



Reviewing the Safety of Junction Right-of-Way Rules with Safety Chain – with Two Case Studies

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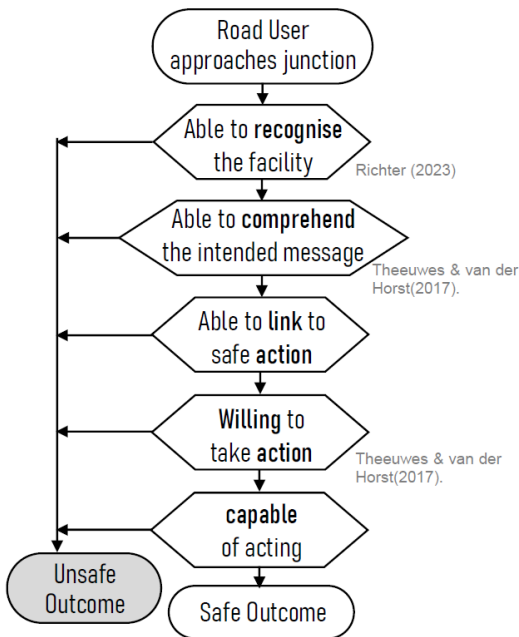
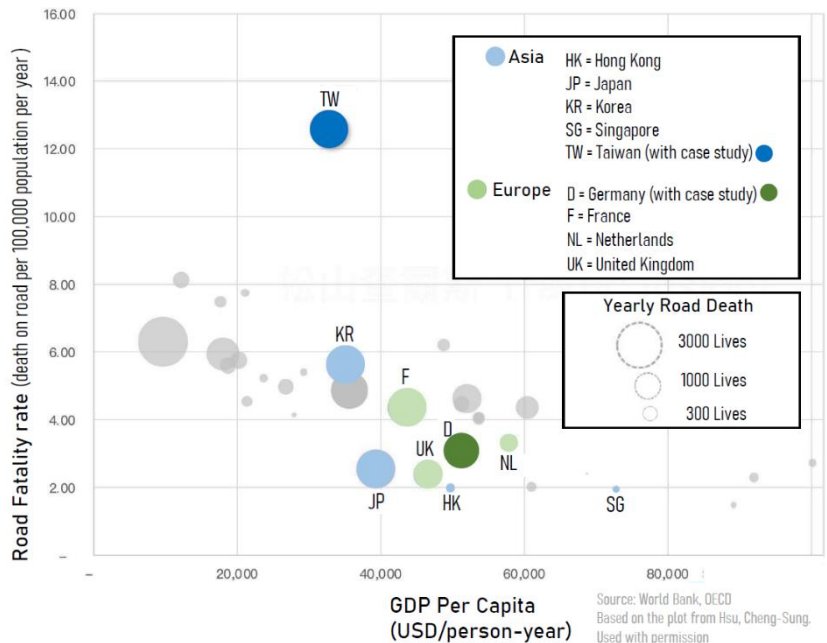
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Junction right-of-way rules vary by country (region), and some of them particularly lead to unsafety due to either requiring tasks beyond human capability or linking to unclear required action, etc. Yet, with the administrative inertia, responsible agencies are reluctant to change the rules leading to unsafety.



This study aims to review the right-of-way (ROW) rules in a systematic way. To offer a theoretical basis to initiate a change in the statutory modification of right-of-way rules, this study has the following objectives: (a) create a Safety Chain of right-of-way rule; (b) generate policy indications from the Safety Chain review.

The Safety Chain examines whether the road infrastructure design matches the road users' behaviour. The recognisability, comprehensibility (understandability), linkage to safe action, willingness of road users, and capability of the users can be plotted as links of a chain, as above. Notably, this study is examining the right-of-way system *per se*, which are listed in visualized format, but not the road users' education or compliance.

Germany & Taiwan systems, with different level of safety, are selected as Case 1 & Case 2, respectively with the research team's preliminary inspection.

