



# Standardisation & Modern Methods of Construction

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## North Middlesex University Hospital

Catherine Barns, Senior Project Manager, West Hertfordshire Hospitals Trust:

*"Given the extremely challenging timescale for this project, we needed to look at more innovative methods of procurement and construction. By using an off-site approach we were able to deliver a fantastic building of this scale, on time and in an unreal timescale, which was a tremendous achievement...the project really pushed the boundaries of off-site construction but you would never know it was a modular building constructed in a factory"*



# 1. Policy and Guidance Framework

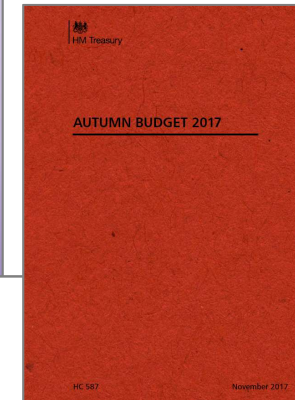
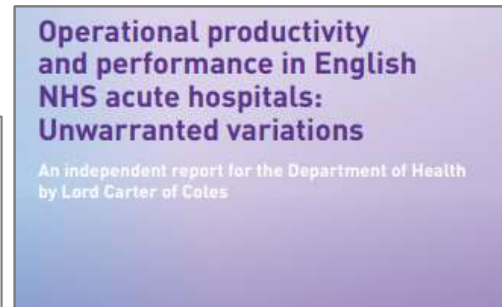
...£5bn of unwarranted variation

