Sustainability transition: are we there yet? - Analysis of transition intention and sustainable tools adoption among New Zealand sheep farmers

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LINCOLN UNIVERSITY TE WHARE WĀNAKA O AORAKI

- New Zealand is one of the top five countries with the highest Greenhouse gas (GHG) emissions per capita among the OECD countries.

  - Nearly 50% of GHG emissions in New Zealand come from agriculture
  - The New Zealand government has adopted new policies impressing the transition toward a vision of net-zero emissions in 2050
  - More challenges for farmers in seeking value improvement while reducing environmental impacts

- New Zealand possesses sizeable potential biological resources with a competitive advantage in livestock production, however:

  - a fragmented governance approach
  - little financial access and support for innovation
  - little public discourse around bio-economy
  - the sustainability assessment can cover a broader range of issues or practices
  - **farmers might face personal constraints and challenges in practising sustainable agriculture**

- Understanding farmers' intensions of, attitudes, and willingness to sustainable transition is crucial for NZ's transition into a into a fully functioning bio-economy

- The majority of existing studies have focused on the dairy industry, whilst the sheep industry:

    - is a major contributor to the primary industries and the NZ economy
    - the sheep farmers may be more concerned and aware of sustainable products

- Most studies have focused on a specific tool/technology or good management practices, but the sustainable transition may need a comprehensive set of tools that can feed into the purpose of environment, social and economic sustainability.

- Agricultural sustainability tools probably help farmers overcome personal and practical restrictions in implementing sustainability transformation.

    - Sustainability tools refer to a wide range of assessment approaches, metrics, and indicator systems that have been developed in both economics and business management disciplines to measure sustainability outcomes and impacts across the environment, social and economic pillars of sustainability.
    - These tools allow farmers to collect objective information for their decision-making process.
    - Farmers may have more control and flexibility in their grazing and pasture productivity and gain more knowledge, competence, and confidence.

Research Questions

- The reduction in the sheep industry under the requirements of sustainability transitions may shed light on the question:

"Are New Zealand sheep farmers ready to transform into the bioeconomy yet?"

  - This study aims to assesses the intention of sheep farmers to adopt sustainability transitions and how the behaviour of collecting sustainability information moderates the relationship between sustainability transition adoption and the use of sustainability tools.

  - Based on the theory of planned behaviour, we employ the information collected from the New Zealand sheep farmer survey to investigate their motivation, awareness, and readiness for adopting sustainability transitions.