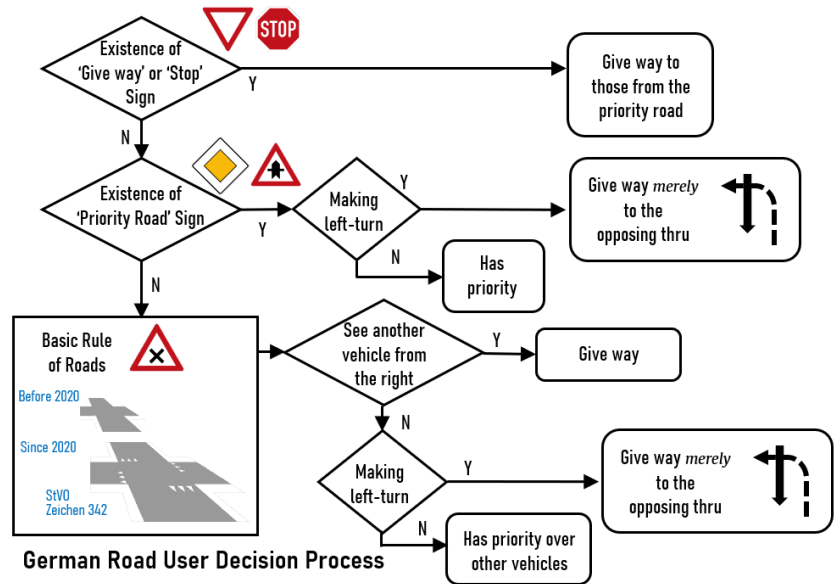


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Case 1: German System				
Feature	Signalled junction (1)	Priority system- give way approach (including roundabout entry) (2)	Priority system-Priority roads (3)	Basic rules-of-road (Priority-to-the-right) (4)
Recognisability (1)	Achieved (by three-colour aspects)	Conditional Achieved (Give way sign 205 StVO 1970 & Stop sign 206 StVO 2017); Condition on context indication, e.g., splitter island, cutting-off by horizontal kerb, etc.	Achieved (Priority sign –306, StVO 1970 & continuation of road markings in RMS-2)	RISK! Some junctions may be unrecognised by road users! (Although minimised risk with usage at access roads only)
Comprehensibility (Understandability) (2)	Achieved (red w/o ROW; green w/ ROW)	Conditional Achieved (suppose the junction is recognised by the user)	Achieved (Priority road and End of priority road)	Achieved (give way to those from the right & opposing thru)
Linkage to Safe Action (3)	Achieved (red means stop; green means proceed)	Achieved (also w/ panels to indicate the layout of priority roads: 1002-11, 1002-21, 1002-14, 1002-24 StVO 1992, at bends)	Achieved (without preparing to stop; exit lane clear with auxiliary panels 1002-10, 1002-20, 1002-12, 1002-13, 1002-22, and 1002-23 in StVO 1992, at bends)	Achieved (give way only to the presence of vehicle from the right& opposing thru)
Users' Willingness (4)	Normal (Layout in RiLSA)	Conditional Achieved (from the upper box)	N/A (No required action)	Conditional Achieved (from the upper box)
Users' Capability (5)	Normal (Layout in RiLSA)	Achieved (buffered by End of priority sign)	Capable of following priority road sign system	Achieved (within access roads)

StVO = The Road Traffic Regulations; RiLSA = Guidelines for Traffic Signals; RMS-2 = Guidelines for Markings on Roads, Volume 2.

Discussion: The safety chain method has potentially exploited a weak link (row 1, col. 4). Interestingly, the weakest link in the German system has recently been recognised and mended. Specifically, shark-tooth markings (Diagram 342) at the Priority-to-the-right junctions were added to the German Road Traffic Regulations (StVO) in 2020.



Case 2: Taiwanese System				
Feature	Signalled junction	Priority system- give way approach (including roundabout entry)	Priority system-Priority roads	Basic rules-of-road
Recognisability	Achieved (by three-colour aspects)	RISK! (Stop & Give way signage RGRTS Ins. #1&2 not mandatory; lack of offering discontinuity markings)	RISK! (Users do not know whether w/ priority or not. Priority sign has legal status but is not being used)	RISK! Some junctions may be unrecognised by road users!
Comprehensibility (Understandability)	Partly Achieved (red w/o ROW; green w/ ROW)	Conditional Achieved (context-based infrastructure missing)	RISK! (Users do not know whether w/ priority or basic rules-of-road being applied)	RISK! (road users are required to conduct three tasks: give way to straight-ahead vehicles first, then judge the approach with more lanes, and give way to vehicle-from-the-right)
Linkage to Safe Action	RISK! (green arrows not necessarily protected)	RISK! (without the panel to indicate the layout of priority roads, if at bends)	RISK! (from upper box)	RISK! (from upper box)