...33% cost savings, 50% time

...25% decline in labour force

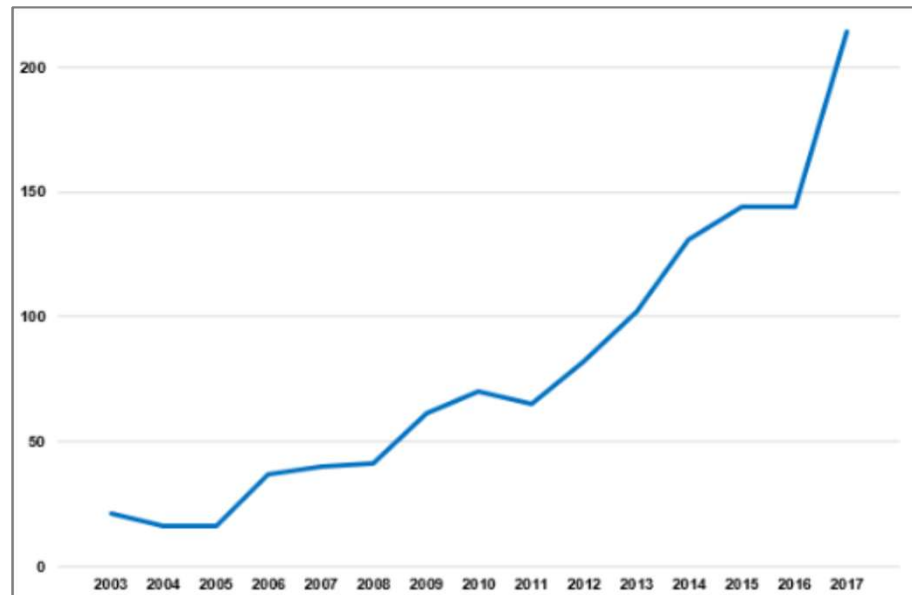
...design for operation

...favour offsite construction by 2019



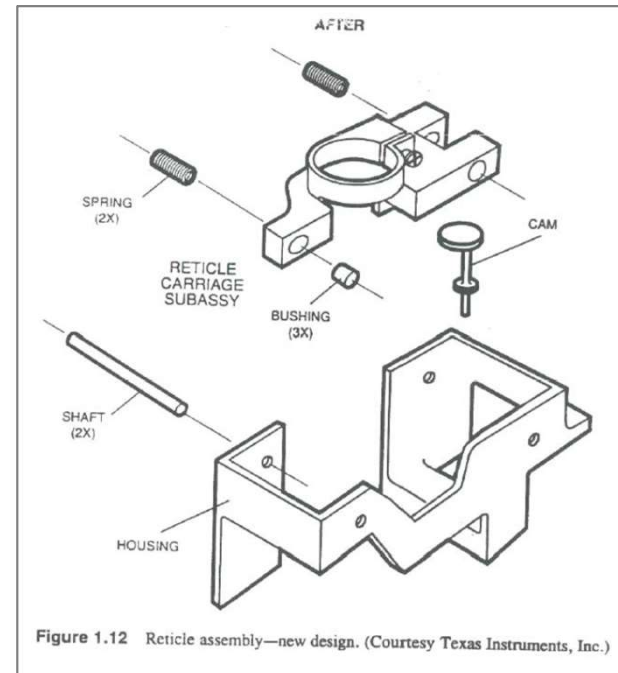
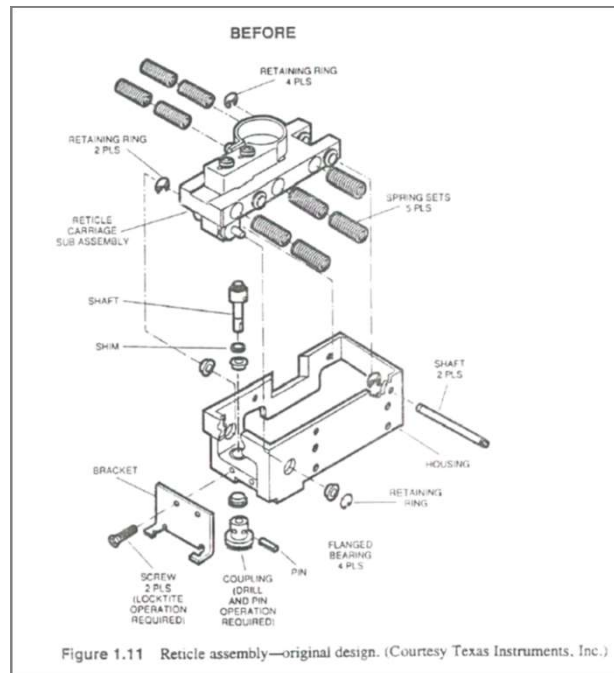
## 2. Benefits of MMC and Standardisation

“Benefits of Off-Site Construction” Google Scholar search



Number of academic papers regarding “Benefits of Off-Site Construction” per annum (2003-2017) – based upon Google Scholar search

## 2. Design for Manufacture and Assembly



In the context of the construction industry, Design for Manufacture and Assembly (DFMA) is an approach best described as **‘improving quality through the application of efficiency.’** – [buildoffsite.com](http://buildoffsite.com)



## 2. Design for Manufacture and Assembly

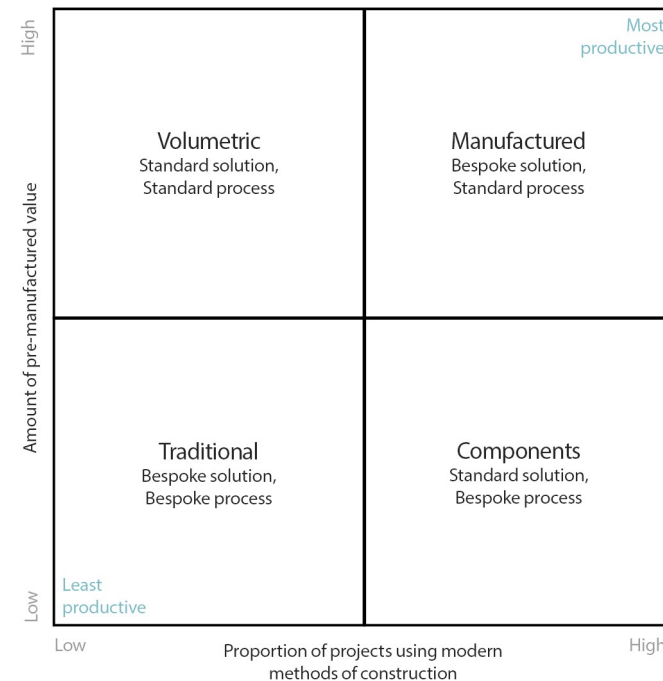


<https://www.buildeffsite.com/themes/bim-dfma/>

## 2. Modern Methods of Construction

...the design, planning, manufacture and pre-assembly of construction elements or components in a factory environment, prior to installation onsite at their intended, final location.

This includes all types of 'industrialisation' from highly efficient manufactured solutions that use standardised processes to deliver bespoke solutions, to the more common component-led project that uses standard components within a bespoke construction process.

