

# Identifying the factors of trust in new seismic-proofing technologies in New Zealand

Shermineh Zarinkamar<sup>1</sup>, Mani Poshdar<sup>2</sup>, Suzanne Wilkinson<sup>1</sup> and Pierre Quenneville<sup>1</sup>

<sup>1</sup> Department of Civil and Environmental Engineering, University of Auckland

<sup>2</sup> Department of Built Environment Engineering, Auckland University of Technology

## Abstract

Earthquakes have caused serious damages to the economy of New Zealand. Numerous innovative methods and technologies are introduced to the New Zealand construction industry with the aim of reducing the consequences of earthquake damages and the aftermath repair costs. However, the low level of trust towards these new technologies poses a significant challenge in their application. An enhanced understanding of the factors that affect the trust in the newly introduced seismic proofing technologies can support design policies to leverage their adoption

## Trust

Trust refers to “a belief that a specific technology has the attributes necessary to perform as expected in a given situation in which negative consequences are possible.”

## Methodology

A case study was conducted to assess the relative importance of the 24 determinant factors collected from the literature review (Table 1).

Table 1: Summary of the significant determinants of trust

Type of client	Availability of labour
Type of cost	Availability of material
Type of project	Procurement system
Type of market	Buildability
Type of bidding	Building characteristics
Location of the project	Site access
Change in owners requirement	Method of construction
The scale of the project	Market condition
The complexity of design and construction	Tender period
The expertise of consultants	Inflation
Availability of design information	Availability of material
Site investigation information	Contract condition

A new generation of resilient seismic technologies was used as the sample for the case study. Resilient Slip Friction Joint (RSFJ) was studied that has been introduced to the market in 2016 and offers a significant damage reduction in the structural and non-structural elements.

The respondents were requested to express their perception about the importance of each factor in Table 1 by ranking them on a five point-Likert scale from ‘Extreme impact’ to ‘No impact’

## Sampling demographic



Figure 2: Respondents characteristics: (a) population (b) working experience

These 24 factors have been categorized into six sub-categories.

In this research the cost related, market related and bidding related factors have been discussed.

The statistical significance of the differences among the cost related, market-related and bidding-related factors in each group was assessed using an independent sample t-test (Table 2).

Table 2: t-test result

Factors affecting trust to new methods and new technologies in construction industry	Mean	t-value	SD	Significance (2-tailed)
<b>(I) Cost-related factors</b>				
Post-earthquake maintenance cost decreases because the system is damage avoidance	4.1	31.9	0.9	0
Cost of new technology is higher compared to the conventional technologies	3.8	38.5	0.7	0
The cost of the project can be misestimated owing to lack of information about RSFJ	3.5	26.7	0.9	0
The project is targeted to reduce costs as much as possible	3.7	23.7	1.1	0
Type and quality of cost planning date	3.2	18.9	1.2	0
<b>(II) Market-related factors</b>				
Procurement system: Local representative	3.6	24.2	1.1	0
Procurement system: overseas representative	3.3	21.3	1.1	0
Product availability: Of the shelf products	3.6	27.7	0.9	0
Product availability: customized products	3.8	27.4	1	0
Inflation	3.3	22.7	1	0
Availability of construction material	3.6	22.3	1.2	0
Availability of labour	3.7	29.6	0.9	0
Fluctuating in labour prices	3.2	21.3	1.1	0
Fluctuating in material prices	3.3	22.3	1	0
Being a made-in New Zealand technology	3.7	21.3	1.2	0
<b>(III) bidding-related factors</b>				
Type of bidding	3.3	20.8	1.1	0
Tender period	3.3	22.1	1	0
Contract conditions	3.2	23.7	1	0
Government policy	3.3	21.1	1.1	0

Therefore, the set of responses were judged to be homogeneous and analysed as one statistical group. The top seven factors that provided the mean importance of above 3.6 are presented in Table 3.

Table 3: Ranking hierarchy of significant factors affecting trust to the new seismic-proofing technology

Rank	Factors affecting the choice of technology	Mean
1	Post-earthquake maintenance cost decreases because the system is damage avoidance	4.1
2	Cost of new technology is higher compared to the conventional technologies	3.8
3	Product availability: Customized products	3.8
4	Being a made-in-New Zealand technology	3.7
5	Availability of labour	3.7
6	Availability of construction material	3.6
7	Procurement system: Local representative	3.6

## Conclusion

The findings highlighted the importance of seven factors as mentioned in table 3. This research form a baseline to understand the adoption process of innovative technologies. Figures 3 and 4 present the factors divided into cost-related and market-related categories

