
Better Together: The Power of Collaboration in Singapore's Healthcare Infrastructure

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Healthcare Infrastructure Projects Division

MOH Holdings Pte Ltd

Singapore's Healthcare

1st

most efficient healthcare system

Bloomberg 2014

2nd

healthcare outcomes globally

Economist Intelligent Unit 2014

4th

world's healthiest countries

Bloomberg 2016

6th

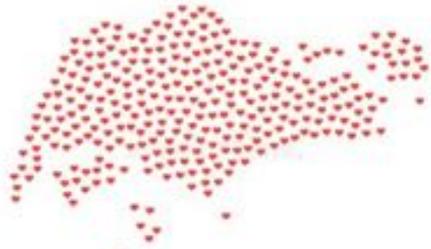
overall healthcare system

World Health Report 2000

We have achieved good health outcomes and have an efficient healthcare system.



1965



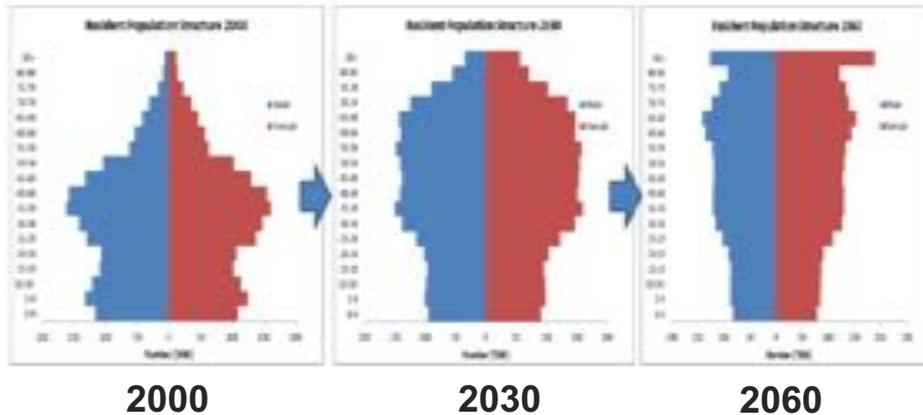
2015



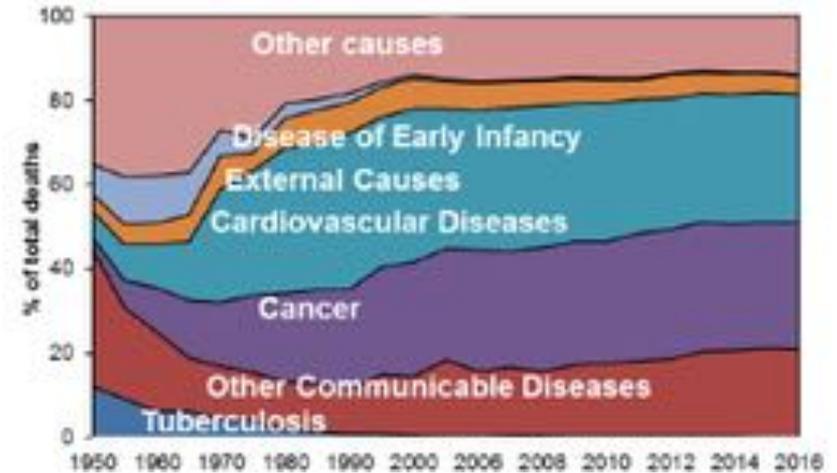
2065



Rapidly ageing population

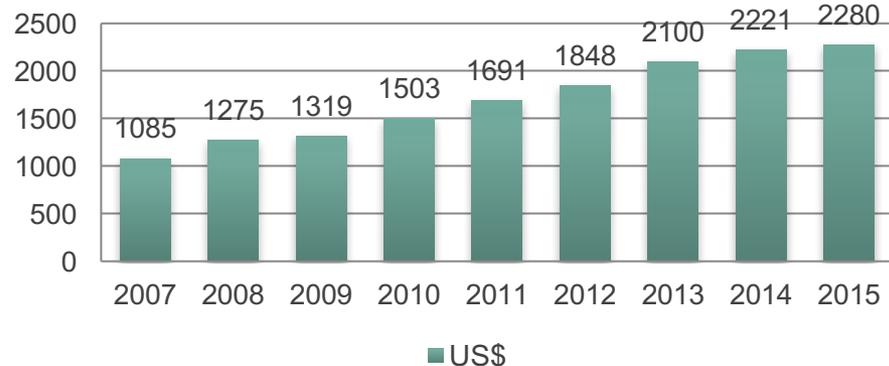


Increasing chronic disease burden



Rising healthcare costs

Health expenditure per capita (US\$)



Increasing demand of healthcare manpower

30,000 additional healthcare workers are needed by 2030.



ACCESSIBILITY

We will receive
healthcare when we
need it

Expand capacity

QUALITY

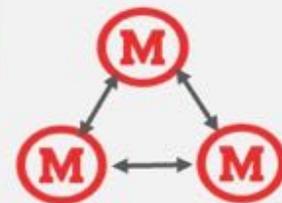
Our healthcare
services will be of
effective and good
quality

*Better quality services &
professionals*

AFFORDABILITY

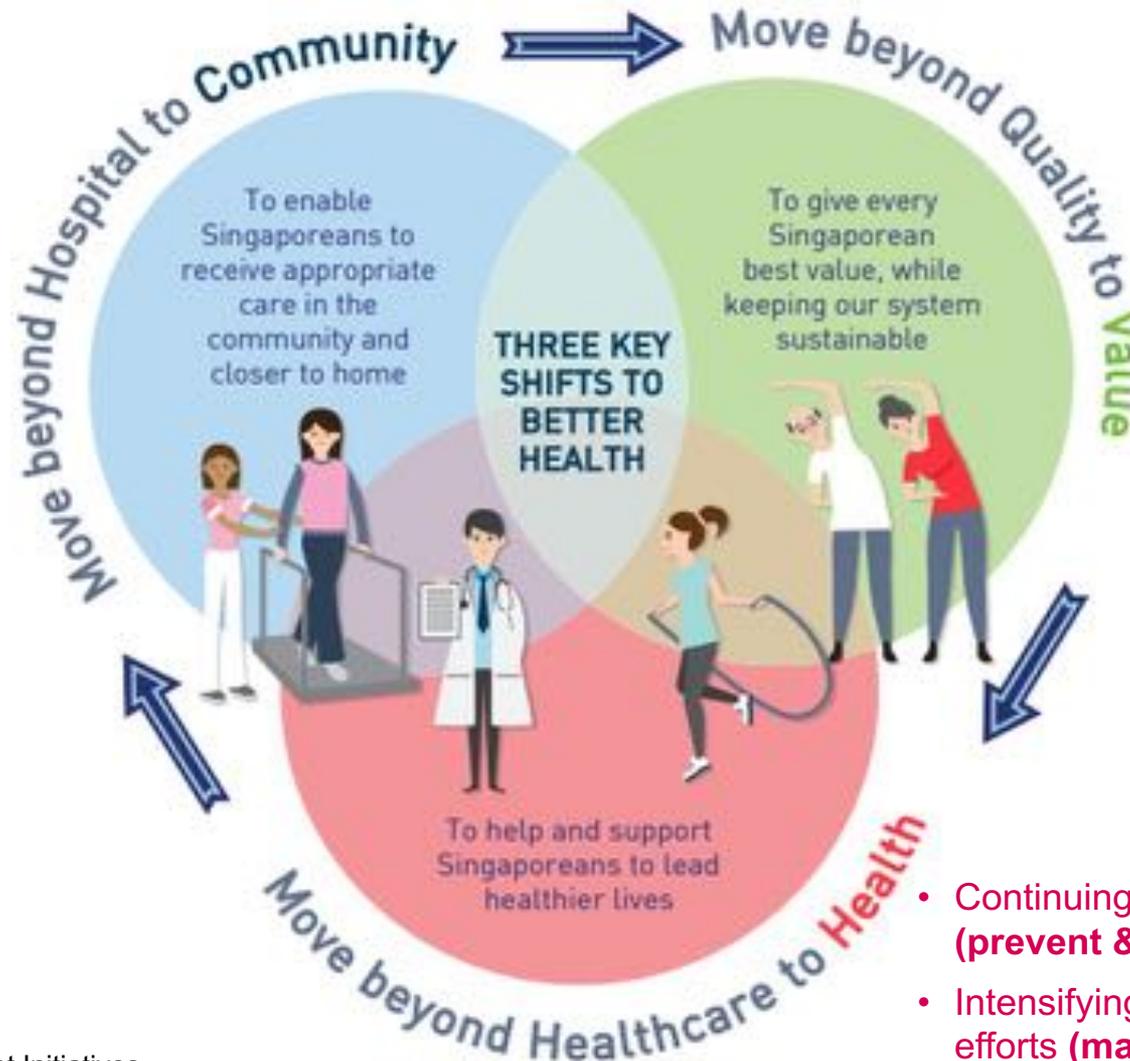
We will be able to
afford such
services

More affordable care



A bigger push towards preventive, primary and community care.

