact the performance of a specific jurisdiction or an intervention [56]. In sum, the different dimensions are simultaneously considered and are more or less intertwined through public policy. Moreover, the elaborating of different components can be interpreted as the different sectorial dimensions of a road safety policy. They can be considered as forces at work inside the road safety system, which can be productive or counterproductive. For illustrating, some examples can be provided for the political force (the commitment of the decision-maker, definition of a strategy and philosophy for road safety intervention (e.g., vision zero)), the economic force (economic situation, economic development, funding dedicated to road safety policy, quality of the vehicle fleet and the dynamics of the car market and socioeconomic dimensions), the social force (urbanization, acceptability of road safety policies by the population, living conditions, the rule perception and cultural dimensions), the technological force (use of control technology, driving aids and assistance, victim support services, network traffic and safety management aids, etc.) and the ecological force (geographical characteristics, climate, spatial planning, etc.). The legal force includes all the dimensions related to the production of laws, regulations, and standards, but also the conditions for the car pursuit of offenders and privacy protection.

Overall, the six components or forces provide a good overview of the different functions of a road safety measure and assess the logic at play with some convergences or divergences among them, which could help in determining the existence of synergies or tensions between them.

The institutional dimension (I) has highlighted the intertwining of different institutional spaces governed by their own fields of action, but which are interdependent. They frame a governance system, for which the strategic analysis (S) makes it possible to identify both the conjuncture and structural effects, but also to qualify them according to their contribution to the successful implementation of public policy. The environmental dimension (E) makes it possible to complete this analytical approach by specifying the functional and policy contributing dimensions or forces. By adding the functional specificities approach, the model can take into consideration a broad diversity of contingencies. Thus, the approach must help in determining the possible levers but also to identify knots.

The convergence of elements favorable to the implementation of public road safety policy and its success is defined by levers. It suggests the existence of potential convergences of assets and strengths in some domains, which facilitates the adoption of road safety intervention. In contrast, knots represent accumulations of unfavorable elements. This implies the existence of potential convergences of barriers and weaknesses in some domains, which leads to difficulties in the adoption of some road safety interventions.

The proposed framework makes it possible to go further in the qualification of these knots and levers. They can be identified at different levels of institutional governance and/or according to the functionalities identified. In this respect, the model makes it possible to assist action both by selecting reliable relays that support intervention and also by identifying difficulties in order to be able to take corrective measures if necessary. Such a model is then a more realistic approach to the management issue compared to the SSMM. Moreover, the levers and knots can be assimilated to public policy connectors in that they identify relationships between actors and organizations, but also intervention tools. These connectors can also be qualified by assigning them both an intensity and a tension. Tension refers to the number of actors involved: this is all the more important when the number of actors to be coordinated is high. Intensity refers to the number of converging elements: it is all the more important when the number of converging elements is large. One way to measure intensity may be to assign a score for a response to a given item on a questionnaire. The score is measured by a standardized scale. The aggregation of the scores for the different items of the questionnaire then determines an overall score, whose importance in relation to a total indicates the intensity for a domain. All this information can be synthesized by intervention matrices (Table 2). In this fictitious example, it is noted that the country has good constitutional support on which regulation and implementation can be rested upon. In addition, the legal and technological components also support public road safety policy, linked to appropriate legislation and supporting control techniques. However, knots exist mainly at the economic level due to limited budgetary resources and environmental limitations, such as an important road network length to be monitored. Such an approach could then be applied to different countries. A similar method was completed for some African countries [56], utilizing a scoring approach. A scoring approach is also a proven and widely used technique for the management of public organizations and public policies [83]. The determination of the score results from the aggregation of answers from questionnaires with the participation of professionals from the fields concerned. It is therefore based on the expression of repeated subjectivities due to the multiplication of answers. This qualitative approach is based on a methodological approach similar to that used for interviews.

**Table 2.** Intervention Matrix.

Level/Components	Political	Economic	Social	Technological	Environmental	Legal
<b>Constitutional</b>	+++		+			++
<b>Organizational</b>	+	--		+		
<b>Operational</b>		-	+	++	--	+

+: positive contribution; (-) negative contribution; no sign: neutral impact. Intensity of contribution: mild (+) or (-), important (++) or (--), very important (+++) or (---).

Such an approach shows how complex the institutional order is in which a road safety public policy is inserted and to intervene through a management system. Reaching a high level of performance requires a high level of integration between the different components interacting towards preventive actions. At best, the managerial model appears as a contributor among others and cannot be presented as the single key for obtaining good performance. Another consequence concerns the compatibility of the SSMM with the institutional framework at large. It can be reasonably assumed that an SSMM requires a favorable and compatible institutional framework. Then, the adoption of an SSMM reflects probably more an evolution of the institutional framework for providing a public answer to a public problem (road safety record). Consequently, the SSMM would permit good performance to be obtained, but a high-performing institutional organization first makes its adoption possible, contributing to an improvement of the whole road safety record.

#### 4. Conclusions

This contribution proposed a critical analysis of the actual approach for implementing a SSMM approach applied to the road safety field. It showed that such an approach faces many defects and limits. The main limitations are that the model does not consider the system dynamics, organizational logics, institutional constraints and the different contextual dimensions specified by the ISE model. For instance, organizational barriers to improve data collection are not considered [76], as is the lack of means to sustain road safety actions as it was found in Togo. This presupposes, first of all, the existence of an appetite for steering public road safety policy and elements of managerial culture so that the SSMM can be implemented.

Moreover, the actual SSMM is not well fit for understanding the complexities and singularities of every road safety situation and policy occurring on the territory. It appears as a model related to new public management practices. From the managerial standpoint, it is an outdated approach. This constitutes a crucial obstacle to a good understanding of the implementation conditions associated with the territory and to ensure conditions of success.

The ISE model stands as a possible alternative. The contribution elaborates the contours of such a model. It appears as being more robust for taking into consideration the different levels of public intervention [34] or to consider different communities living in the same territory [18]. This approach is then more open to adapted local strategies and more respectful of the diversity of the institutional framework, which could not be summed up in a generic model. The ISE model consists of combining three levels of analysis to provide a relatively detailed assessment of the challenges of governance systems and to be able to define a road safety policy adapted to the different countries, considering the contingencies and specificities of the context. The different levels have to be assessed and specified to be able to grasp the complexities of the system and to provide an adapted answer. The evaluation of the different dimensions is not an easy process because it presupposes the identification of the related elements and the ability to apprehend them, notably, through questionnaires and scoring practices. Furthermore, the comparison of different dimensions raises the issue of being able to compare them appropriately, which implies weighting them in the public decision function. Finally, this approach requires an investment of resources and time to carry out the study. Resources are often limited, while political decisions sometimes impose tight deadlines that are not compatible with a well-thought-out analysis.

Whatever the road safety management model adopted, it has to face some constraints of desirability and practicality as other public policies [14,84]. The public decision-maker is all the more inclined to adopt such measures, as they are considered internationally recognized practices. Such an issue raises the status of knowledge (expertise and research) and its division among society. Such a model also raises the question of the ecology of knowledge production, the possible rule of experts and its consequences for citizens and democracy [85].

There remains the ultimate reality test for selecting the appropriate model, whether the recommended policy fails or succeeds, which will determine the public support of the population for improving the road safety situation.

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