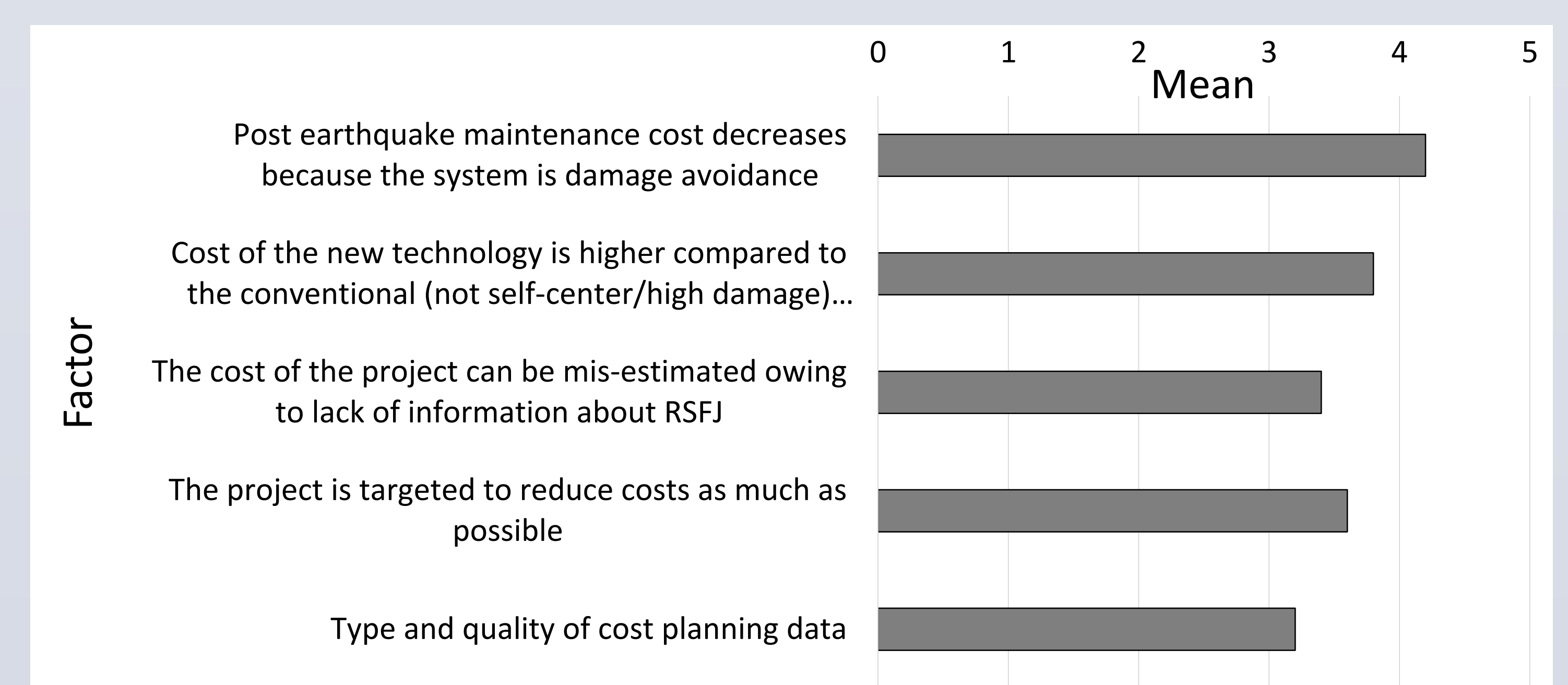


Figure 3: Cost-related factors

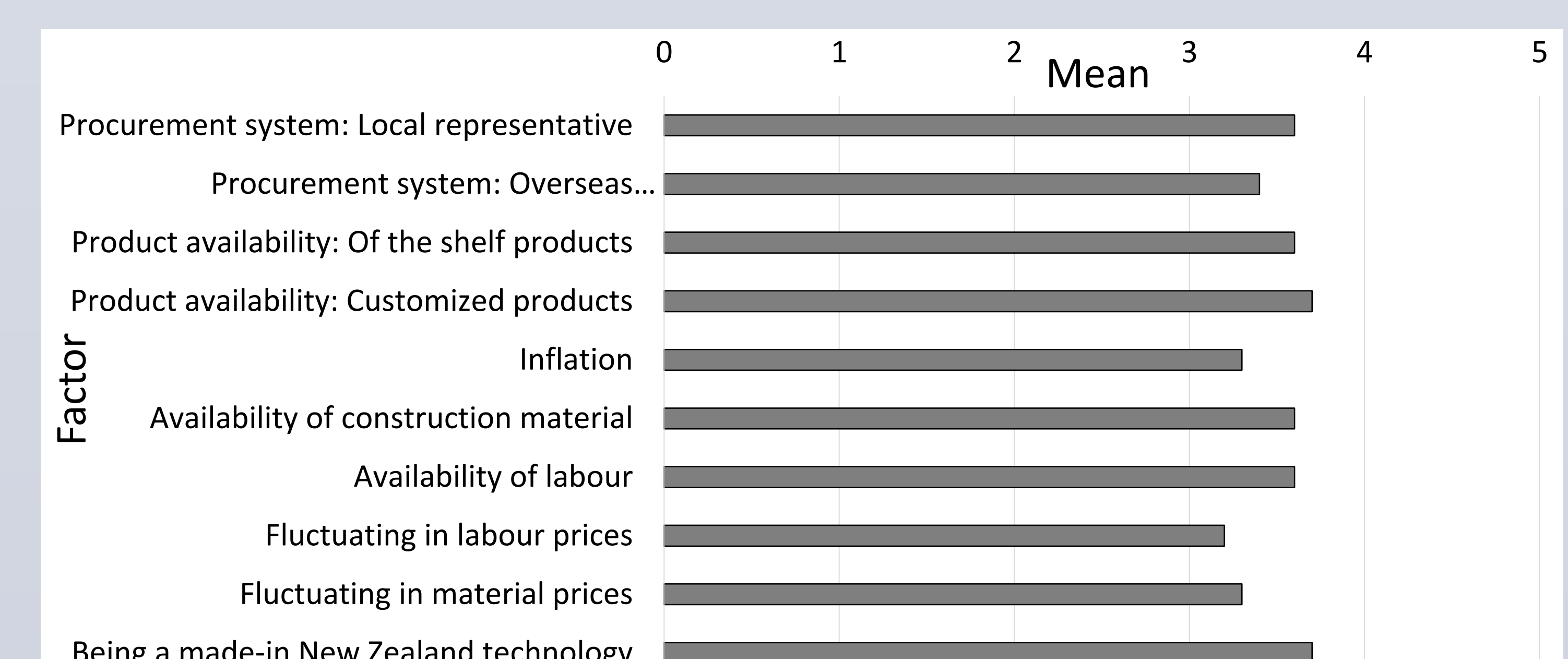


Figure 4: Market-related factors