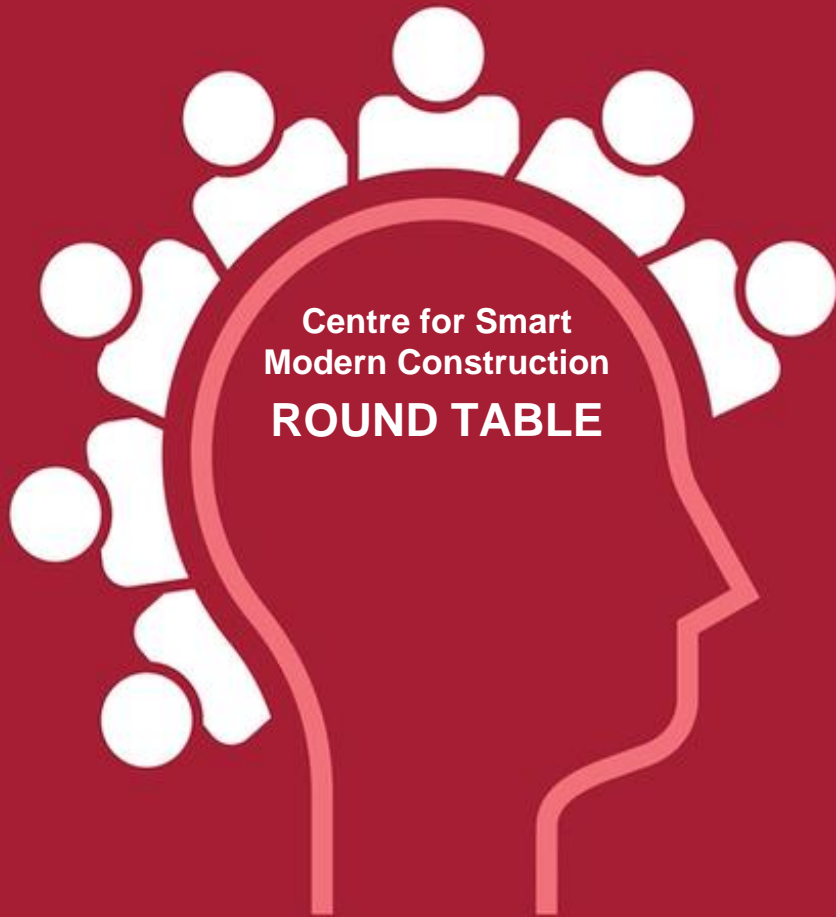


**WESTERN SYDNEY
UNIVERSITY**



Centre for
Smart Modern Construction



Centre for Smart
Modern Construction
ROUND TABLE

c4SMC INTER-UNIVERSITY ACADEMIC ROUND TABLE

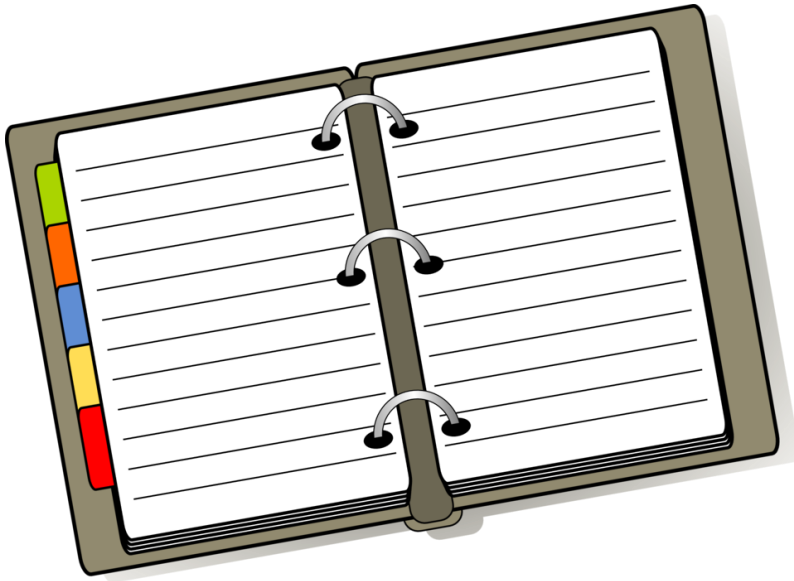
14th November 2018

Smart Modern Construction : Business scenarios leading to Industry 4.0

Priyadarshini Das

Doctoral Researcher, c4SMC

Agenda



01

Ideas that have gained traction in the media

GSK's factory in a box

02

From Seers – Roebuck to Katerra and more

Freedom of Design & Integrated Solutions
Take, Make and Deliver (TMD) functions of construction

