University of Salford MANCHESTER

Introduction
19 June, 2013

Prof Mohammed Arif
Professor of Sustainability and Process Management,
School of the Built Environment
The University of Salford

University of Salford MANCHESTER

Agenda

The Demand

Establishing the paradigm

Barriers

Opportunities

Where are we headed?

Low Cost Housing: The Demand

University of Salford MANCHESTER

Global Demand

- There are 1.6 billion people living in need of shelter worldwide according to habitat for humanity.

University of Salford MANCHESTER

Low Cost Housing: The Demand

Situation in the UK

1. 240,000 Affordable Houses are Needed Every Year To Control the Gap Between Supply and Demand
2. The New Government Has Announced the New £8.4 Billion National Affordable Housing Programme for England
3. 170,000 Homes Funded by the Government Over the Next Four Years

University of Salford MANCHESTER

Low Cost Housing in the UK

University of Salford MANCHESTER

Social Sustainability

Health and Safety

Continued Employment

Gender Equality

Lower Skill Set

University of Salford MANCHESTER

Environmental Sustainability

Low Embodied Energy

Tighter Envelop

Use of Energy Efficient Material

Waste Minimisation

University of Salford MANCHESTER

Economic Sustainability

Higher Speed

Economies of Scales Reduces Costs

Reduced Reword and Waste Saves Money

University of Salford MANCHESTER

Offsite and Sustainability

Issue	Improvement over Conventional Construction (estimated)	Benefit to Society	Benefit to Housebuilder
SOCIAL			
Reduced Accidents & Incidents (H&S)	Up to 80%	Large	Large
Improved Working Conditions and Job Security	Significant	Significant	Small
ENVIRONMENTAL			
Reduced Road Traffic Movements (Congestion & Pollution Benefits)	Up to 70% (40%)	Significant	Small
Reduced Energy Used on Site	Up to 80% (50%)	Small	Small
Reduced Waste	Up to 90%	Significant	Significant
Reduced Energy-in-Use	20% (typical)	Significant	Small (unless house builder is also the property owner)
ECONOMIC			
Faster Construction	Up to 80% time compression on site	Significant	Large (reduced construction financing costs)
Alternative Business Model	Payment on completion	Small	Large (reduced working capital requirement)
Fewer Defects	Up to 80%	Small	Significant

Note: Figures include adjustments for delivery journeys to the factory and energy consumed during the manufacturing process.

University of Salford MANCHESTER

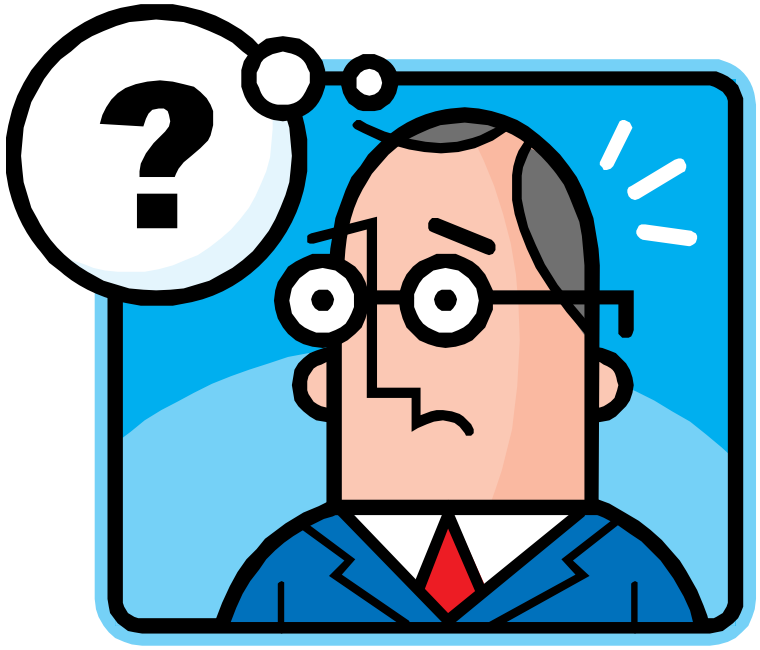
Food For Thought

- Speed
- Economies of Scale
- Quality

So Why Has the Success Only Been Partial?