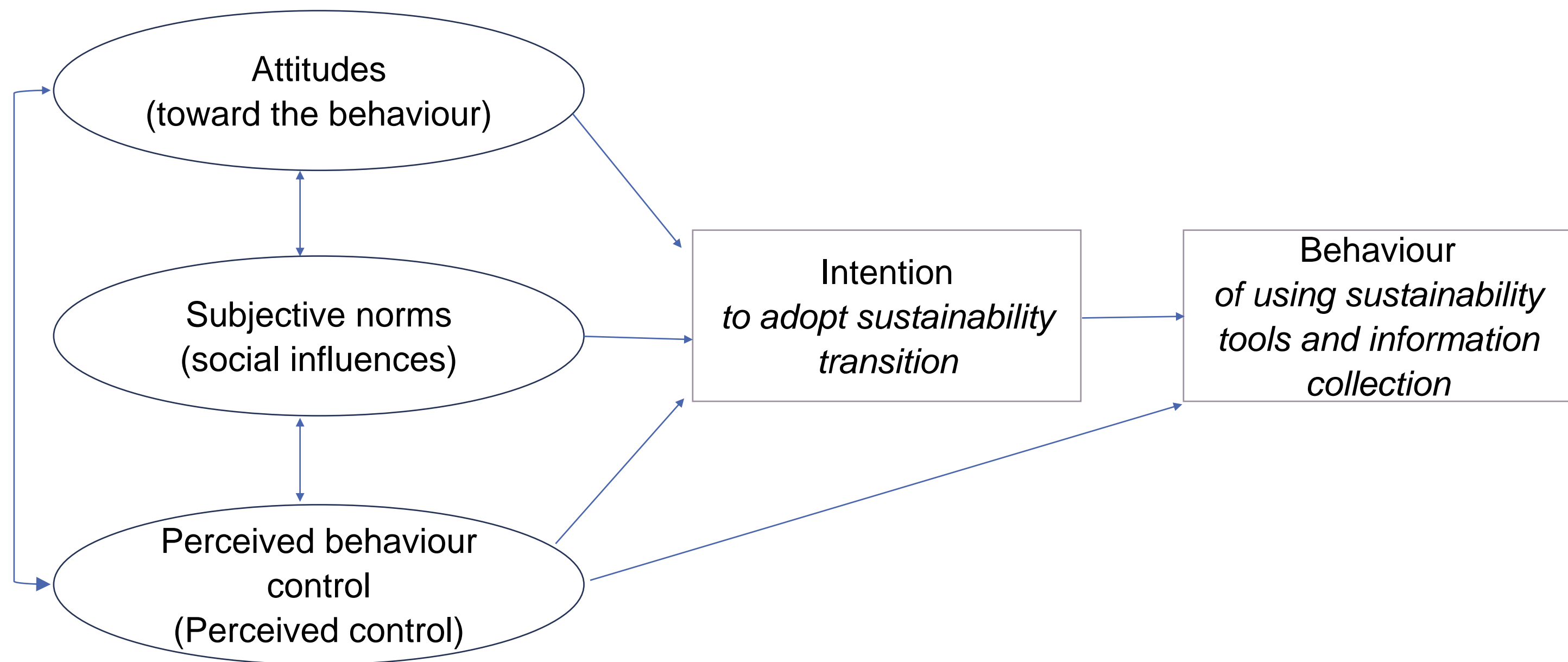**Adoption and the theory of planned behaviour (TPB)**