03

The GAFAM

The Google Apple Facebook Amazon Microsoft
Newer markets, newer competitors?

04

Research Problem and Objectives

Need for organisational resilience and sustainability in withstanding the impact of globalisation, industrialisation and digitalisation

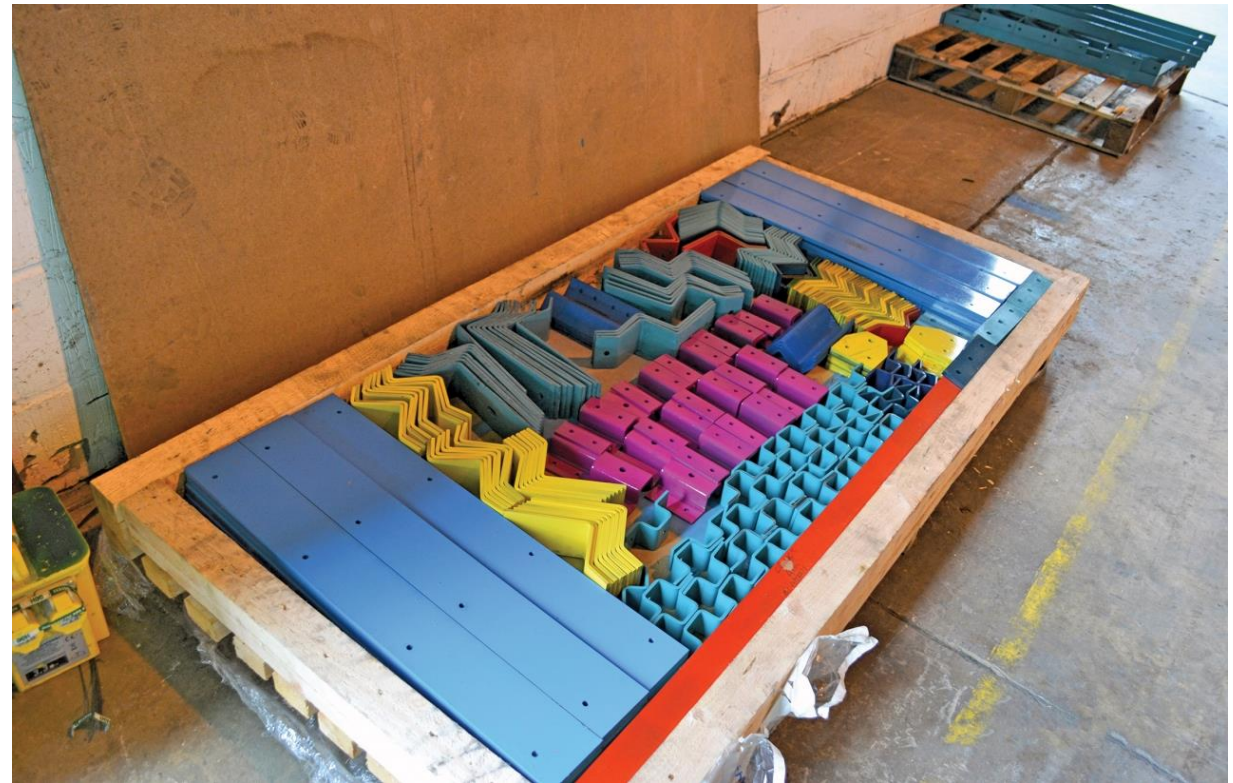
05

The Business Model Transformation Canvas

An introduction to the Business Model Canvas and today's Round Table Discussion Activity

GLAXO SMITH KLINE 'BETA' BUILDING PROTOTYPE

- **'Factory in A Box'** is a building packaged as a repeatable commodity.
- The boxes are in fact shipping containers that contain every component packed in the reverse order needed for the re-assembly process.
- **"Factory In A Box"** cuts the construction programme from 12 weeks to four and delivers an estimated 30% saving compared to the same facility built conventionally.