University of Salford MANCHESTER

So Why Has it Not Succeeded?



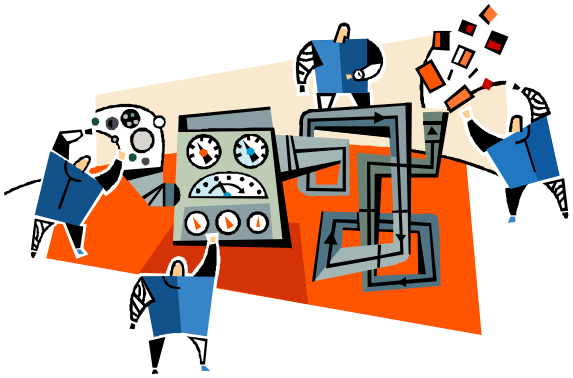
University of Salford MANCHESTER

Exploring it Further

- Post World War Era
- Bigger Status Symbol – Biggest Investment of Life for Some

Knowledge Based Vs Skill Based

University of Salford MANCHESTER

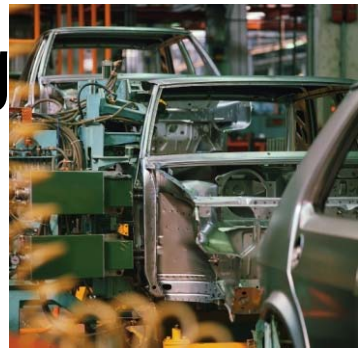


Automation Vs Mechanisation

University of Salford MANCHESTER

Manufactured Construction?

Manufacturing



To

Construction

Construction

To

Manufacturing

So What it Really Is?

