

## Examining Queensland Drivers' a Priori Acceptance of Conditional and Full Automated Vehicles

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### Abstract

This study applied the Theory of Planned Behaviour (TPB) and the Technology Acceptance Model (TAM) to assess drivers' a priori acceptance of Conditional (SAE Level 3) and Full (SAE Level 5) automated vehicles (AVs). Queensland drivers' ( $N = 505$ ) were invited to complete a 20 minute online survey. The findings revealed that the TPB predictors of attitudes, subjective norms, and perceived behavioural control and the TAM predictors of perceived usefulness and perceived ease of use explained variance in future intentions to use Conditional and Full AVs.

### Background

Automated vehicles (AVs) offer the potential to reduce crashes associated with human error. However, for AVs to be of benefit to the community, drivers' need to be willing to accept these vehicles. The Theory of Planned Behaviour (TPB; Ajzen, 1991) and the Technology Acceptance Model (TAM; Davis, 1989) are two theories which can be applied to assess technology acceptance. The TPB proposes that attitudes, subjective norms, and perceived behavioural control (PBC) influence intentions, which in turn, influence actual behaviour. While the TAM proposes that perceived usefulness and perceived ease of use are predictors of intentions.

This study applied the TPB and TAM to assess drivers' a priori acceptance of Conditional (SAE Level 3) and Full AVs (SAE Level 5). It was anticipated that attitudes, subjective norms, and PBC would be significant predictors of future intentions to use Conditional and Full AVs. It was further anticipated that perceived usefulness and perceived ease of use would also be significant predictors of future intentions to use these vehicle types.

### Method

Drivers' ( $N = 505$ ) aged 17-81 years ( $M_{age} = 33.96$ ,  $SD = 18.79$ ; 278 female) were recruited via email, a paid Facebook advertisement, and the university's online recruitment system to complete a 20 minute online survey. Prior to responding to the TPB and TAM items, participants were provided with a short definition of Conditional and Full AVs. Specifically, the definitions provided were as follows, Conditional AV: *The driver is not required to watch the road, but must take back control of the vehicle when requested. The vehicle can drive itself some of the time* and "Full AV: *The driver is never required to take action as the vehicle will drive itself all of the time. There won't even be a need for a steering wheel.*" Questions were counterbalanced so that half of the participants read and responded to questions about Conditional AVs first, followed by the questions about Full AVs and vice versa.

### Results

The TPB constructs explained 66.3% of variance in intentions to use Conditional AVs,  $F(3,463) = 304.29$ ,  $p < .001$ . Attitudes and subjective norms were significant positive predictors of future intentions and PBC was a significant negative predictor of future intentions to use Conditional AVs (see Table 1). Additionally, the TPB constructs explained 67.8% of variance in intentions to use Full AVs,  $F(3,451) = 317.82$ ,  $p < .001$ . Attitudes and subjective norms were significant predictors of future intentions to use Full AVs. PBC was not a significant predictor of future intentions (see Table 1). One possibility for the difference in PBC findings between the Conditional and Full AVs

may be that participants perceived that the scale items reflected control of the vehicle rather than control over whether or not to use an AV.

The TAM constructs explained 49.2% of variance in intentions to use Conditional AVs,  $F(2,475) = 231.30$ ,  $p < .001$ . Perceived usefulness and perceived ease of use were both significant predictors of future intentions to use Conditional AVs (see Table 1). While for Full AVs, the TAM constructs explained 50.9% of variance in intentions to use such vehicles,  $F(2, 473) = 245.80$ ,  $p < .001$ . Perceived usefulness and perceived ease of use were both significant predictors of future intentions to use Full AVs (see Table 1).

## Conclusions

This work extends previous research undertaken outside Australia which had found the TPB and TAM useful to assess drivers' acceptance of advance driver assistance systems (Rahman, Lesch, Horrey, & Strawderman, 2017) and Conditional AVs (Buckley, Kaye, & Pradhan, 2018). On the basis of overall amount of variance explained in each regression model, the results suggest that the TPB factors were able to account for more variance in intentions than factors from the TAM. Findings also provide initial insights into factors that policy makers may consider when attempting to motivate drivers to use AVs and could assist with informing public education messages regarding AVs.

**Table 1. Linear Regressions of the TPB and TAM Predictors of Intentions to use Conditional and Full AVs**

	B	SE B	$\beta$	$p$
TPB (Conditional AVs)				
Attitudes	.646	.036	.604	>.001
Subjective norms	.351	.040	.297	>.001
PBC	-.065	.033	-.054	.048
TPB (Full AVs)				
Attitudes	.700	.037	.642	>.001
Subjective norms	.322	.043	.257	>.001
PBC	-.049	.032	-.041	.125
TAM (Conditional AVs)				
Perceived usefulness	.646	.037	.591	>.001
Perceived ease of use	.354	.050	.243	>.001
TAM (Full AVs)				
Perceived usefulness	.654	.037	.605	>.001
Perceived ease of use	.315	.047	.228	>.001

*Note.* TPB = Theory of Planned Behaviour; TAM = Technology Acceptance Model; PBC = Perceived Behavioural Control; AVs = automated vehicles.

## References

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