

VIRTUAL HOSPITAL MODEL

Strategic decision support through integrated modelling of alternatives | Menno Hinkema

TNO innovation
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› TNO – FLYWHEEL FOR INNOVATION

DEVELOPING FUNDAMENTAL KNOWLEDGE



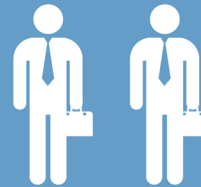
Together with
universities

DEVELOPING KNOWLEDGE



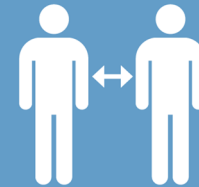
In public-private
collaboration with
partners from the
golden triangle

APPLYING KNOWLEDGE



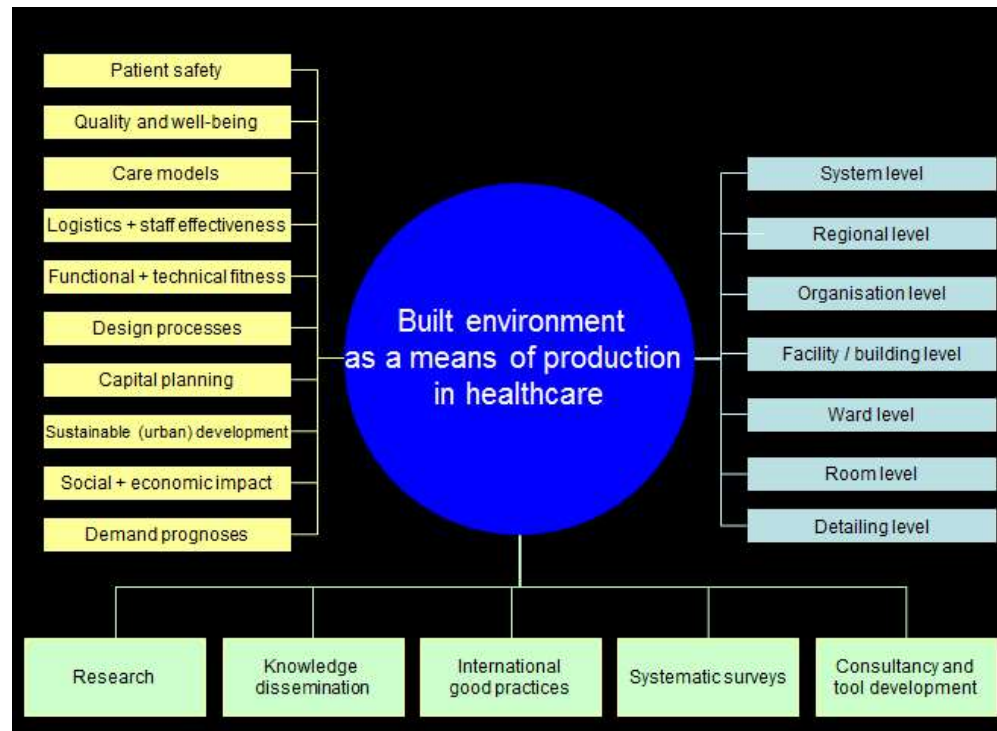
Contract research for
and with customers

TRANSFERRING KNOWLEDGE

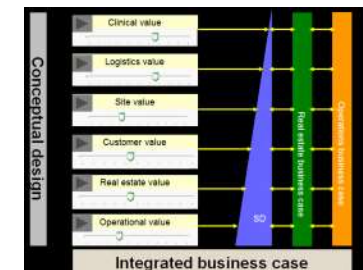


Exploiting knowledge
through spin-offs,
licences, etc together
with other companies

Conceptual approach



Trends and pressures in Dutch hospital design



Priorities in research and services



Access to evidence

TNO has a long-term history and an extensive international network in hospital planning, design and construction. TNO can provide reference designs that showcase the current state-of-the-art. And we can help you decide how to include the best from elsewhere in your own project

Models and simulations

Making good planning and design decisions means forecasting their effects. TNO offers a range of evidence-based modelling and simulation tools to support your decision making. From high level options analysis and long-term demand prognoses, to innovative integrated Building Information Management solutions

Business case analysis

Large hospital projects require substantial investment and have a huge impact on future financial performance. TNO has developed a range of business case analysis instruments. These are specifically designed to help decision making in complex situations, where there are many unknowns and stakeholder groups.