University of Salford MANCHESTER

Delivering a Construction Product Through Manufacturing Process

University of Salford MANCHESTER

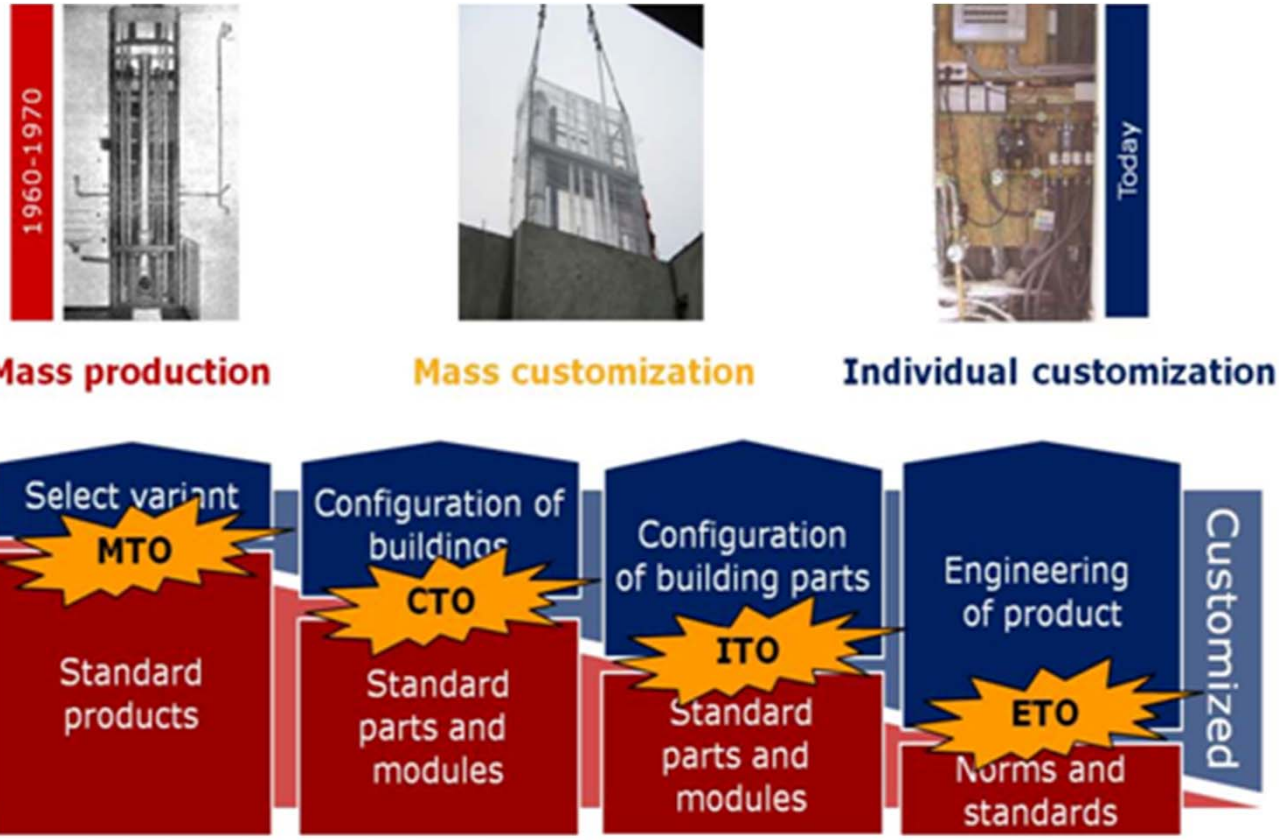
Mass Production to Mass Customization

"…producing goods and services to meet individual customer's needs with near mass
production efficiency"

Tseng and Jiao (2001)

University of Salford MANCHESTER

Mass Production to Customisation Value Chart



Pan and Goodier (2012)

University of Salford MANCHESTER

Mass Customisation

Developing Reusable Systems
Vs
Developing Design Rules and
Go Up

University of Salford MANCHESTER

More to Choose From
Vs
More Choices to Make

University of Salford MANCHESTER

Customer Perception

Low Cost

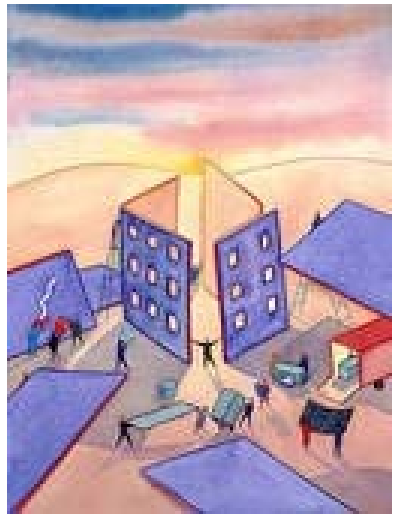
Fragile

Traditional Building Materials

What is the Product Here?