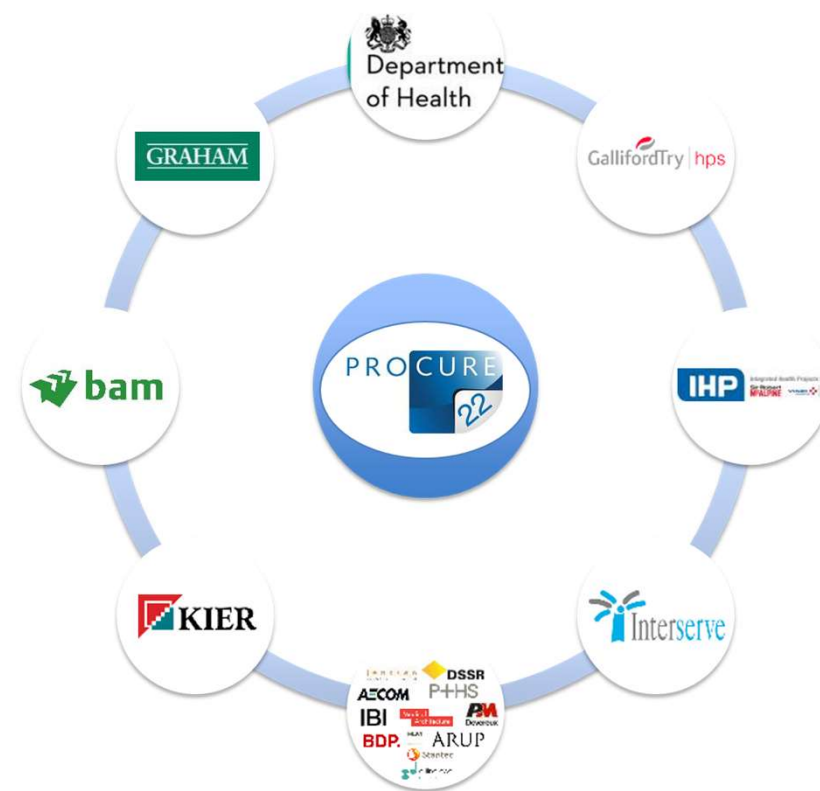


Zurich Services Corporation – 'Modern Methods of Construction (MMC)'  
NAO 'Using Modern Methods of Construction to build homes quickly and efficiently'