Source: *Farmer's Modernise or Die*, Bryden Wood Website



THE JOINING UP CONSTRUCTION CONVERSATION



REDEFINING PREFAB FOR THE 21ST CENTURY

Freedom of Design

- Early prefab housing projects - pretty **pedestrian**, and a **cookie-cutter design**
- “One size fits all”
- “Offsite construction” – coexistence of the **efficiency of prefab** and the **personality of architectural design**
- The idea is to balance factory efficiency with design freedom

Integrated Solutions

- Buildings are exclusively designed as **one-off prototypes**
- Building systems (mechanical, electrical, plumbing, and fire protection) are engineered exactly opposite way
- Manufacturers typically split these systems into **off-the-shelf** products
- This generic standardization means **suboptimal performance** and increased installation effort
- Higher costs in both the short and long term

FOR SUBURB OR FARM

The GREENVIEW **Honor Bill** **\$1,152.00**
No. 2015 "Already Cut" and Fitted.

See Description of "Honor Bill" Houses on Page 9.

At the above price we will furnish all the material to build this cozy six-room story and a half house with frame construction, consisting of lumber, lath, shingles, porch ceiling, siding, finishing lumber, mill work, building paper, eaves trough, down spout, hardware and painting material. We guarantee enough material to build this house. Price does not include cement, brick or plaster.

OVER fifty houses of this design were built in one year and every one of them has satisfied the owner in price, quality and saving. The porch extends across the front 13 feet and 16 feet along the side, giving ample porch room.

First Floor Front door leads to the living room and open stairway leads to the second floor. Another door from the porch leads to kitchen. Directly in rear of the living room is located a bedroom with closet and door leading to living room; also door from living room to kitchen. Adjoining the kitchen is a large pantry with shelves and a door leading to rear porch.

Second Floor On the second floor are located three medium size bedrooms with closets. We furnish our best "Quality Guarantee" mill work, described on pages 120 and 121. Interior doors are five-cross panel, with trim and flooring to match, all yellow pine, in beautiful grain and color. Windows are made of clear California white pine, with good quality glass set in with best grade of putty. Porches have fir edge grain flooring.

Built on concrete block foundation; No. 1 yellow pine framing lumber. Covered with clear narrow bevel cypress siding and roof covered with best grade thick cedar shingles.

Our Guarantee Protects You—Order Your House From This Book
Price Includes Plans and Specifications.

SEARS, ROEBUCK AND CO. CHICAGO

FIRST FLOOR PLAN.
BED ROOM 6'-5" x 12'-3"
KITCHEN 14'-6" x 12'-3"
LIVING ROOM 15'-2" x 10'-6"
PANTY 6'-4" x 5'-5"
P.O.R.C.H.
24'-0" P.O.R.C.H.

SECOND FLOOR PLAN.
BED ROOM 6'-5" x 12'-3"
BED ROOM 11'-2" x 12'-5"
BED ROOM 11'-2" x 10'-6"
HALL 6'-0" x 5'-0"
CLO.
CLO.
CLO.
P.O.R.C.H.

OPTIONS
Paint for two coats outside, your choice of colors. Varnish and wood filler for two coats of interior finish. Stratford Design hardware, see page 129. Excessed collar, 7 feet from floor to joists.
First floor, 8 feet 4 inches from floor to ceiling. ~ Second floor, 8 feet from floor to ceiling.