Figure 1. The conceptual diagram of the theory of planned behaviour
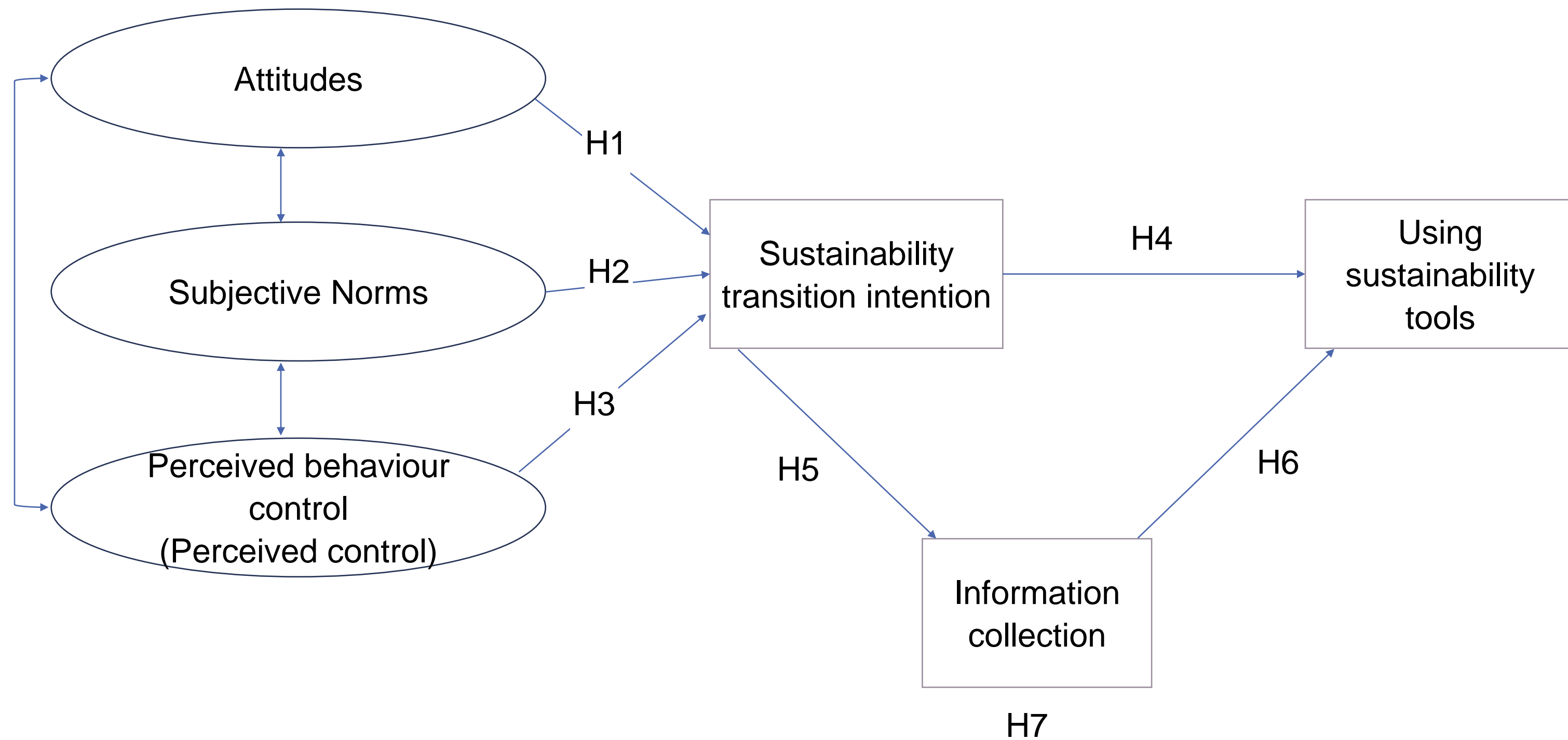
Source: Adapted from Ajzen (1991)

Theoretical Framework

- **Adoption and the theory of planned behaviour (TPB)**

Components	Original TPB	Manifest variables from the decomposed TPB	Manifest variables from the proposed TPB extension
Attitude	Behavioural beliefs	• Perceived usefulness • Ease of use	• Customers place a high value on sustainable products • Trust in using the sustainability tools
Subject norms	Normative beliefs	• Injunctive norms • Descriptive norms	• Social pressure on using sustainability tools • Industry pressure on using sustainability tools • The country-level priority of sustainability transition • The industry-level priority of sustainability transition
Perceived behaviour controls	Control beliefs	• Self-efficacy – a confidence level to carry out a particular behaviour based on individual ability • Perceived control over the behaviour	• Understanding sustainability transitions • Understanding sustainability tools • Readiness in making general and sustainable strategies

The TPB constructs of the study

Principal component analysis (PCA)

- We employ the principal component analysis (PCA) to determine common factors within each TPB constructs (e.g., attitudes and subjective norms) based on the variation in data.

  - The PCA can analyse the interrelationship among variables and determine the constructs relying on their similar underlying dimensions.

  - The PCA allows to determine common factors based on the variation in survey data

  - The PCA can reduce multi-observable variables into fewer dimensions of interest latent variables

Structural equation modelling (SEM)

- SEM considers two models:

  - The first is the measurement model, which shows how the measured variables represent constructs
  - The second model is a structural model that estimates the correlation between constructs (SEM estimations).