- Strengthen our **primary care** foundation
- Enhancing our **infrastructure**
- Enhance **community support** for the elderly

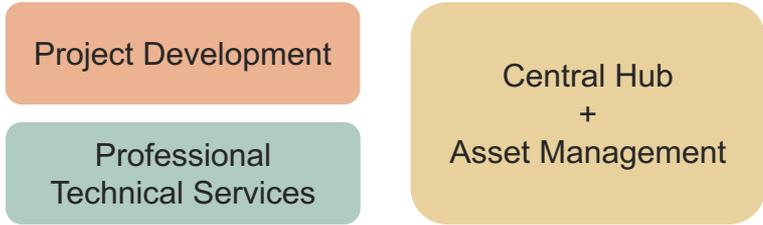


- Towards an **affordable & sustainable healthcare**
- Support **productivity & innovation**
- Nurture a future-ready healthcare workforce

- Continuing the war on diabetes (**prevent & screen**)
- Intensifying tobacco control efforts (**manage & empower**)



Healthcare Infrastructure Projects Division (HIPD)



Vision

To be the leading healthcare infrastructure developer and asset manager in the region

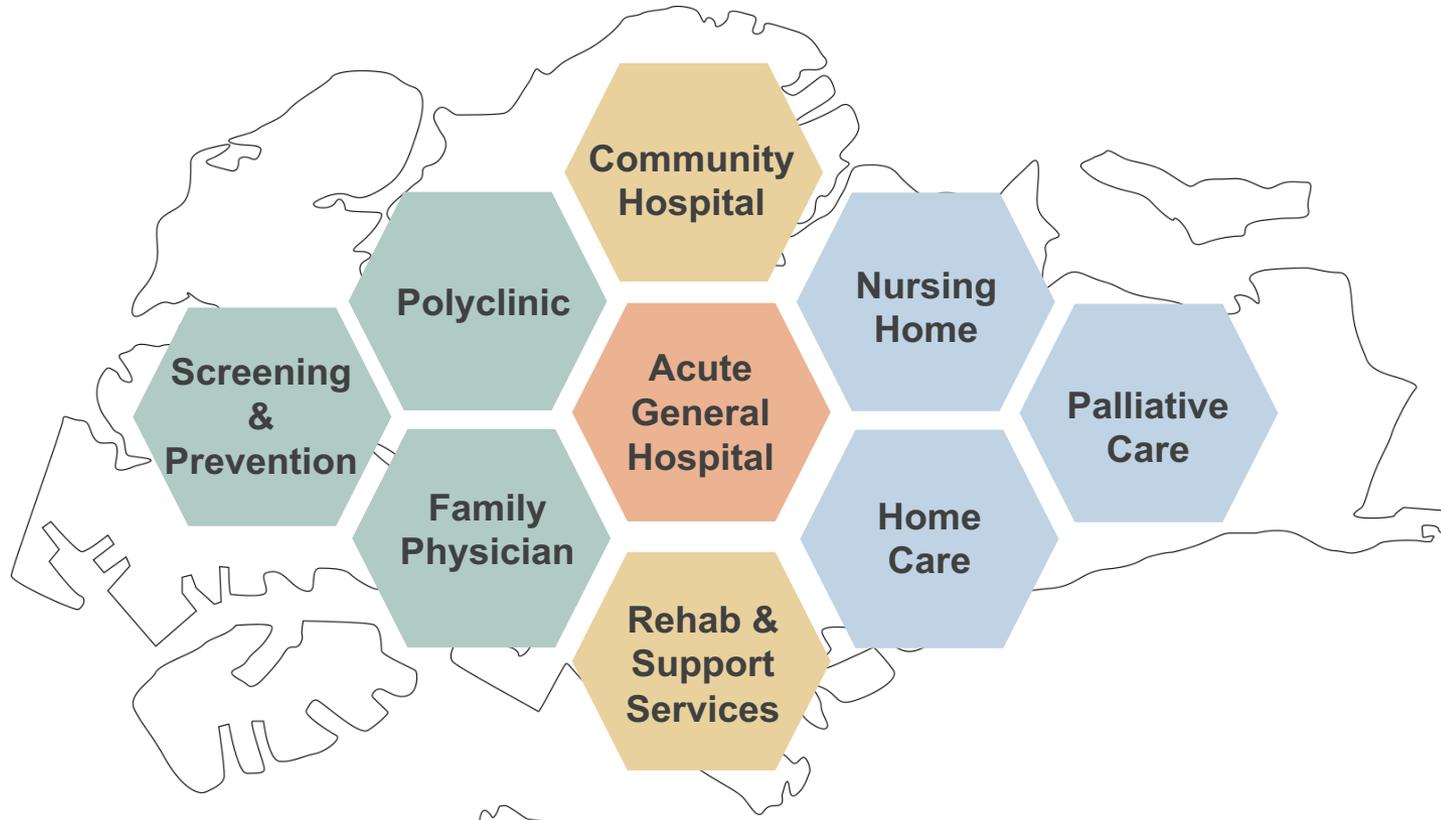
Mission

- To build a multi-disciplinary team of healthcare infrastructure professionals
- To develop a central healthcare infrastructure knowledge repository
- To deliver quality projects on time and within budget

Regional Health System

Improve Quality Outcomes – Raise Care Standards

Integrate Care Through Regional Health Systems



Grow and retain our pool of healthcare professionals

Improve healthcare financing to keep healthcare affordable

Well



Frail 7

Healthcare Infrastructure Projects



**acute
general
hospitals**



**community
hospitals**



master plan



polyclinics



**nursing
homes**



**specialty/
medical
centres**



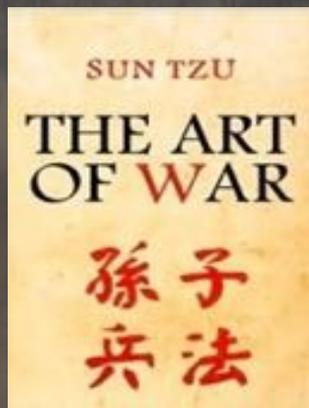
**feasibility
studies**

Ever Changing . . . Collaboration to Success

“Know yourself,
know your enemies.”

- Sun Tzu

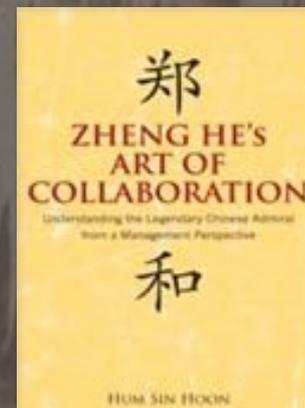
Minimise loss of value.



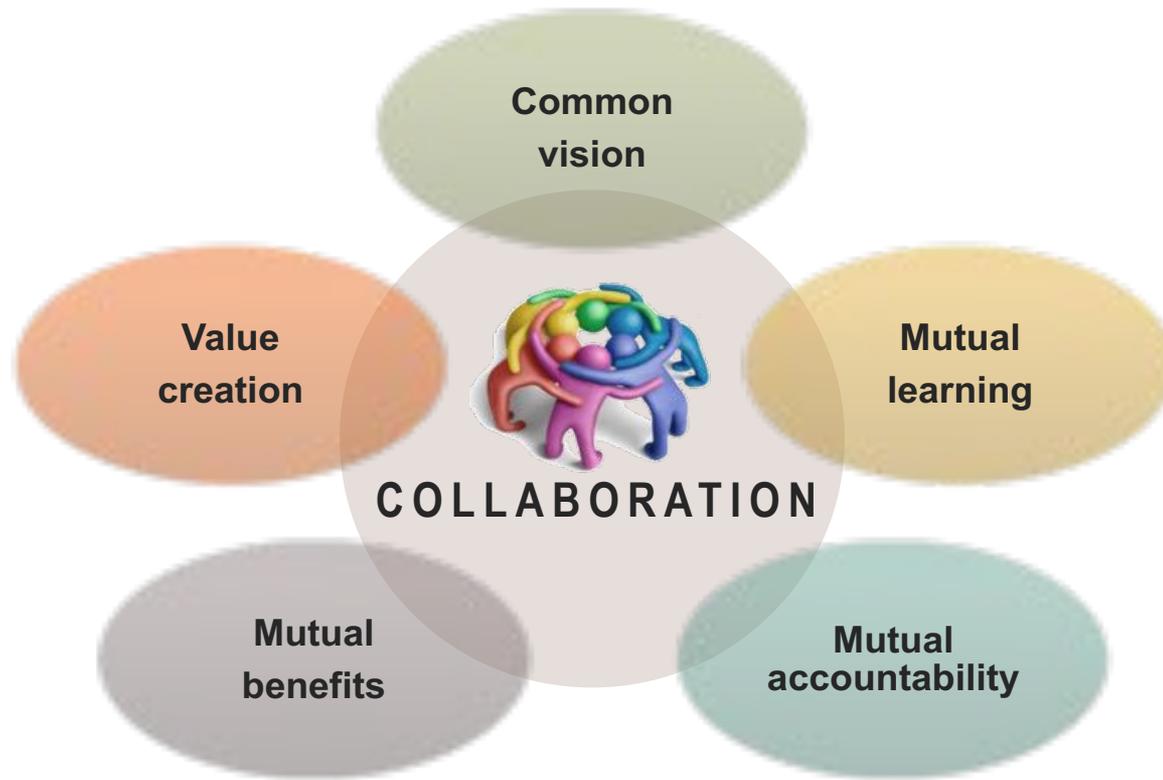
“Know yourself,
know your collaborators.”