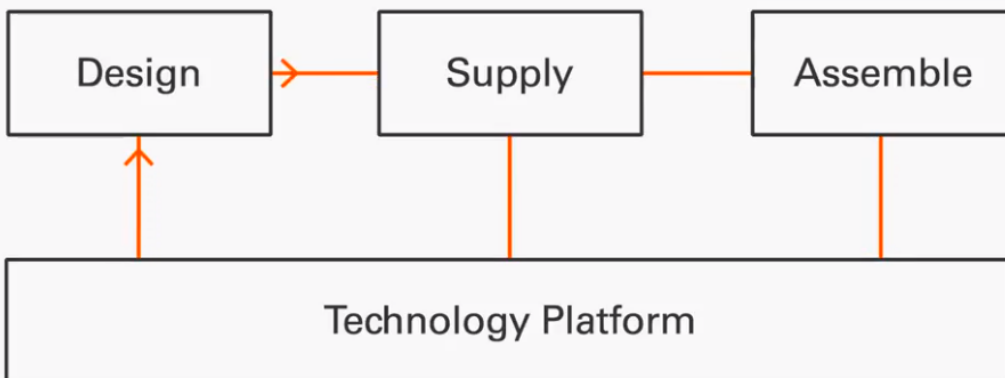
Sheet Plaster and Plaster Finish to take the place of wood lath, \$80.00 extra.
Five-Chief Shingle Roll Roofing, Red or Sea Green in color, instead of wood shingles, \$18.00 less.
Storm Doors and Windows, \$22.56 extra.
Screen Doors and Windows, black wire, \$22.48 extra; galvanized wire, \$14.23 extra.
This house can be built on a lot 30 feet wide.
If ESTIMATES and SPECIFICATIONS for plumbing, hot water or warm air heating systems, electric wiring material, gas or electric fixtures are desired, write for them, specifying the Greenview Modern Home No. 2015 in your request.

Saved \$405.00 on Modern Home.
Name _____
Address _____
City _____ State _____
Sears, Roebuck and Co., Chicago, Ill.
Gentlemen—I am sending you a photo of my new house built with material ordered from you, and after your plans. I saved \$405.00 and the material is better than I could buy here.
Respectfully yours,
JNO. HOLZENBERG.

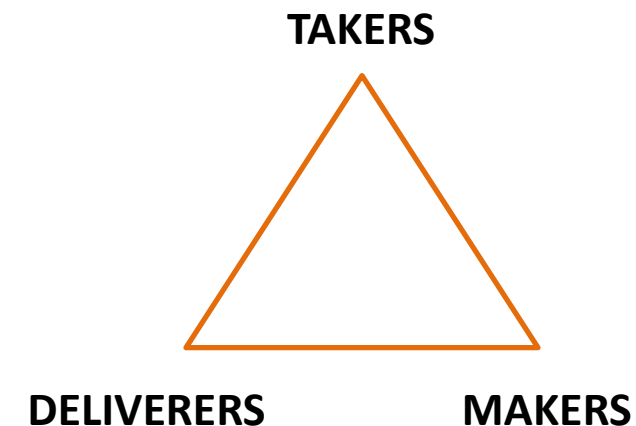
EMERGING BUSINESS MODELS

An emerging model talks of a technological platform to again enable a single mind to conceive, design, manufacture, and assemble a building in which the final cost and schedule are known at the point of the design decision.

The Katterra Model



- The evolving role of the 'Take, Make and Deliver' (TMD) functions of construction puts the bigger global picture into perspective.
- The shift from onsite to offsite puts the Makers at a higher footing than the Deliverers (former constructors).



THE EMERGING COMPETITION FROM GAFAM



Amazon invests in prefab startup focused on smart home tech

Could this investment in California-based Plant Prefab be a new avenue for Alexa expansion?