- SEM allows any interrelationships presented in the proposed model to be estimated, and a set of hypotheses can be tested simultaneously:

  - It fit the purpose of testing for the validity of the predictive empirical model and the relative effect of attitude, subjective norm, and perceived behavioural control on intention
  - It is well-developed model that has various indicators to measure its goodness-of-fit

Empirical models and data

Data collection

- Interviewing sheep farmers across New Zealand between August 30th and September 8th, 2021

- Using the Qualtrics software platform and could be accessed using www.nzsheepsurvey.com

- The survey yielded 583 responses, with 118 partially completed

- After screening and cleaning missing information responses, 238 observations will be used for further analysis

Principal component analysis (PCA)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.693 > 0.5
Bartlett's Test of Sphericity	Approx. Chi-Square	664.889
	Df	66
	Sig.	.000

Kaiser-Meyer-Olkin test results show that PCA is appropriate for SEM analysis

Bartlett's test results confirm a strong relationship between the variables of the TPB constructs – the constructs are validated.

Empirical results

Principal component analysis (PCA)

over 0.5, confirming the validity of factor measurements

TPB constructs	Cronbach's Alpha	Drivers	Component				Expected effect
			1	2	3	4	
Perceived behaviour controls toward adopting sustainability transitions	0.652	Ready for a sustainable strategy	0.797				(+)
		Ready to make a sustainable strategy	0.791				(+)
		Ready for general strategy	0.690				(+)
		Knowledge about sustainability tools	0.594				(+)
		Knowledge about sustainability transitions	0.495				(+)
Normative belief - Priority	0.824	Pastoral industry priority		0.893			(+)
		New Zealand priority		0.877			(+)
Normative belief - Pressure	0.697	Industry pressure			0.874		(+)/(-)
		Social pressure			0.832		(+)/(-)
Attractiveness in adopting sustainability transitions	0.518	Trust in sustainability tools				0.718	(+)
		Motivation to use sustainability tools				0.658	(+)
		Attractiveness on values of sustainability products				0.579	(+)

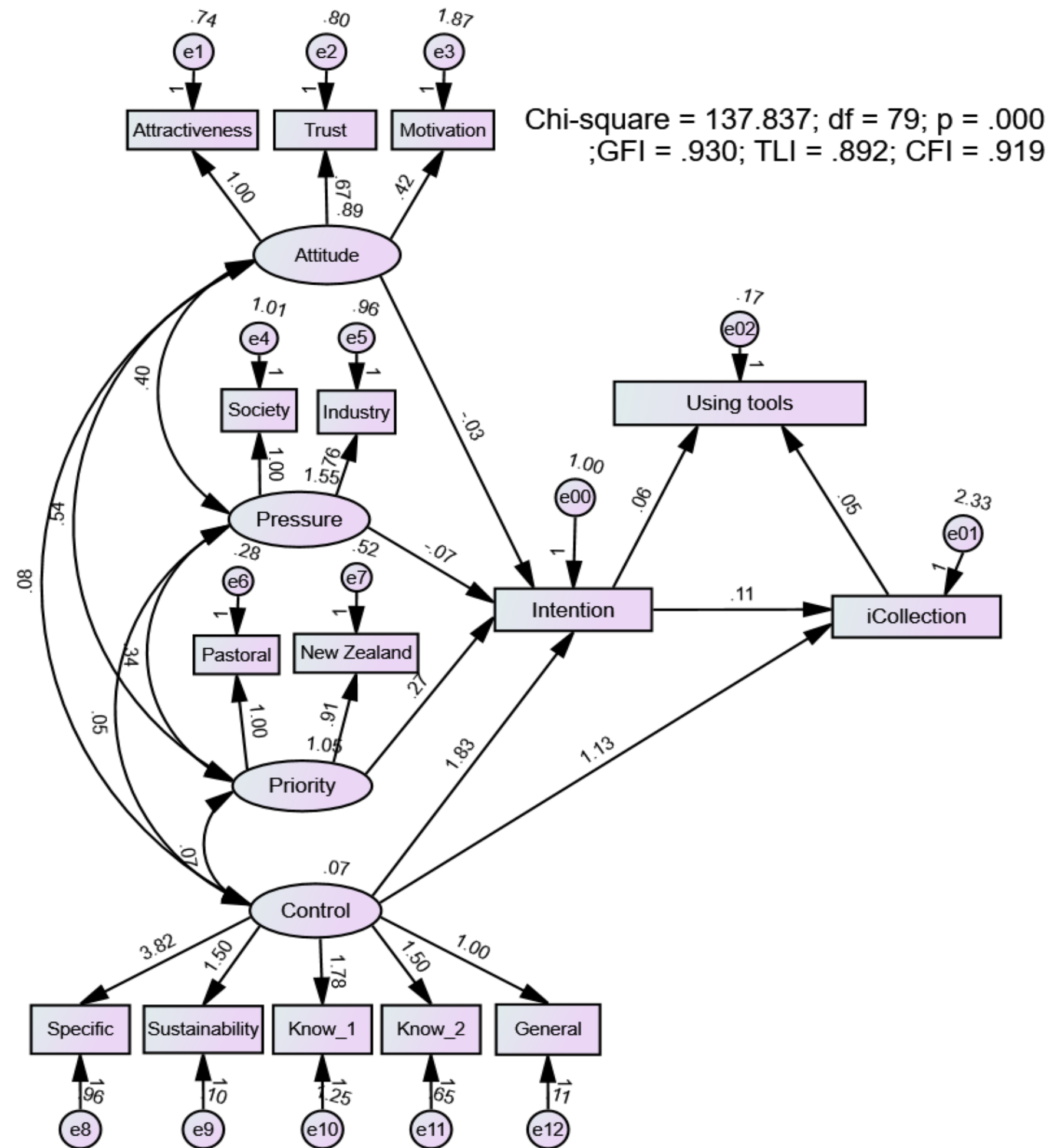*Notes: Extraction method: Principal Component Analysis with Varimax rotation and Kaiser Normalisation; Factor loadings less than 0.45 have not been printed, and variables have been sorted by loadings on each factor.*