- Zheng He

Maximise value and benefit for all.



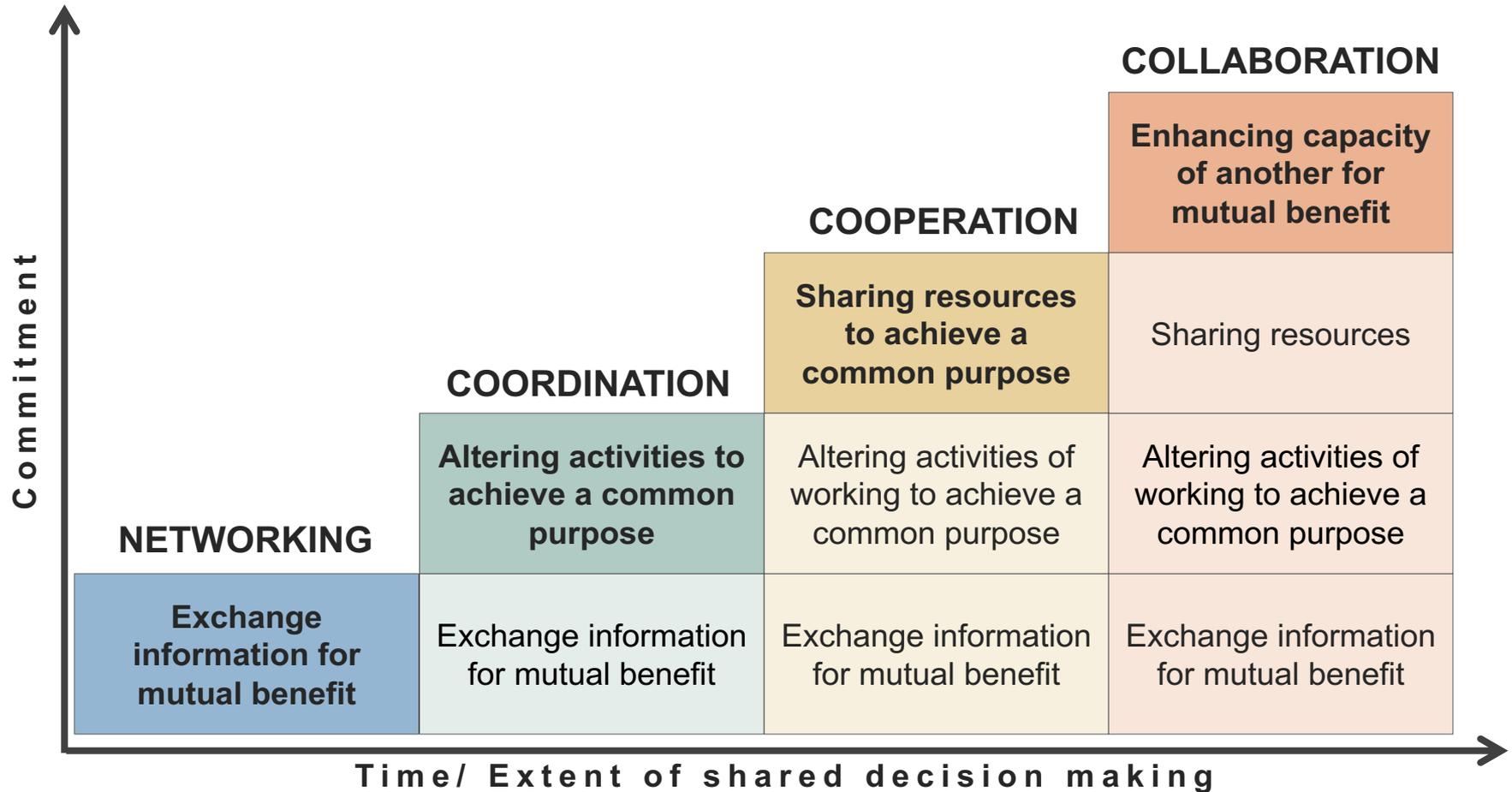
What is Collaboration?

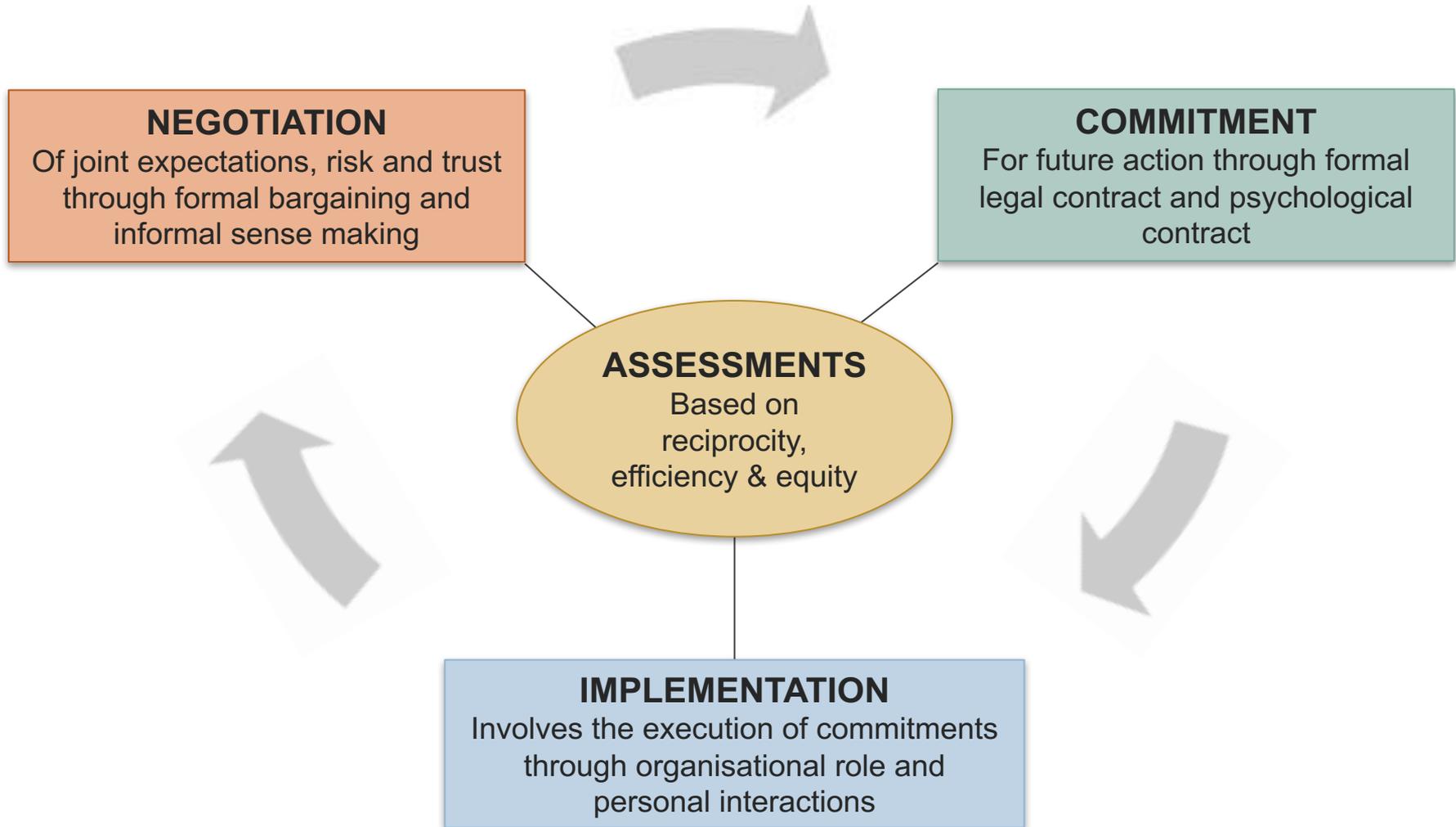


“Collaboration is a process through which parties who **see different aspects of a problem** can **constructively explore their differences** and **search for solutions** that go beyond their own limited vision of what is possible.”

