

Diffusion of Lean Construction in Small to Medium-Sized Enterprises of Housing Sector

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Background

In New Zealand:

- the construction industry is incapable of attending the current demand;
- small to medium-sized enterprises (SMEs) constitute 76% of the active companies - 68% of the total workforce in the industry

Lean Construction is present in New Zealand, but little known about its level of acceptance among SMEs

The significance of SMEs increasing as large companies outsource construction activities

Research question

The state of diffusion of lean construction
among SMEs active in Auckland, NZ?

Large enterprises vs SMEs

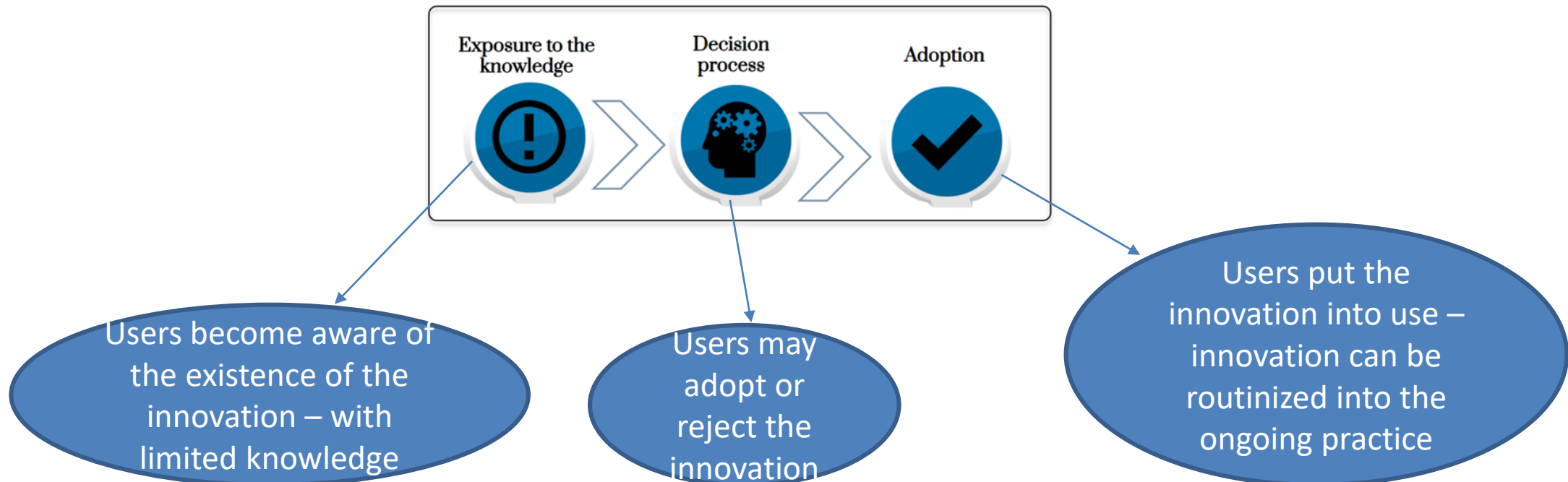
Attribute	Large Enterprises	SMEs
Leadership	Leaders are more involved with strategic activities	Leaders are more involved with operational activities than strategic activities
Management	Participative management	A mixture of empowered supervision and command and control
Strategic Planning	Short and long term planning	Short term planning focus on niche strategies
Organizational Structure	Hierarchical with several layers of management	Flat with few layers of management
System & Procedures	Formal control systems, High degree of standardization	Personal control Some degrees of Standardization and formalization
Human Resource	Training and staff development is planned and is on a large scale	Training and staff development is ad-hoc and small scale
Customer Focus	Formal customer relationship Large customer base	Formal-Informal customer relationship Limited customer base
Operational Improvement	Vast knowledge or understanding of operational improvement activities	Limited knowledge or understanding of operational improvement activities
Innovation	Innovation based on R&D	Innovation based on clusters and networking
Networking	Extensive external networking Better understanding of support available from local government	Limited external networking Limited knowledge of funding and support available from local government

Large enterprises vs SMEs

- The simple organisational structure and the flexible production of SMEs – a unique quality to implement lean construction
- The increasing presence and the number of SMEs – the need for understanding the issues around the diffusion of lean construction to SMEs

An innovation diffusion model

- Lean construction fits into the definition of innovation
- Users of lean construction pass through the stages drew on the diffusion of innovation theory



Research Method

- Post-positivism methodology – a quantitative approach
- **Sample selection:** cluster sampling practice – a simple random technique to take two construction sites out of seven in Auckland
- **Sample size and the response rate:** 130 companies were listed from the two clusters – 100 responses were collected
- **Data collection:** A telephone survey method
- **Respondent's profile:** concrete works, painting, blockwork, glazing, carpentry, plumbing, roofing, metal works, electrical works, others (e.g., scaffolding, surveying)

Analysis of the results

- 20% of companies – exposed to the lean construction in the past
- **ONLY 3% of companies – actively use lean construction**
- 1% of companies had used lean construction in the past but discontinued it

Discussion

Three main elements that can affect the observed patterns in the diffusion level of learn among SMEs:

1) The characteristics of SMEs as the main social unit: A typical construction project is a social system comprising a set of interrelated SME units – the system is known for cultural resistance to change.

Systems norms (behaviour patterns established in the units of social system): fragmented delivery, meagre budget, lack of skill, development ignorance, computer illiteracy, traditional management, lack of commitment, lack of ability to work in a group, lack of self-criticism, weak communication and transparency.

Discussion

2) Time and the adoption rate: lean construction has found its early adopters among SMEs – next step is about engaging the early majority type of adopters in the near future (according to S-shaped curve)

Discussion

3) Communication: essential for the diffusion of innovation and confronting the uncertainties (suitability of the innovation – consequences expected from implementing the innovation)

Four questions to be clarified for SMEs: what is lean construction? how does it work? Why does it work? What will be the advantages and disadvantages of implementing the innovation?

The opinion leaders and change agents: the managers can communicate the suitability and the implementation consequences of innovation – change agents can direct the decision process of the enterprise towards the desired orientation

Discussion

The channels: a communication channel (mass media, social media, or interpersonal channels) is a way by which messages are passed from one individual to another.

Conclusions

- Only 3% of SMEs are actively using lean construction
- The diffusion of lean construction is associated with the characteristics of SMEs as social units of construction projects, the time required to attract adopters, and the level of communication used to approach the potential adopters.

Future Research

What are the roles of different actors within the construction industry to leverage the introduction of Lean Construction as a disruptive innovation within the SME sector in construction?

What are the reasons for the observed drop between the rate of the SMEs that were exposed to the lean construction knowledge and those are implementing it?

What are the likely drivers of innovation that can optimize the innovation-decision of Lean Construction within the SME sector in construction?

What are the roles of innovators such as universities, professional bodies, industry champions, government to promote Lean Construction within the SMEs sector in construction?