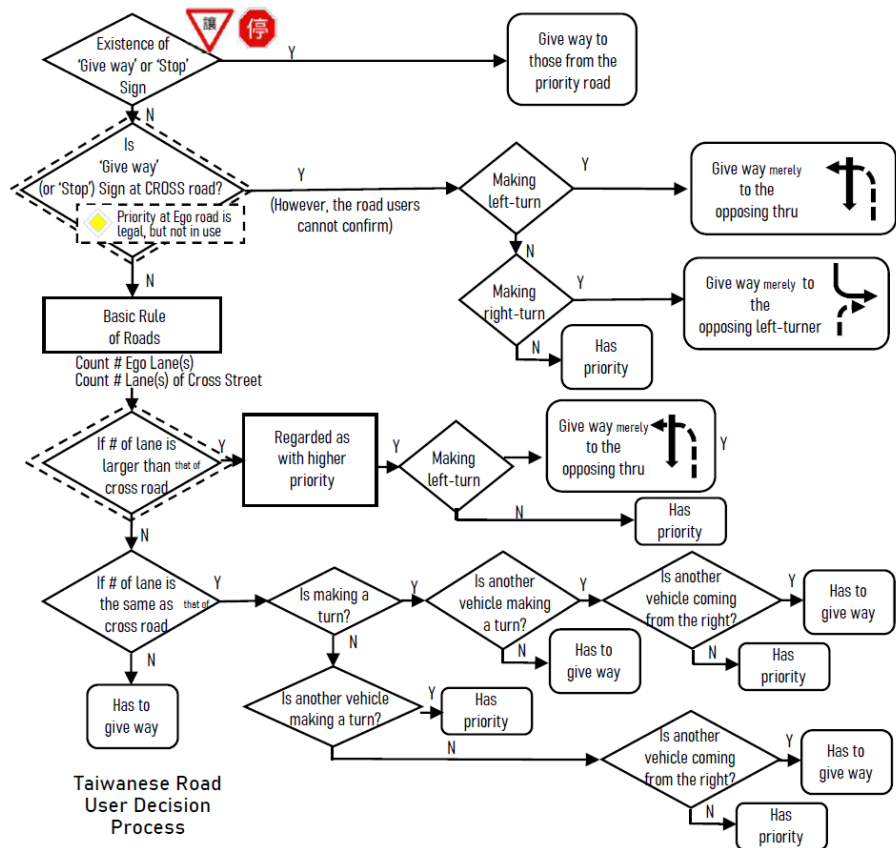
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Users' Willingness	DEPENDS! (w/o standardised layout)	Conditional Achieved (risk from lacking such particular subject in drivers' road test)	N/A (no required actions)	RISK! (difficult to follow the current rule)
Users' Capability	Normal	Normal	RISK! Beyond user capability! (The user has to predict whether the crossing road has Give way sign)	RISK! Beyond user capability! (The user has to predict whether other users are turning or through-going, count the number of ego lanes and other lanes, and compare the lane numbers concurrently. If all conditions are equal, then give way to vehicles from the right.)

RGRTS = Regulations Governing Road Traffic Safety(道路交通安全規則); Ins. = Instruction Sign(遵行標誌)

On the other hand, it is conceivable that weak links are spread at various parts of the Taiwanese system. The short-term policy indications are:

- The priority junction may be mended if the “priority road sign” in the Vienna convention is restored.
- The Taiwanese basic rule, in its current form, is completely beyond road users' capability, and it leads to unsafety. As shown in the Safety Chain examination, the construction of junctions with basic rules should be completely avoided in the short term to reduce unsafe outcomes. In other



words, the design process shall consider standard roundabouts, mini-roundabouts, and priority junctions. Such a suggestion indeed increases the cost at residential streets and home zones, but at this moment, it is the most probable way to enhance safety without a legislature or statutory process.

Currently, the research team inspects the right-of-way safety chain in this preliminary study phase. Potential tasks in the next phases are listed below:

- Questionnaires from experts responses;
- Tests general public with diagrams; or
- Tests general public with driving simulators

Should the further study confirm the preliminary inspection, mending regulations to simplify the basic rule of roads shall be implemented, in the long term.