- Prof. Barbara Gray, Professor Emeritus of Organizational Behaviour, The Pennsylvania State University

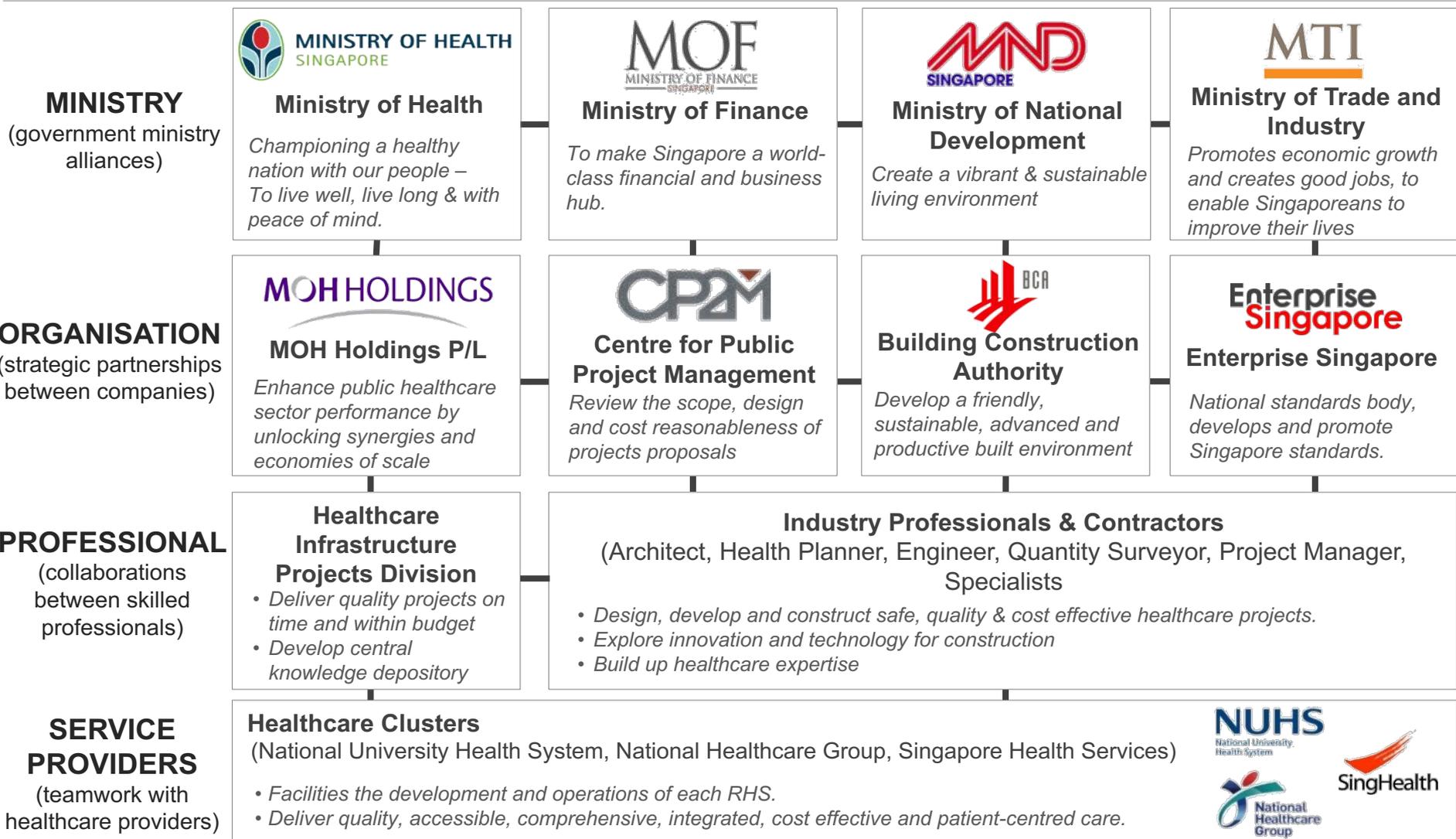
Initiating Collaboration





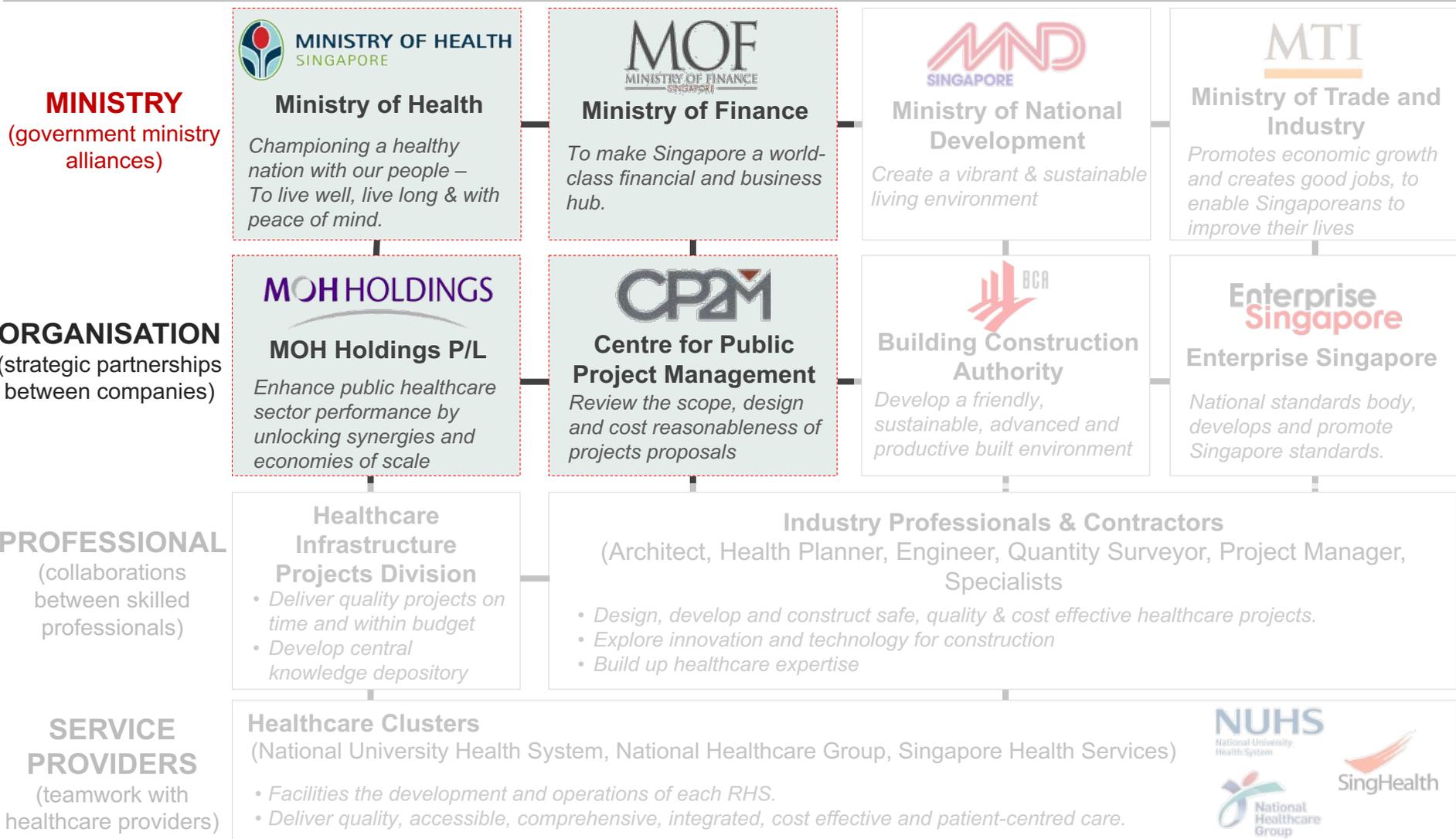


Our Collaborators



QUALITY, AFFORDABLE, SUSTAINABLE, PRODUCTIVE, INTEGRATED CARE FACILITIES.

Ministry Collaboration



QUALITY, AFFORDABLE, SUSTAINABLE, PRODUCTIVE, INTEGRATED CARE FACILITIES.

MOH/MOHH & MOF/CP2M: Funding & Procurement Approval

Ministry Collaboration

Organisational Collaboration

Professional Collaboration

Service Providers
Collaboration

Value Management – Gateway Processes



Business Case

- Enhance robustness of project proposals
- Scrutinise project objectives, scope and design
- Review national impact of project



Innovation / Value-add

- Explore opportunities for innovation & synergies in systems, processes and features
- Improve project outcomes at a Whole of Government level.



Optimisation

- Optimise scarce land, space and financial resources through judicious independent expert review

VALUE MANAGEMENT

Useful purpose

Beneficial outcomes

Important features

Develop healthcare facilities:



Space Norms



Cost Norms

Project Outcomes: Outram Community Hospital

Ministry Collaboration

Organisational Collaboration

Professional Collaboration

Service Providers
Collaboration



PROJECT DATA

- **Site area:** 1.7 Ha
- **GFA:** 148,000 m²
- **No. of floors:** 19 storeys + 4 basements
- **Total beds:** 550 beds
- **Status :** Under construction

Concurrent Activity 1

Allow tender for substructure to be called and awarded before budget approval.



Time Savings*:
11 months

Concurrent Activity 2

Allow tender for superstructure works to be called, but not awarded before DPC approval.