Empirical results

SEM – Path analysis

- GFI = 0.93 (> 0.9)

- CFI = 0.91 (> 0.9)

→ Considerable good-fit model

Chi-square = 137.837; df = 79; p = .000
;GFI = .930; TLI = .892; CFI = .919

Empirical results

Structural equation modelling (SEM)

Path			Path coefficient[a]	Std. E	T-value	Hypothesis	Results
Intention	<---	Attitude	-0.028	0.129	-0.268	H1	Not supported
Intention	<---	Pressure	-0.078	0.072	-1.008	H21	Not supported
Intention	<---	Priority	0.240	0.1	2.692***	H22	Supported
Intention	<---	Control	0.410	0.366	4.996***	H3	Supported
Using tools	<---	Intention	0.172	0.024	2.704***	H4	Supported
iCollection	<---	Intention	0.082	0.1	1.111	H5	Not supported
Using tools	<---	iCollection	0.170	0.018	2.669***	H6	Supported

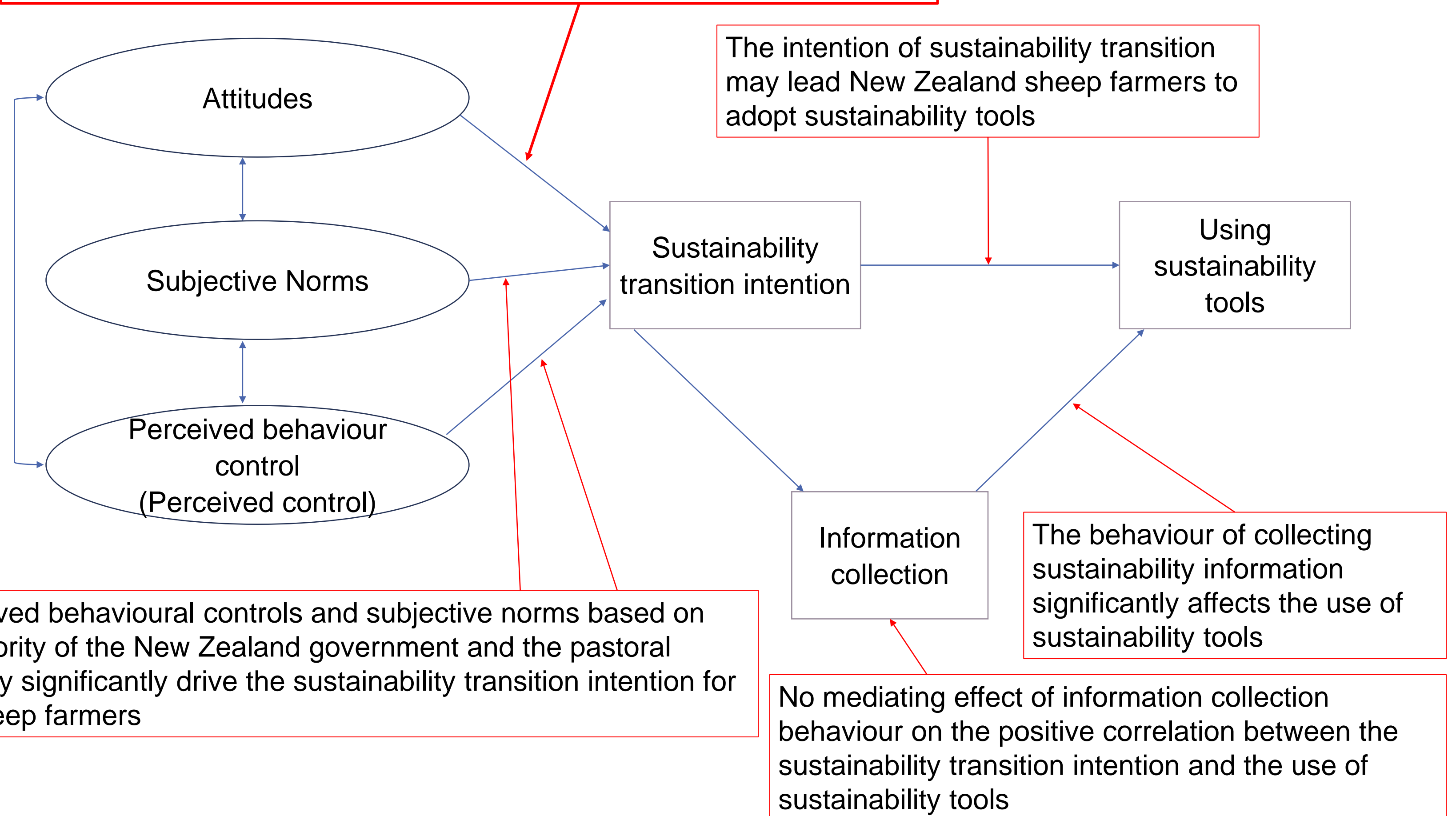*Notes: ***p < 0.001; (a) Standardized Regression Weights*

H7: Mediation effect of information collection (iCollection) on intention v.s. adoption – Not supported

- the tool use is significantly affected by the intention of sustainability transition and information collection.
- However, the intention does not affect the behavioural information collection of sheep farmers.

Discussions and Conclusion

There is an attitude-behaviour gap in the TBP model toward NZ sustainability transition intention: the farmers' attitude toward transforming into sustainability farms does not affect the intention significantly

Due to the constraints of the strong influence of perceived behavioural controls and priority subjective norms

The intention of sustainability transition may lead New Zealand sheep farmers to adopt sustainability tools

Attitudes

Subjective Norms

Perceived behaviour control
(Perceived control)

Sustainability transition intention

Using sustainability tools

Information collection

The behaviour of collecting sustainability information significantly affects the use of sustainability tools

Perceived behavioural controls and subjective norms based on the priority of the New Zealand government and the pastoral industry significantly drive the sustainability transition intention for NZ sheep farmers

No mediating effect of information collection behaviour on the positive correlation between the sustainability transition intention and the use of sustainability tools

THANK YOU

Questions & Comments are welcome!

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