Delivery Platforms for Government Assets' – Bryden Wood 2017



### 3. P22 Efficiency and Productivity Programme (EPP) - Virtual Team

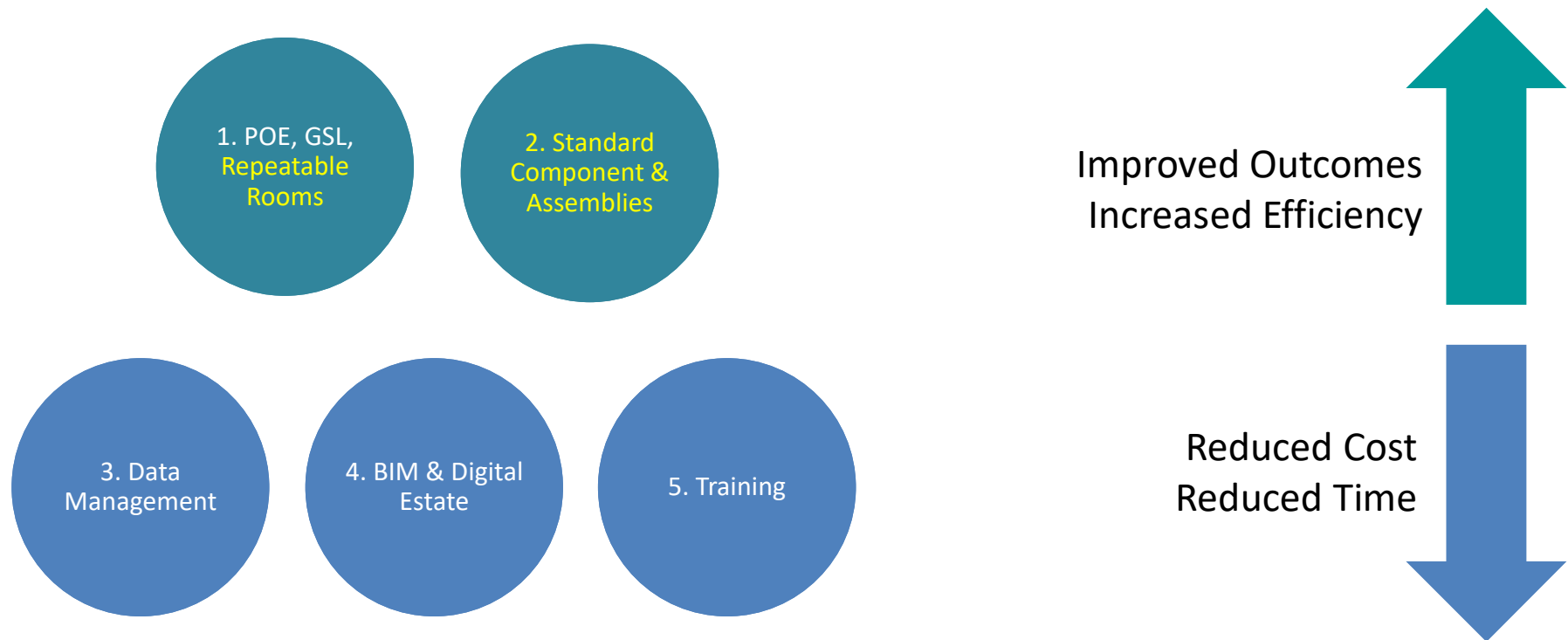




### 3. P22 EPP - Objective

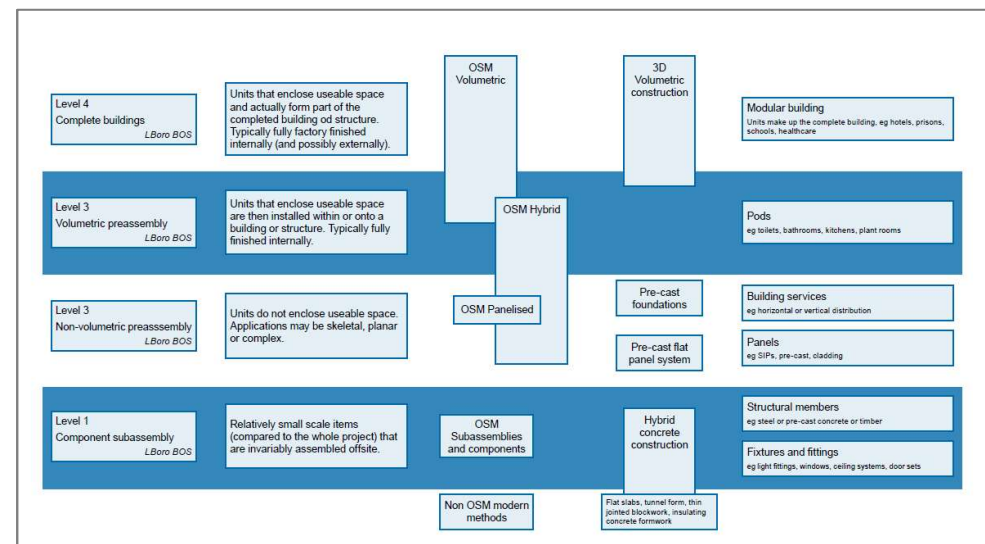
...developing evidence & experience based tools to improve efficiencies and outcomes whilst supporting enhanced clinical outcomes and improved environments for patients, staff and visitors

### 3. P22 EPP - Working Groups



## 4. MMC & Standardised Solutions

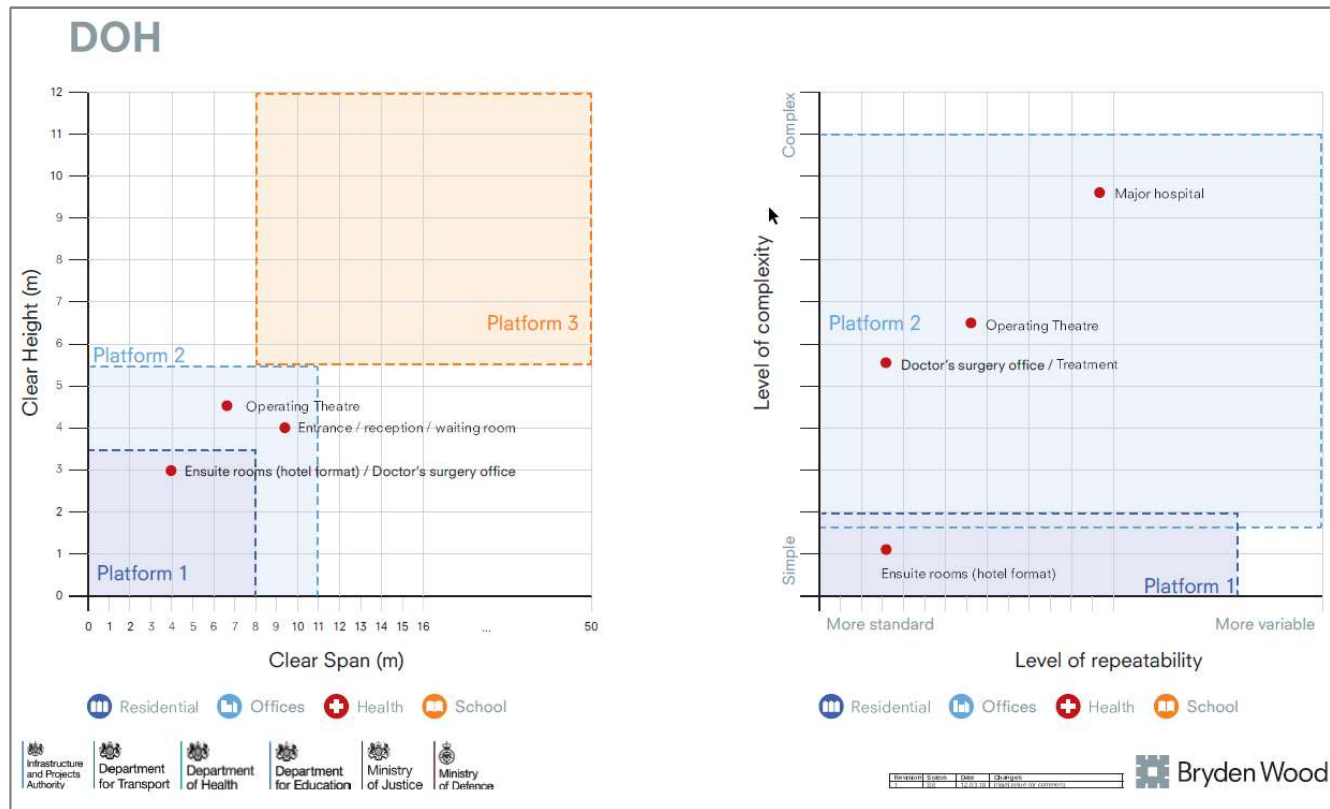
- Repeatable Designs
- Standard Components
- Manufactured Assemblies
- Volumetric