Performance Indicators

How do you define what your new hospital and hospital building need to do? And how do you use that information to manage the design and

development process? TNO can help you define key performance indicators for various performance domains, from staff efficiency to energy consumption. We can help you decide what are appropriate KPI's for different design and

Development phases, and integrate these into effective assessment processes. Insight into financial performance KPI's will help secure financing from bank and other financiers.



PROBLEMS IN STRATEGIC HOSPITAL PLANNING

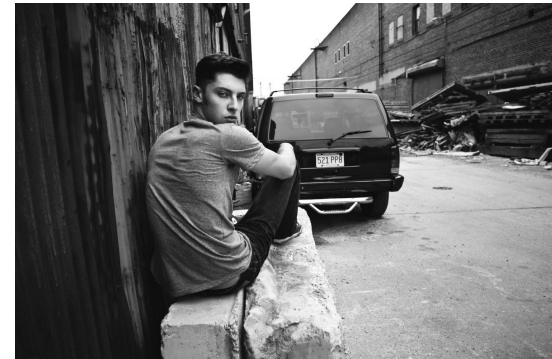
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Fragmentation

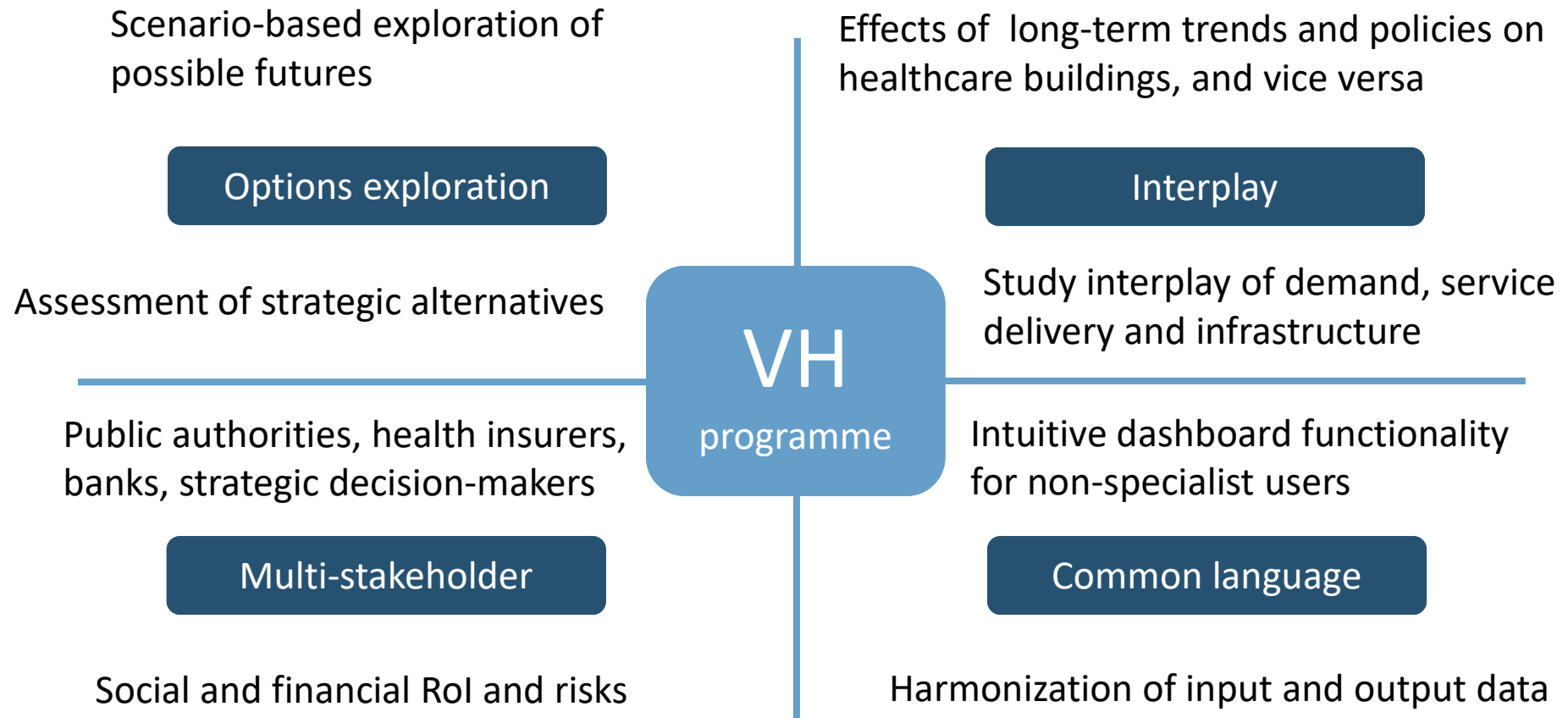


Vagueness



Backwards perspective

OUR AMBITION



AND WILL THAT HELP?

More grip on likely future developments as a basis for strategic decisions

Options exploration

More control over development and utilization phases