Time Savings*:
3 months

Value for money

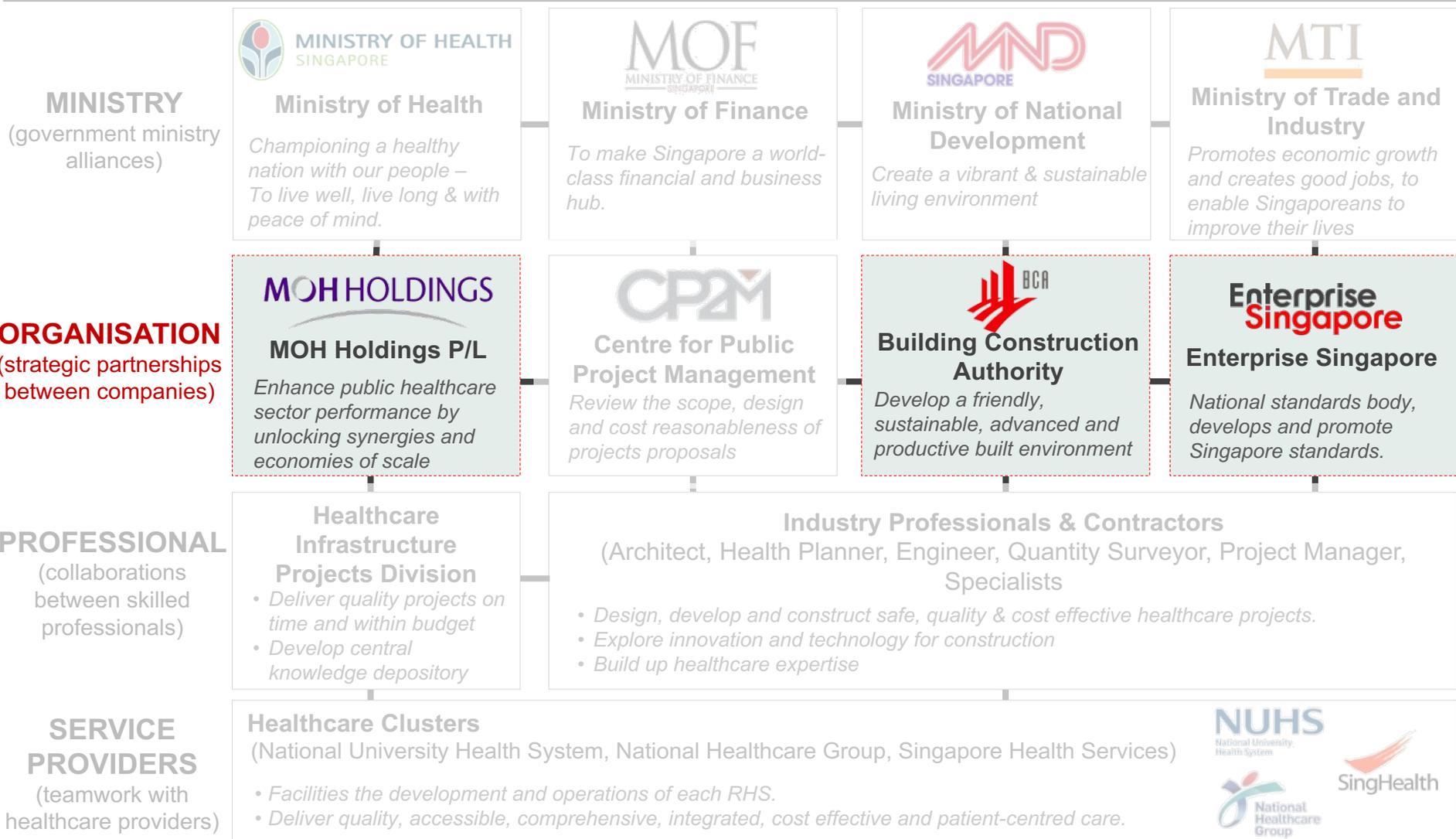
Use of larger diameter piles at the column grids → reduce number of piles between grids.



Estimated savings:
\$5 M

* The net time savings was 13 months due to concurrent works and processes.

Organisational Collaborations



QUALITY, AFFORDABLE, SUSTAINABLE, PRODUCTIVE, INTEGRATED CARE FACILITIES.

Construction Industry Transformation Map (ITM)

Ministry Collaboration

Organisational Collaboration

Professional Collaboration

Service Providers Collaboration

Construction Industry Transformation Map (ITM) Thrust: Advanced and Integrated Sector

Green Buildings

3rd Green Building Masterplan Review



↑ **80% (2030)**
+ **34% (2017)**
GREEN BUILDINGS

SHI 2020 Implementation Roadmap

Achieve **5% energy savings** (healthcare facilities) (against the acceptable national reference)

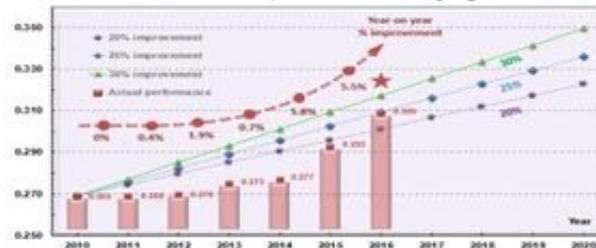
Design for Manufacturing and Assembly (DfMA)

DfMA Adoption



↑ **40% (2030)**
+ **20% (2017)**

2 – 3% annual productivity growth



Integrated Digital Delivery (IDD)



Cities of Tomorrow R&D Program (CoT)

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Professional Collaboration

Service Providers Collaboration

A multi-agency effort that seeks to leverage R&D to establish Singapore as a highly liveable, sustainable and resilient city of the future, and as a vibrant urban solutions hub.



Advanced Construction

- Productive construction
- Resource & land optimisation
- Nuisance mitigation



Resilient Infrastructure

- Building structure & façade fixtures
- Building systems



New Spaces

- Underground spaces
- Land reclamation



Greater Sustainability

- Urban ecosystems
- Quality living
- Energy & resource efficiency
- Coastal protection

- **Urban environment analytics**

- **Complex science for urban solutions**

Collaboration objective:

- Develop **advanced DfMA solutions for multi-storey framed buildings**, at system level that is:
 - highly productive & cost-effective

Organisational collaboration



Desired outcomes:

- Improve **construction productivity** by **≥30%**
- Reduce **≥50%** of cycle time, without increasing workforce
- Reduce **≥30%** of construction period, without increasing workforce

Project Outcomes: Woodlands Care Home (WCH)

Ministry Collaboration

Organisational Collaboration

Professional Collaboration

Service Providers Collaboration



Strategies

- DDB ECI procurement
- PPVC DfMA system
- Regular grid design
- Module standardisation
- BIM utilisation
- Site mechanisation

PROJECT DATA

- **Site area:** 0.3 Ha
- **GFA:** 9,000 m²
- **No. of floors:** 9 storeys
- **Total beds:** 248 beds
- **Status:** TOP Jun'17 (3 mths earlier)
- **Buildable Design Score:** 80 (Min. 79)
- **Constructability Score:** 70 (Min. 47)
- **Productivity Manpower Data:** 0.83 m² per man day



In Process Outcomes

- Reduce dust & noise
- Relieve space constraint
- Create safer worksite – zero site incidence
- Speedy PPVC erection
- 3 months (3rd to roof)



Benefits

- Better on site quality
- Reduce rectification works
- Improve synergy & coordination
- Reduce rectification works
- Manpower savings
- Reduce construction period



< 4 months for manufacturing in factory & assembling on site



82% PPVC per floor (L3 – L9)



30% time savings *



65% manpower savings *

* Compared to conventional construction

MOHH & Enterprise Singapore: Facility Guidelines for Healthcare Infrastructure (FGHI)

Ministry Collaboration

Organisational Collaboration

Professional Collaboration

Service Providers
Collaboration

COLLABORATION

2012: Initiate

- Network
- Coordinate
- Cooperate
- Collaborate



NEGOTIATION

2013: Facilities Guidelines for Healthcare Infrastructure (FGHI) Roadmap



COMMITMENT

2014/2015: TR 42:2015 – Technical Reference for Facility Design Guidelines for Acute General Hospitals

- Submit New Work Item Proposal
- Form Working Group (WG) Committee
- Draft & develop TR with WG
- Seek approval from Technical Committee (Architectural Works) and Building Construction & Standards Committee (BCSC)



ASSESSMENT

2016: Adoption Workshop
2017: Coordination Meeting



IMPLEMENTATION

2015: Publish & launch TR 42:2015



'It's great that we have now standardised the classification of isolation rooms in this TR to allow consistency for discussion in the industry.'



Ms Yong Seow Kin
Member, WG
Director, Facilities Development,
SingHealth Services P/L

- **19 WG members from 17 agencies & consultancies**
- **Standardised 5 Key and 15 Functional Planning Units**
- **560 comments from WG**

MOHH & Enterprise Singapore: Facility Guidelines for Healthcare Infrastructure (FGHI)

Ministry Collaboration

Organisational Collaboration

Professional Collaboration

Service Providers
Collaboration

COMMITMENT

2016/2017: TR 59:2015 – Technical Reference for Facility Design Guidelines for Community Hospitals



- 14 WG members from 10 agencies & consultancies
- Standardised 2 Key and 5 Functional Planning Units