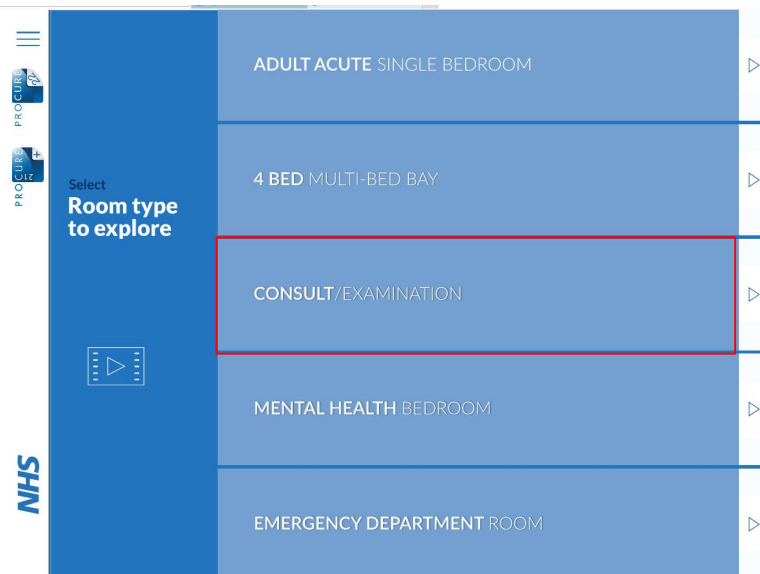
Loughborough University - Build off Site



## 4.1 Standard Designs: Optimal Structural Grids



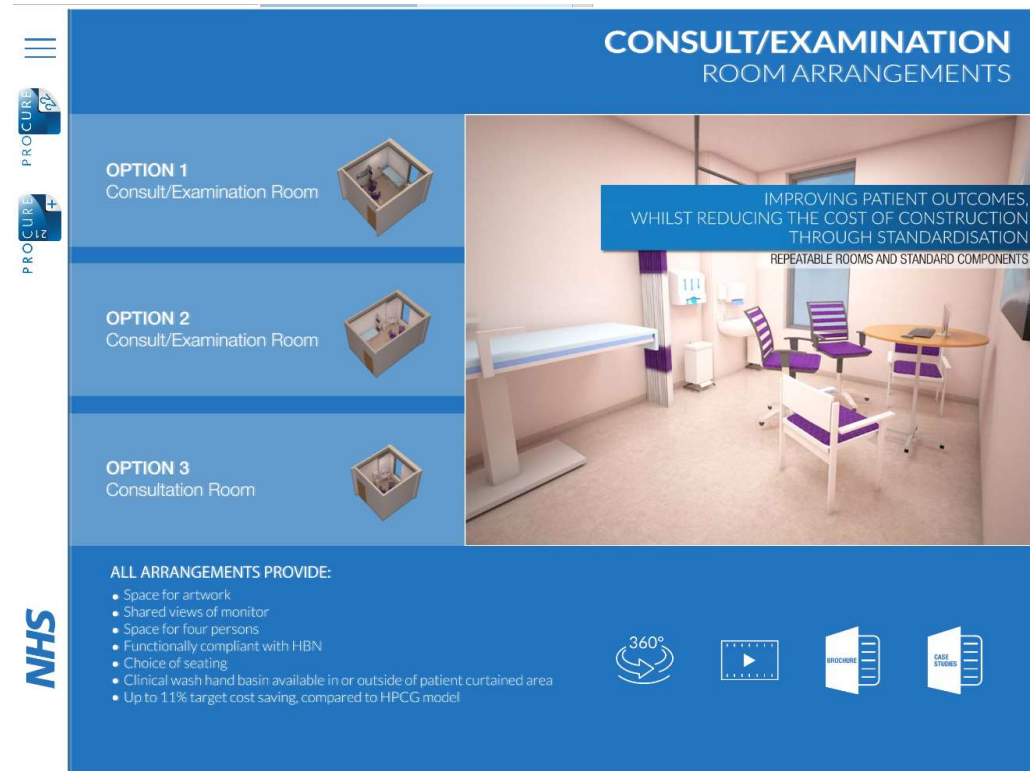
## 4.1 Standard Designs: Repeatable Rooms