By Patrick Sisson on September 25, 2018 8:42 am



Google is beginning to get serious about the construction business

The tech giant is soliciting proposals for prefab units for its employees

February 28, 2018 02:15PM



- These companies are among the **biggest and most influential** in shaping the future of technology.
- They have **enough capital** to invest in disruptive technology that could benefit them
- Plenty of future construction needs including **expansion, warehouses, logistic spaces and data centres**
- Want to “**form relationships and work collaboratively**” on future housing projects

WA builder Cooper & Oxley suspends trading as it reviews its 'financial viability'

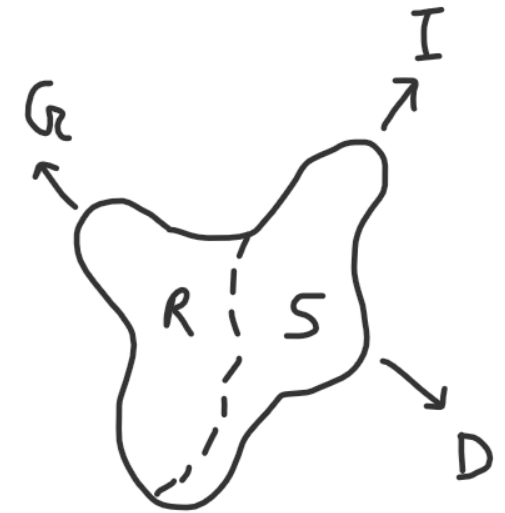
By [Emily Piesse](#) and [Rebecca Trigger](#)

Updated 5 Feb 2018, 9:44pm



THE RESEARCH PROBLEM

- Today a construction enterprise is constantly being pulled apart in different directions by the forces of **globalisation**, **industrialisation** and **digitalisation**
- If the **internal dynamics** within the company do not change, they might **collapse** under the impact of these challenges



An enterprise that is able to withstand the impact of these forces to become **sustainable** and **resilient** is what the research terms as a “**Smart Modern Construction Enterprise**”.



Prof. Srinath Perera



Dr. Sepani Senaratne



Dr. Robert Osei-Kyei

DEVELOPING A **SMART MODERN CONSTRUCTION** ENTERPRISE MATURITY MODEL FOR BUSINESS SCENARIOS LEADING TO INDUSTRY 4.0



01. What is **SMC**?

To explore and define the concept of Smart Modern Construction (SMC) and its application to construction enterprises



02. SMC Enterprise **Typology**

To analyse the types and characteristics of SMC Enterprises through Case Studies



03. SMC **Attributes**

To evaluate the drivers / barriers / key performance indicators of SMC enterprises through Case Studies and Expert Opinion Surveys



04. SMC **Maturity Model**

To conceptualize a Capability Maturity Model (CMM) for SMC enterprises





THE JOINING UP CONSTRUCTION CONVERSATION



The Construction Business Model Transformation Canvas

Table No:

No. of participants:

<p>Key Partners</p> <p>Network of suppliers and partners that bring in external resources</p> <p><i>How are key partners changing? How are key suppliers changing? Which Key Resources are being acquired from these new suppliers? Which Key Activities are these partners performing?</i></p>	<p>Key Activities</p> <p>Activities = The Onsite / Offsite mix</p> <p><i>How are key activities changing? What new activities are being introduced?</i></p>	<p>Value Proposition</p> <p>Bundle of products and services that create value for a client</p> <p><i>How are companies redefining their value proposition? What new products and services are being offered?</i></p>	<p>Client Relationships</p> <p>How clients are acquired and retained</p> <p><i>Is the relationship with client changing? Are there newer expectations from clients?</i></p>	<p>Potential Competition</p> <p>Groups of people / organisation in an advantageous position to create value in similar space in a bigger way</p> <p><i>Are there newer markets / competitors coming up?</i></p>
<p>Cost Structure</p> <p>With the shift from onsite to offsite the cost structure is likely to alter</p> <p><i>What are the most important costs inherent in the new business model? Which Key Resources are most expensive? Which Key Activities are most expensive?</i></p>	<p>Revenue Streams</p> <p>With the shift from onsite to offsite the revenue distribution is likely to change</p> <p><i>Are there newer revenue streams for construction companies now?</i></p>			

Inspired from: www.strategyzer.com

THE ROUND TABLE DISCUSSION - 1

- We will try to map the **ongoing transformation** in construction businesses using the **Business Model Canvas**
- A **single** canvas is expected from each table
- The soft copy of canvas available on each computer and can be filled **digitally**



THE
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CONVERSATION

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A C4SMC COLLABORATION



hansen yuncken