IMPLEMENTATION

2017: Publish & launch TR 59:2017



ASSESSMENT

3-year provisional application period



IMPLEMENTATION

NEW healthcare projects

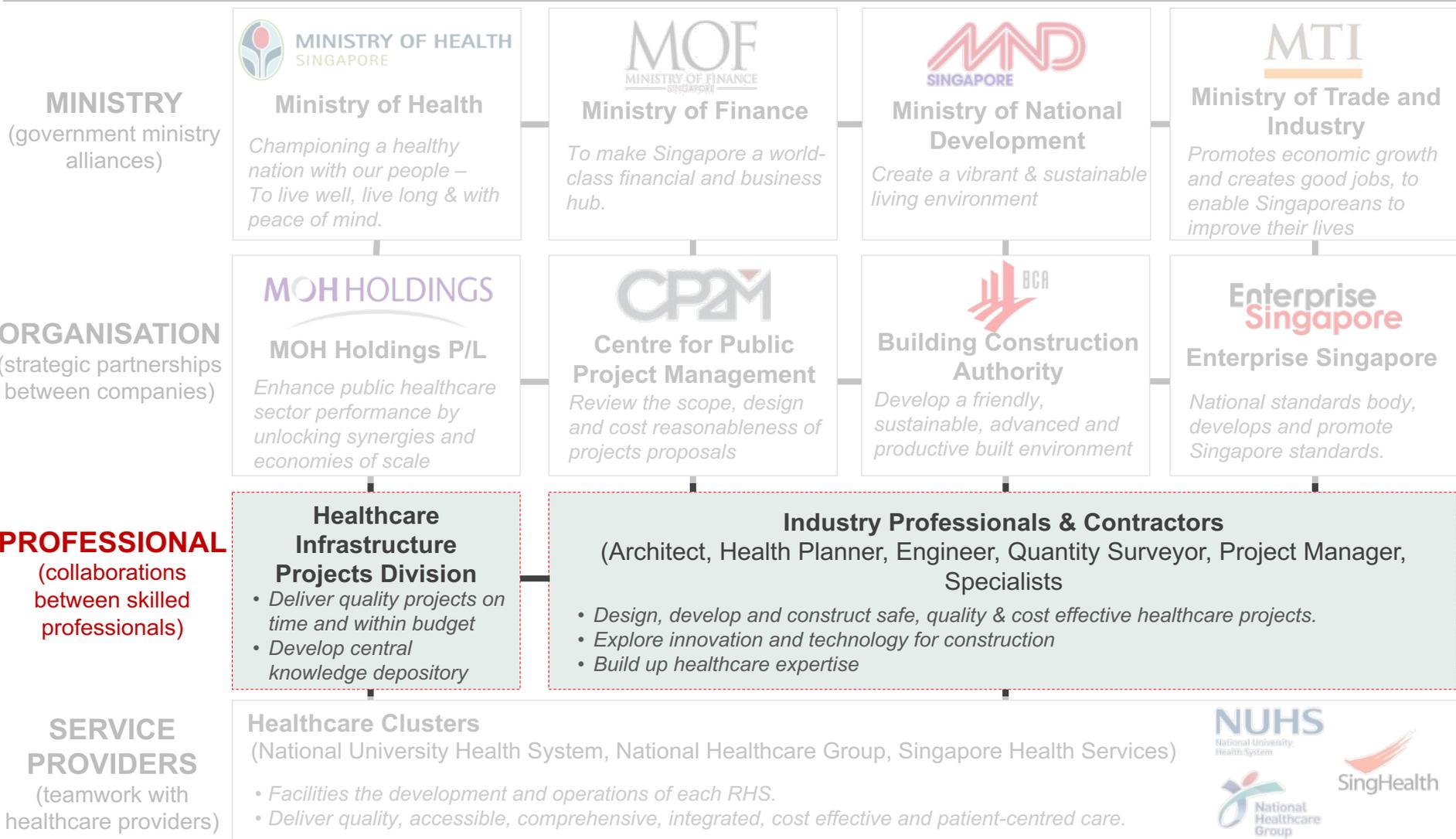


Woodlands Health Campus

Integrated Care Hub

SGH Elective Care Centre

Professional Collaborations



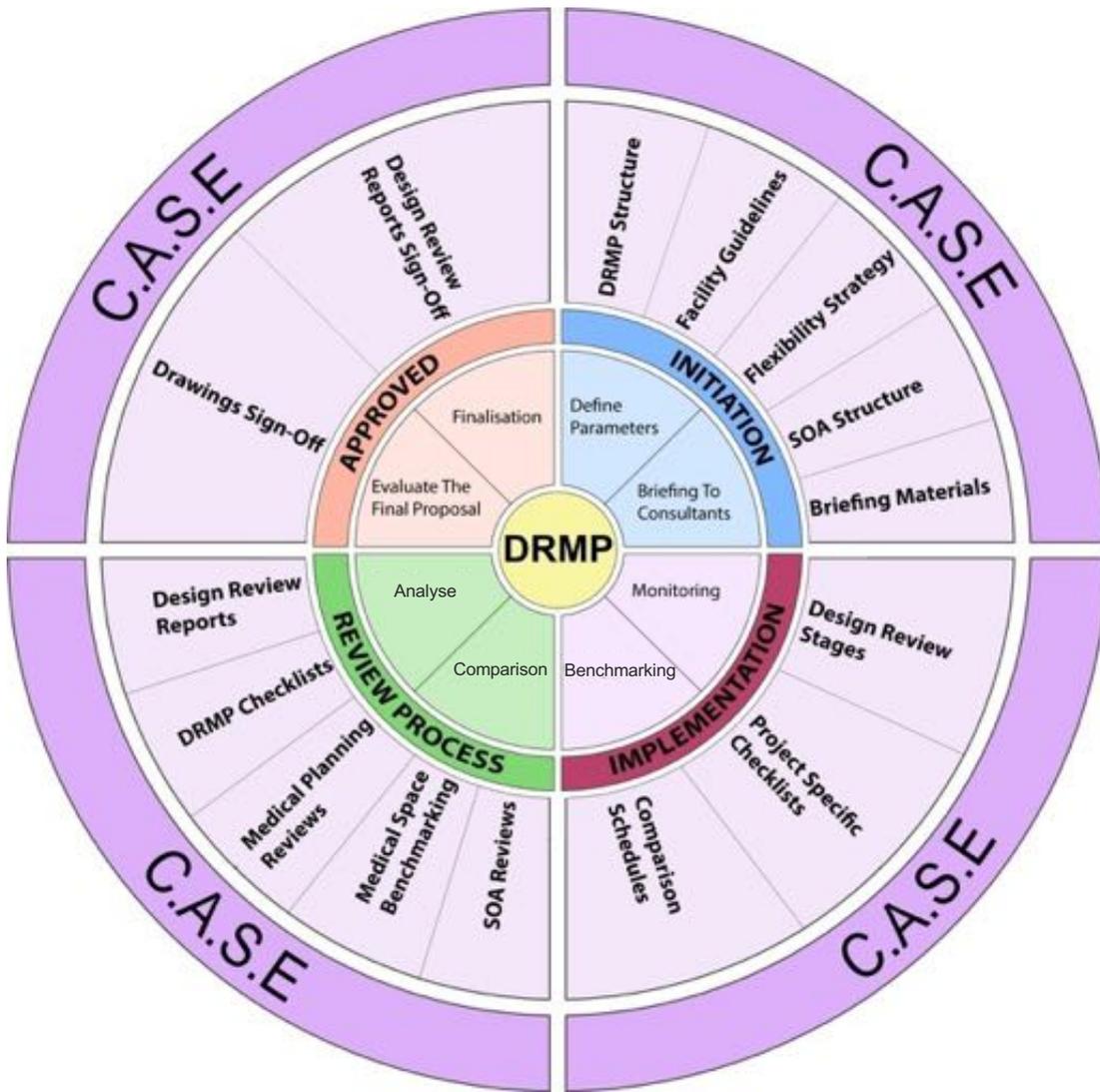
QUALITY, AFFORDABLE, SUSTAINABLE, PRODUCTIVE, INTEGRATED CARE FACILITIES.

HIPD, Consultants & Clusters: Design Review Management Plan (DRMP)



Design Review Sign-Off

Name: Dr Kain Beng Thong Designation: Chief Executive (Infrastructure Projects)	Signature: [Signature]	Date: [Date]
AND Name: Cheng Peng Designation: Deputy Director, Healthcare Infrastructure	Signature: [Signature]	Date: [Date]
AND Name: Dr Jason Cheah Designation: Chairman, Project Steering Committee	Signature: [Signature]	Date: [Date]
AND Name: Polly Cheung Designation: Chief Executive (Capital Planning)	Signature: [Signature]	Date: [Date]
AND Name: Dr Wong Kwik Chean Designation: Chief Clinical Services Manager	Signature: [Signature]	Date: [Date]



Facility Guidelines for Acute General Hospitals (FGAGH)

MOH Holdings Pte Ltd

FUNCTION	Proposed Developments			ETM	Remarks (Row)	NTON
	No.	Area m ²	Net Area m ²			
01 Site Level Zone						
02 Resuscitation & Trauma						
03 Resuscitation Bay						
04 DRP Station						
05 Monitoring Cables Tray						
06 Adult Treatment Cables						
07 DRP Station						
08 SHARED SUPPORT AREA						
09 Bay Resuscitation						
10 Bay Resuscitation						
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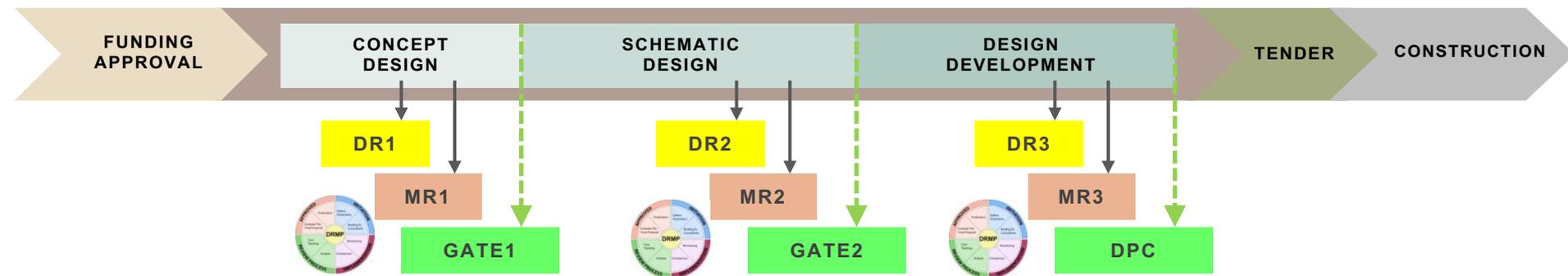
Emergency Unit - Number of Cables / Rooms / Beds						
	EMUC	EMUCP	EMUCP	EMUCP	EMUCP	EMUCP
Emergency Unit - Total Departmental Area (sqm)	1000	1000	1000	1000	1000	1000
P1 Resuscitation / Trauma Suite	8	10	8	8	8	12
P2 Beds	20	50	28	30	20	N/A
P3 Beds	20	50	28	30	20	N/A
Observation Cables	12	10	7	7	7	28