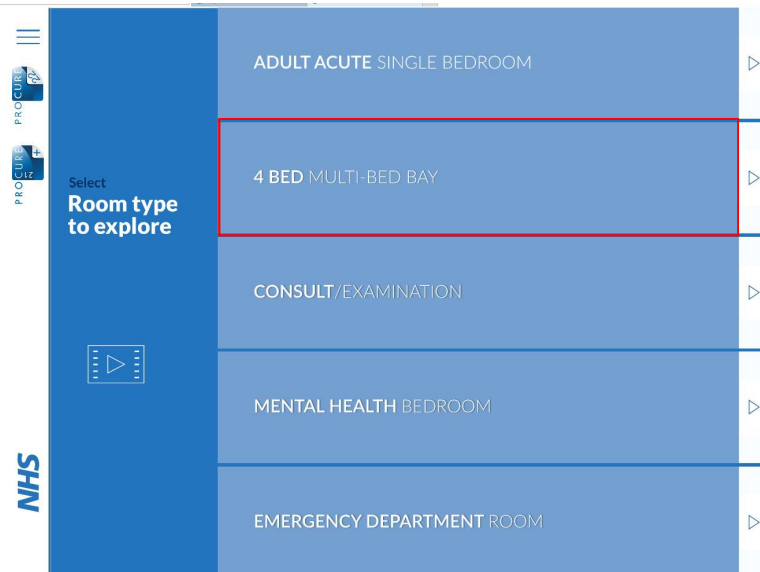
### NHS Reusable Rooms

Peter Hansford, Government Chief Construction Advisor:

*"For six [Principal Supply Chain Partners] to agree to develop and share their designs and procure standard specifications for components across the framework is, frankly, I think a first – it's an exemplar"*



## 4.1 Standard Designs: Repeatable Rooms



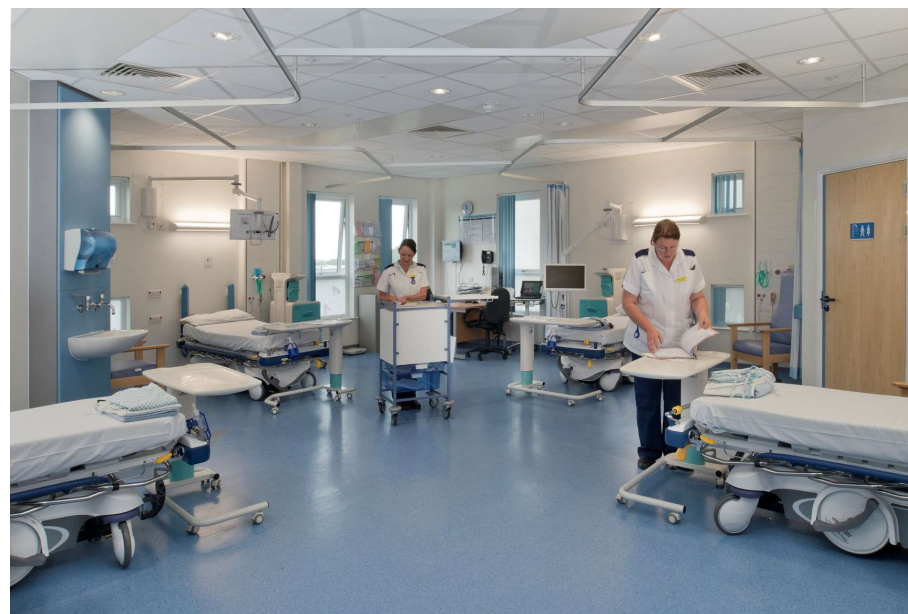
### NHS Reusable Rooms

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## 4.1 Standard Designs: Repeatable Rooms