Design for Manufacturing and Assembly

Construction Is Merely Assembly

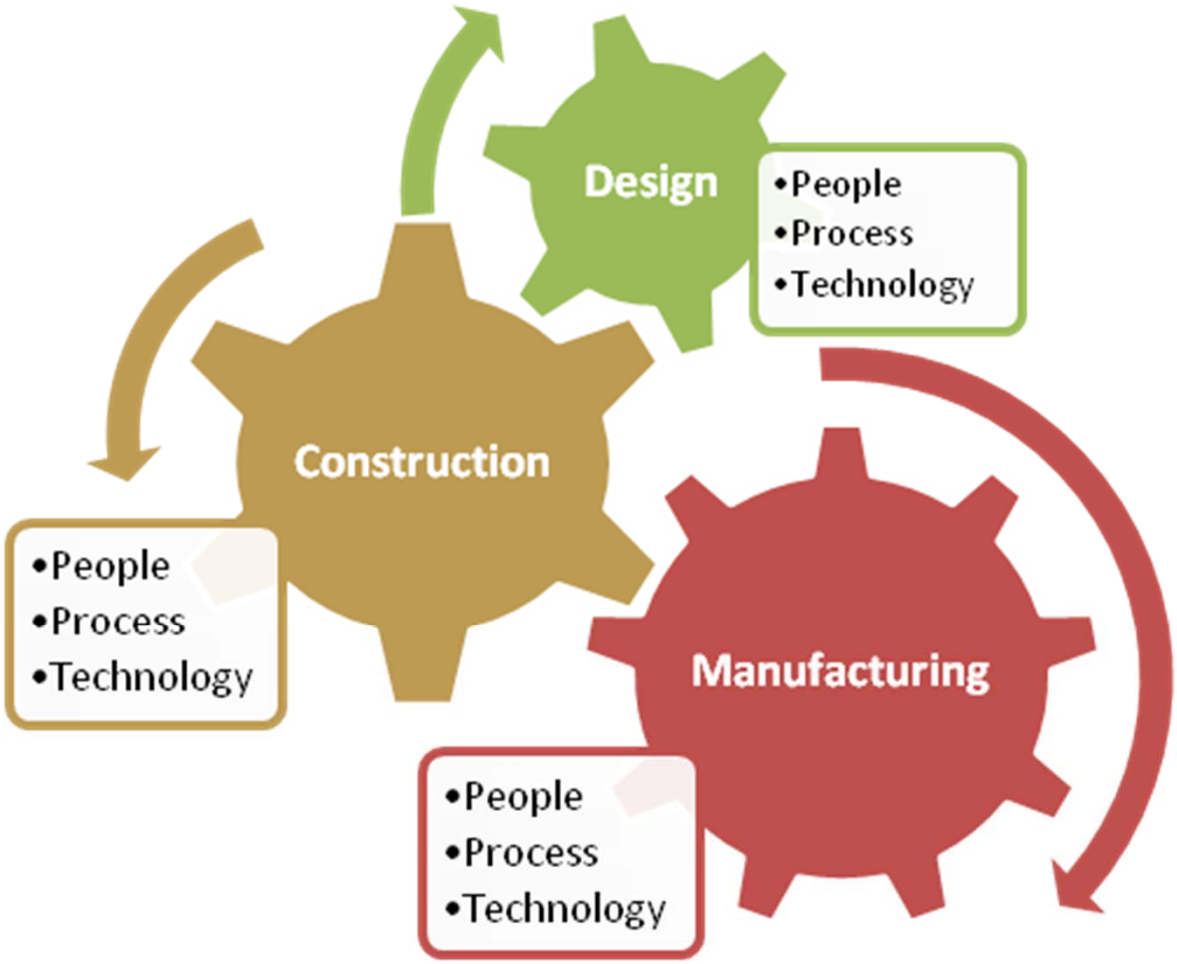


Optimisation of Design Is Where It All Starts

So How Do We Move Forward?