Demolition/Construction Details			
No.	Area	Net Difference	Net Difference
1	2.0m x 1.0m	2.0m ²	0.0m ²
2	3.0m x 3.0m	9.0m ²	0.0m ²
3	1.0m x 1.0m	1.0m ²	0.0m ²
4	1.0m x 1.0m	1.0m ²	0.0m ²
5	1.0m x 1.0m	1.0m ²	0.0m ²
6	1.0m x 1.0m	1.0m ²	0.0m ²
7	1.0m x 1.0m	1.0m ²	0.0m ²
8	1.0m x 1.0m	1.0m ²	0.0m ²
9	1.0m x 1.0m	1.0m ²	0.0m ²
10	1.0m x 1.0m	1.0m ²	0.0m ²
11	1.0m x 1.0m	1.0m ²	0.0m ²
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85	1.0m x 1.0m	1.0m ²	0.0m ²
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87	1.0m x 1.0m	1.0m ²	0.0m ²
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MOHH/HIPD, Consultants & Clusters: Design Review Management Plan (DRMP)



DESIGN STAGES



	Stage 0 General	Stage 1 Feasibility	Stage 2 Design			Stage 3 Tender	Stage 4 Construction	Stage 5 Completion	Stage 6 Post Completion
	Masterplan (MP)	Concept (CD)	Schematic (SD)	Detail (DD)		Sign Off i.e. Based on DD Sign-Off	Sign Off i.e. Room Book, Mock Up, Materials Selection, Signage Package	Sign Off i.e. Updated Room Book, Handover Package As Built Drawings, SOA	Sign Off i.e. Defect list
	MP - DR	CD - DR	SD - DR	DD - DR					
	MP - MR	CD - MR	SD - MR	DD - MR					
Funding Approval	Sign Off i.e. Masterplan / Feasibility Report	Sign Off i.e. CD Report GATE 1 Approval	Sign Off i.e. SD Report GATE 2 Approval	Sign Off i.e. DD Report DPC Approval					

MOHH/HIPD, Consultants & Clusters: Design Review Management Plan (DRMP)

Ministry Collaboration

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Collaboration

HIPD's Intra-professional collaboration

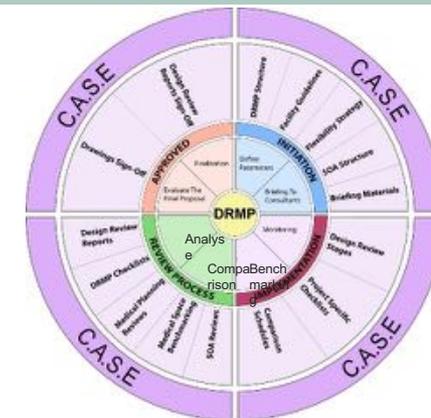
- Medical planners
- Architects
- Engineers
- Project managers
- Quantity surveyors
- Asset management professionals



Facility Guidelines for Healthcare Infrastructure



Design Review Management Plan (DRMP)



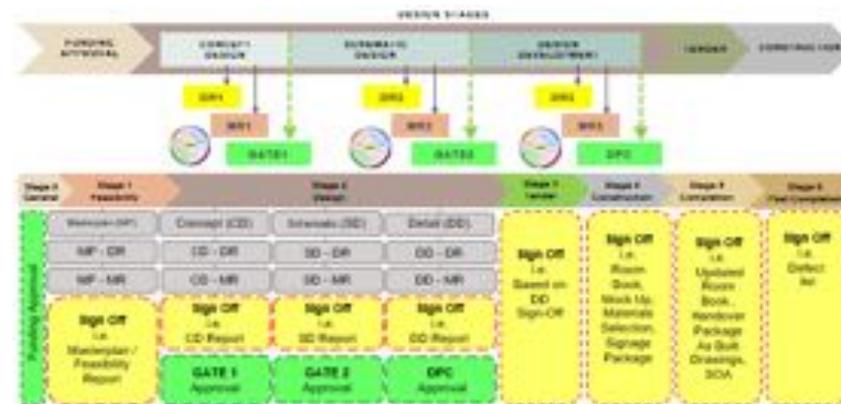
“The DRMP checklist should be a live file that can be updated with the latest trends in healthcare delivery. It’s a very good step to achieve a national healthcare standard.”



“The DRMP process has been useful as a systematic design review tool to look at the work created at the project milestone in a comprehensive manner... helped to identify the strengths and weaknesses of the project to proceed to the next stage of work in a fair and transparent manner.”



Review Stages



Project Outcomes: Integrated Care Hub

Ministry Collaboration

Organisational Collaboration

Professional Collaboration

Service Providers Collaboration



PROJECT DATA

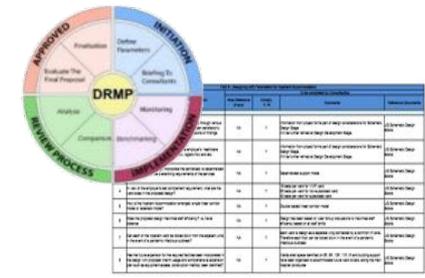
- **Site Area:** 1.06ha
- **GFA:** 60,800 m²
- **No. of Floors:** 17 storeys + 4 basements
- **Total beds:** 500 beds
- **Services:** Sub-Acute Care, Rehabilitation Care & Palliative Care



INITIATION & IMPLEMENTATION



Facility Guidelines for Healthcare Infrastructure

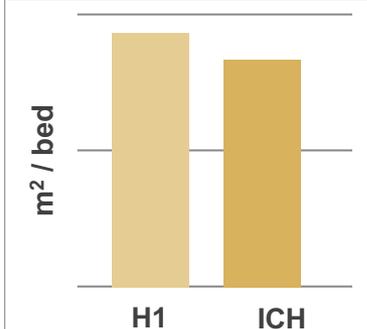


Design Review Management Plan

CONSTRUCTION



APPROVAL

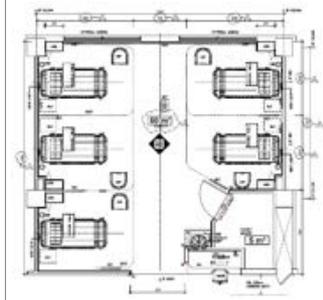


Results in reduced bed space norms through space optimization → **Up to 9% reduction in space per bed than H1**