## 4.1 Standard Designs: Exemplar Study

### Outstanding outcomes

- Pressure ulcer rates, of 1 per 291 patients, less than a 1/3<sup>rd</sup> of the National average
- Nursing staff vacancy rates, of less than 3%, below a 1/3<sup>rd</sup> of the National average
- Patient experience scores have nearly doubled at 86.7%

### Excellent efficiencies

- 4 more beds than the ward below on the same footprint
- 30 minutes saved of non-productive time per staff member per shift
- 79% less maintenance time
- 50% less energy
- £125,000 saving per annum compared to the Trust's newest ward (Maple 2011)

### Shared Learning

- Published POE case study
- Promotion of simulation modelling - taking time to test

CALM MODERN  
friendly motivating  
SAFE PATIENT CENTRED  
practical EMPATHETIC accessible  
FRESH  
HAPPY TEAM functional  
ergonomic Clean  
enthusiastic  
spacious BRIGHT organised  
TIDY FLEXIBLE  
individualised



## 4.1 Standard Designs: Standard Outcome Measures

- Inpatient Ward
  - Mental Health inpatient Ward
  - Urgent and Emergency Dept
  - Outpatients
  - Operating Theatres
  - Maternity
- 
- Renal
  - SCBU
  - Paediatric Outpatients
  - Endoscopy
  - Imaging
  - Critical Care

The image displays five sample forms from the PROCURE framework, each designed for a different healthcare setting. The forms are titled 'Pre-Post Occupancy Evaluation', 'Occupancy Evaluation', 'Inpatient Ward', 'Outpatient', and 'Maternity'. Each form includes sections for 'Introduction', 'Executive Summary', and 'Data Collection'. The 'Data Collection' section contains various tables and checkboxes for recording performance metrics. The forms are branded with the PROCURE logo and include a footer with the text 'Page 1 of 1'.

## 4.1 Standard Designs: Virtual Reality

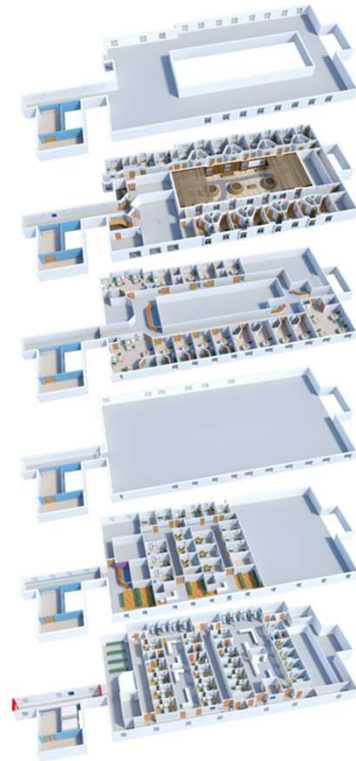
Level 5 Future Plantroom

Level 4 Mental Health Ward

Level 3 Acute Inpatient Ward

Level 2 Future Hot Floor

Level 1 Outpatients



## 4.1 Standard Designs: Repeatable Rooms & Standard Components



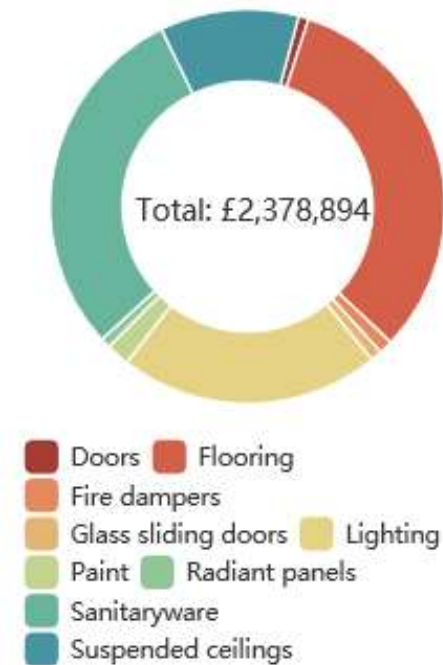
University Hospitals  
of North Midlands  
NHS Trust



## 4.2 Standard Components



NHS Client savings: Q1 2018



## 4.2 Standard Components



## 4.3 Manufactured Systems and Assemblies



Precast concrete frame, unitised façade panels



CLT (Cross Laminated Timber), Glulam and SIPS (Structurally Insulated Panels)



LGS (Light Gauge Steel) framing systems



Prefabricated risers, service runs and trench heating





## 4.3 Manufactured Systems & Assemblies

### Project Capella

Delivered from a blank piece of paper to an enclosed building in 24 months.