University of Salford MANCHESTER

Roadmap for the Future



Construction People

University of Salford MANCHESTER

Up-skilling personnel

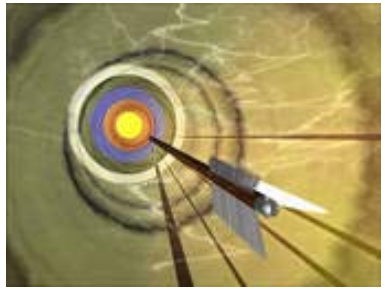
Promoting sustainability

Improving Health & Safety

University of Salford MANCHESTER

Manufacturing People

Improving integrated decision modelling



Maximising training impact

Alignment of new job roles

Design People

University of Salford MANCHESTER

Importance of DfMA and logistics

Need for new skills

Need for new approach to design

University of Salford MANCHESTER

Construction Process

Greater flexibility needed

Integration of process with BIM

Improving the interface of OSP

Manufacturing Process

Learning from other industries

New business models needed

Identifying breakeven point for automation

University of Salford MANCHESTER

Design Process

Adding value to the process

Improving the impact of design/technology

Better lifecycle process analysis

Construction Technology

University of Salford MANCHESTER

Improving product modelling flow

Identification of technology support tools

Better understanding of risk analysis

University of Salford MANCHESTER

Manufacturing Technology

Optimisation of manufacturing payback

Business cases needed for Software

Simulation and modelling tools needed

University of Salford MANCHESTER

Design Technology

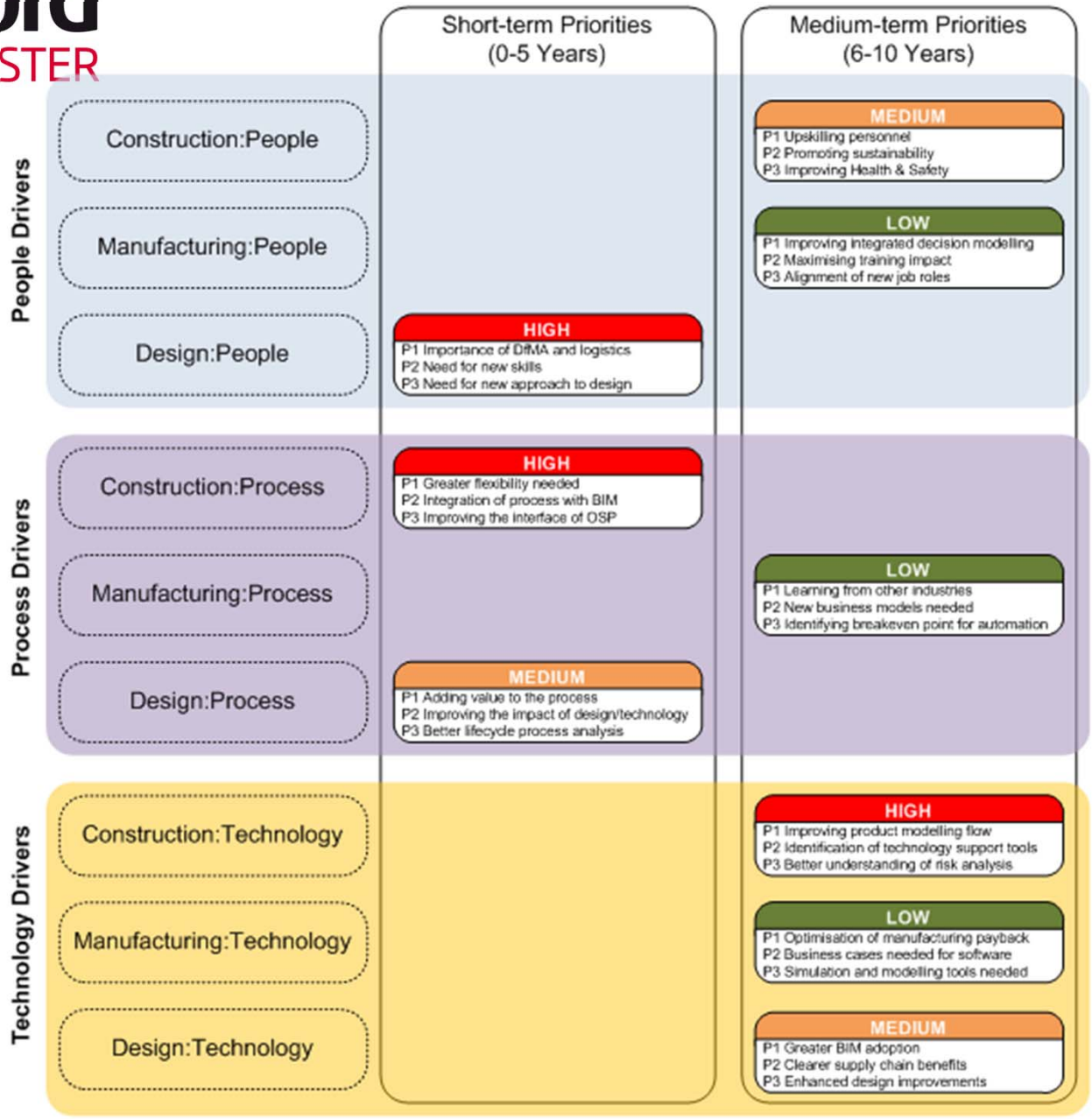
Greater BIM adoption

Clearer supply chain benefits

Enhanced design improvements

The Roadmap

University of Salford MANCHESTER



University of Salford MANCHESTER