REVIEW



Review / Workshops – e.g. Lean workshops



Room Layout Sheets & Room Data Sheets



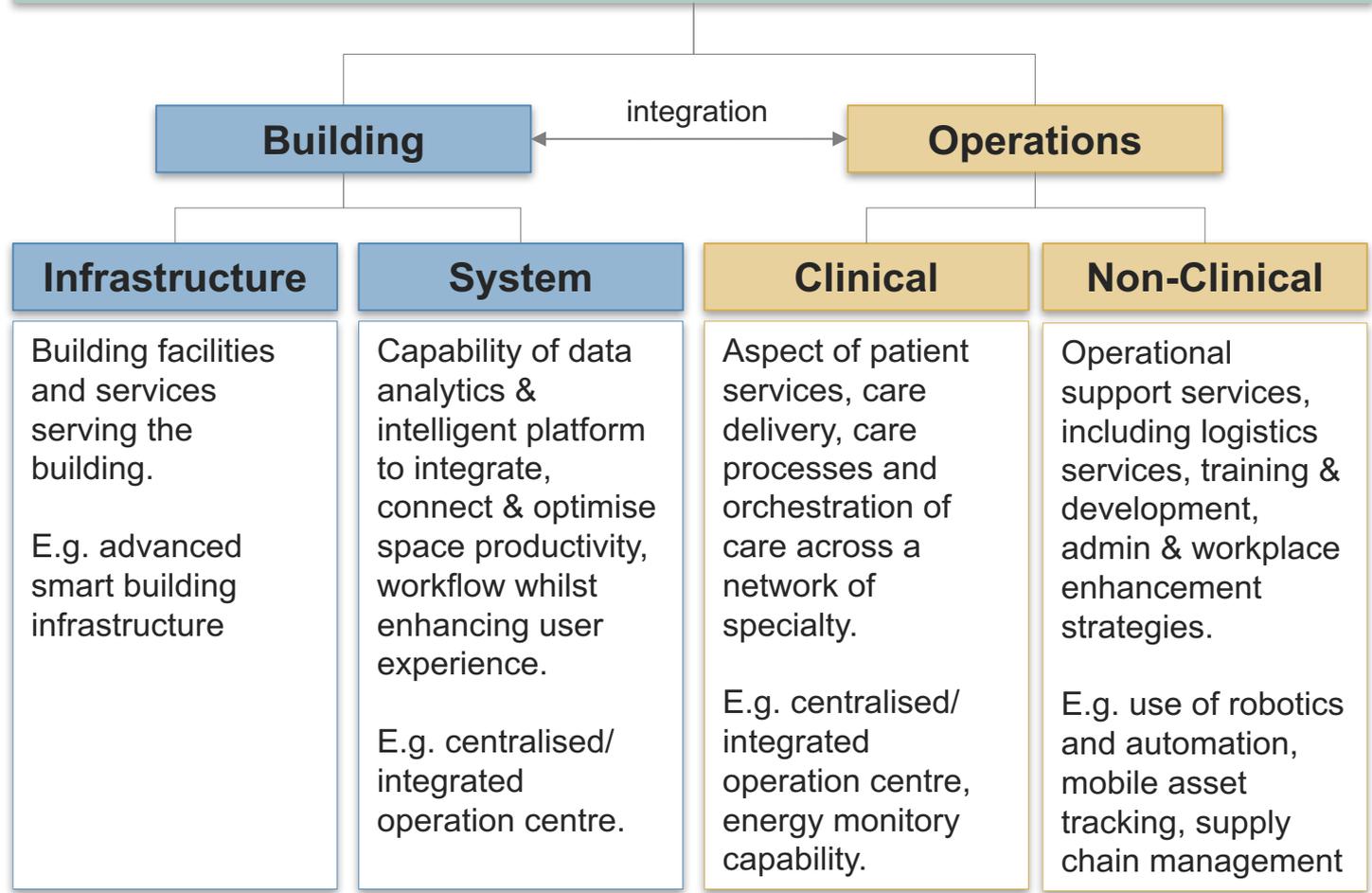
Mock-ups

- Develop SMART strategies for healthcare facilities

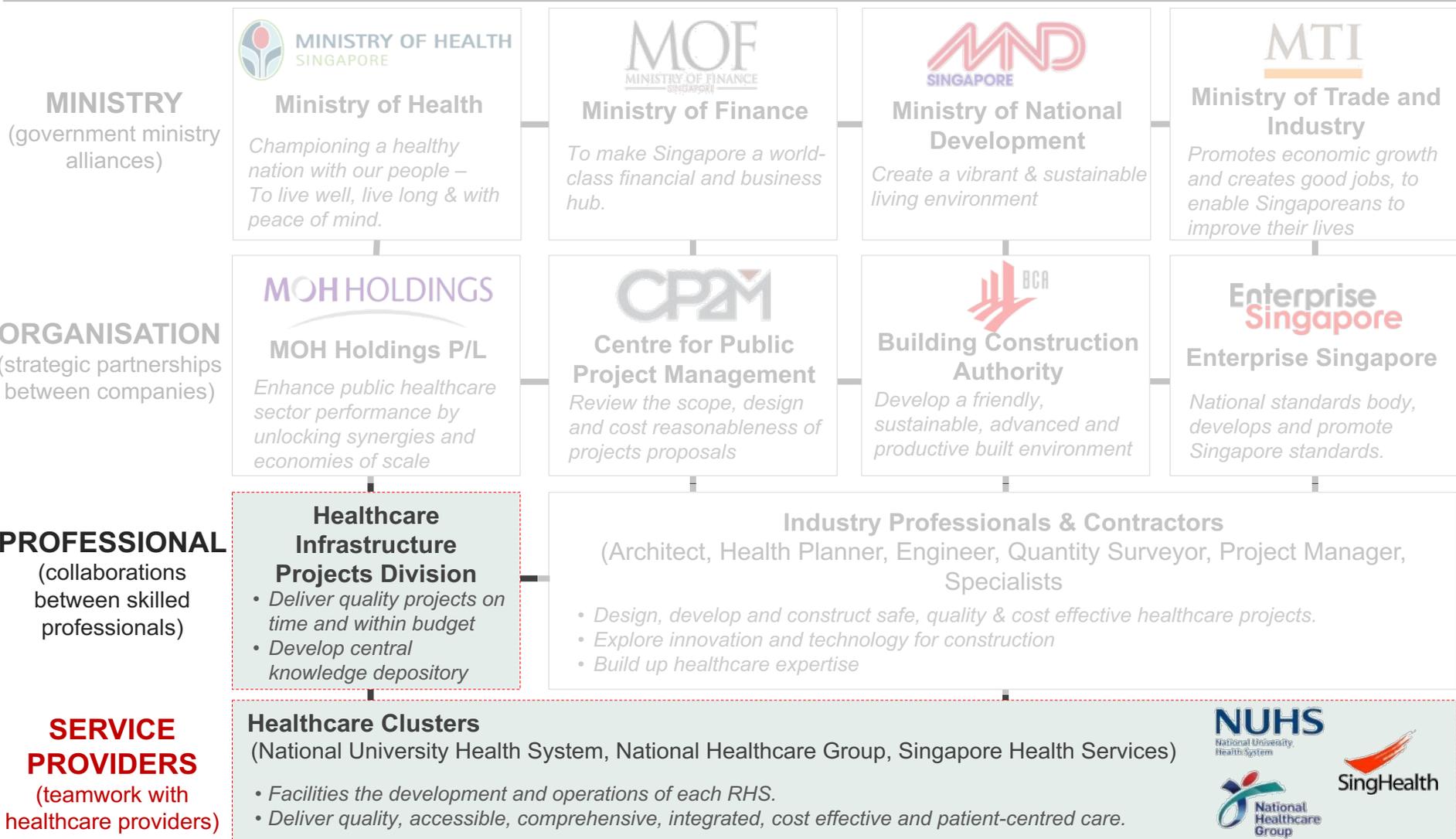
Ministry Collaboration	Organisational Collaboration	Professional Collaboration	Service Providers Collaboration
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Smart strategy / technology for public healthcare facilities



Collaborations with Service Providers



QUALITY, AFFORDABLE, SUSTAINABLE, PRODUCTIVE, INTEGRATED CARE FACILITIES.

MOHH/HIPD – Healthcare Clusters/Users & Consultants

Ministry Collaboration

Organisational Collaboration

Professional Collaboration

Service Providers
Collaboration

Healthcare Clusters / User Engagement → Service Delivery



Mock-up Reviews



Clinical Workshops



**Design Thinking
Workshops**



Lean Workshops



User Group Meetings



**CAVE Application
(Wards & Operating
Theatre)**



Lessons Learned



**Post-occupancy
evaluation
(nursing homes)**

Our Collaboration - A Symbiotic Relationship

Types of Collaboration	Collaborative Work	Partner	Benefits to Partners	Value to MOH/MOHH/HIPD
MINISTRY COLLABORATION	Funding & procurement approval	MOF/CP2M	<ul style="list-style-type: none"> ✓ Optimise project design to achieve greater value for money. ✓ Optimise managed reserves to balance the present and future financial needs of SG. 	<ul style="list-style-type: none"> ✓ Establish space & cost norms ✓ Develop construction technologies and design standards that improves productivity: <ul style="list-style-type: none"> - Shift focus on project specific needs, e.g. model of care - Maximises time spent on project innovation and elimination time wastage in re-establishing standard requirements for each project. ✓ Kept abreast of the latest technology and innovations for healthcare. ✓ Expand operational and service delivery knowledge.
ORGANISATION COLLABORATION	Construction Industry Transformation Map (ITM) Cities of Tomorrow R&D Program (CoT)	BCA	<ul style="list-style-type: none"> ✓ Raise construction productivity across buildings in SG. ✓ Increase skilled workforce for locals ✓ Increase the capabilities of building and construction industry. 	<ul style="list-style-type: none"> ▶▶ To develop a central healthcare infrastructure knowledge repository ▶▶ To deliver quality healthcare infrastructure projects on time and within budget.
	Standardisation Programme	Enterprise Singapore	<ul style="list-style-type: none"> ✓ Develop and promote building & construction standards to meet industry needs and government policy objectives 	
PROFESSIONAL COLLABORATION	Initiating & Implementing projects	Industry Professionals	<ul style="list-style-type: none"> ✓ Develop healthcare projects portfolio and track record ✓ Gain healthcare knowledge and expertise for professional development 	<ul style="list-style-type: none"> ▶▶ To deliver quality healthcare infrastructure projects on time and within budget.
	Develop construction technologies	Contractors	<ul style="list-style-type: none"> ✓ Learn new technologies to advance construction methods 	
COLLABORATION WITH SERVICE PROVIDERS	Initiating & Implementing projects	Healthcare clusters	<ul style="list-style-type: none"> ✓ Deliver integrated, affordable, patient centered care in a safe environment 	

QUALITY, AFFORDABLE, SUSTAINABLE, PRODUCTIVE, INTEGRATED CARE FACILITIES.

Moving Forward: Multi-national alliances

HI-TEC, a yearly event where a global community of thought leaders, healthcare policy makers, academics and industrial professionals to come together and learn from one another.

Conference, Innoshow, Workshops. Learning Journeys.



Partners



Partner event



Supporting organisations





Our Goals. Our Dreams.

Synergise capabilities

Learn from one another

Learn from best practices

Catalyse innovations

COLLABORATION

Be open to ideas

Develop tomorrow's solutions

Transform healthcare

Prepare for future healthcare challenges

The People. The Expertise. The Time. The Project.



Thank You