Programme reduced by 20 weeks.

Early collaboration allowed for panelisation, 4135 units

the building was wrapped in six weeks by just eight operatives.

Saved 747 deliveries.

Saved 36,050 site man hours.

0 RIDDORs.



## 4.3 Manufactured Systems & Assemblies

### GSK: Factory in a box

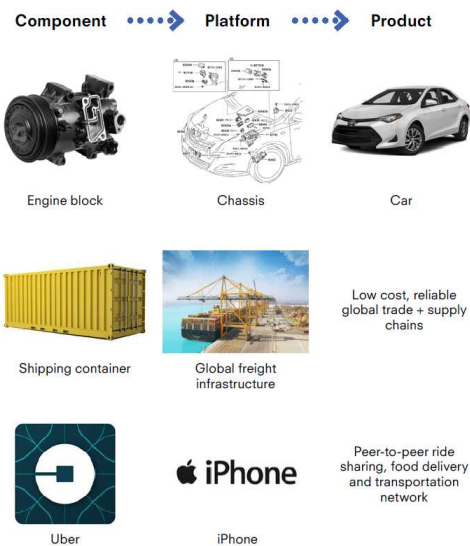
4 weeks instead of 12 to build and

30% saving on cost

81% productivity on site

10% extra cost of materials

Multiple components



## 4.4 Volumetric



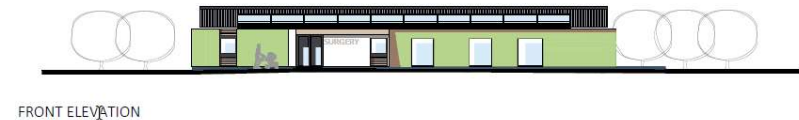


## 4.4 Volumetric



## 4.4 Volumetric

- 6,000 patient list
- 5 Consult/Exam
- Minor Surgery Room
- Pharmacy
- Training / Conferencing / Seminar Room
- 32 weeks to build
- Circa £1,700m<sup>2</sup>
- 665m<sup>2</sup> GIFA, 583m<sup>2</sup> NIA
- Flexible Volumetric solution

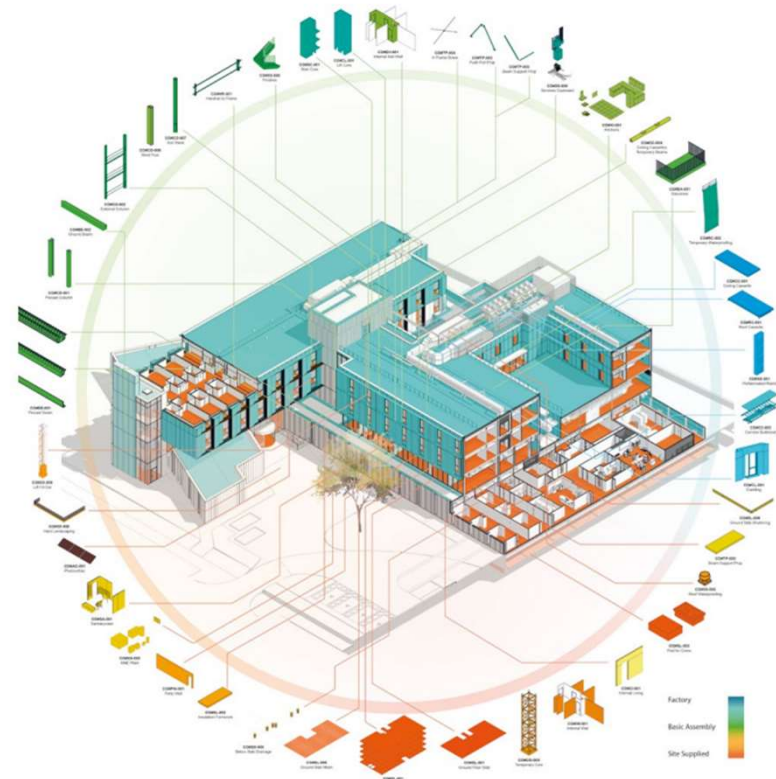


## 5. Summary

Select a set of evidence based service designs and a MMC solution/s that best adds value in terms of:

1. Effectiveness; in delivering its desired outcomes
2. Efficiency; the whole life cost to deliver outcomes

A kit of parts to be applied to those services required in a hub?



Transforming Infrastructure Performance, IPA, 2017



## Mini Sky City, Changsha, China

57 storeys

2736 modules

800 apartments

4.5 months off site in fabrication

19 days on site