Clarify different stakeholder business case interests and concerns

Multi-stakeholder

Support cost-benefit allocation discussions

More insight into enablers and barriers in the healthcare built environment

Interplay

Insight into trade-offs helps set development priorities

More effective engagement of stakeholders in decision making process

Common language

Comparability of projects across national and systems boundaries

VH
programme

WHY BOTHER?

The world changes



The healthcare estate is slow to catch up

WHY BOTHER?

Solid, common sense reasons



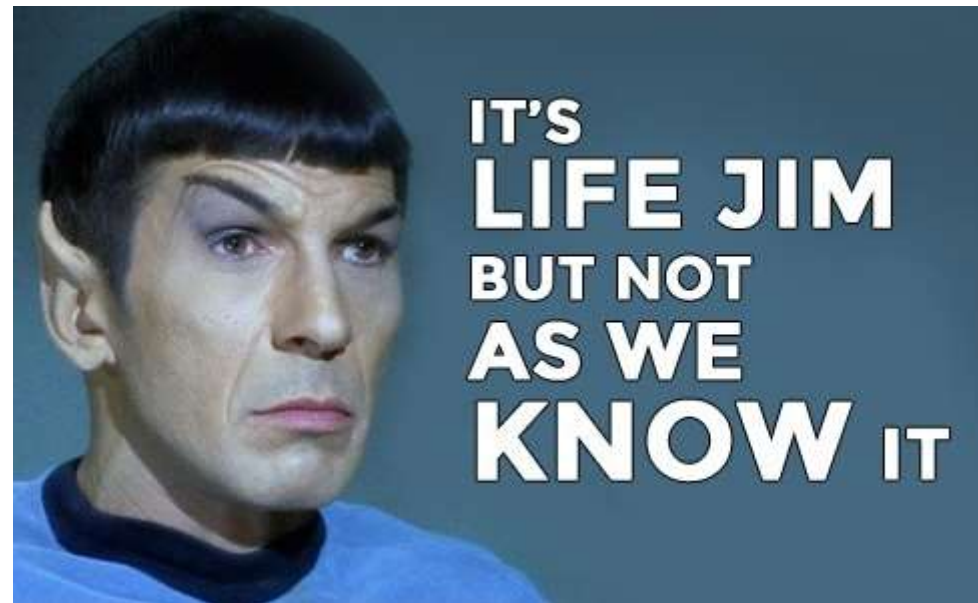
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WHY BOTHER?



Complexity



Disruption



'In 30 years time, we won't need hospitals anymore.'

Nico van Meeteren, CEO Health Holland

Health~Holland
SHARED CHALLENGES, SMART SOLUTIONS



APPROACHES AND FEATURES

Dashboard layer



Starting
position

Demographics
Epidemiology
Trends

Care demand
Productivity
Means of
production

Functional
aspects
Technical
aspects
Cost aspects

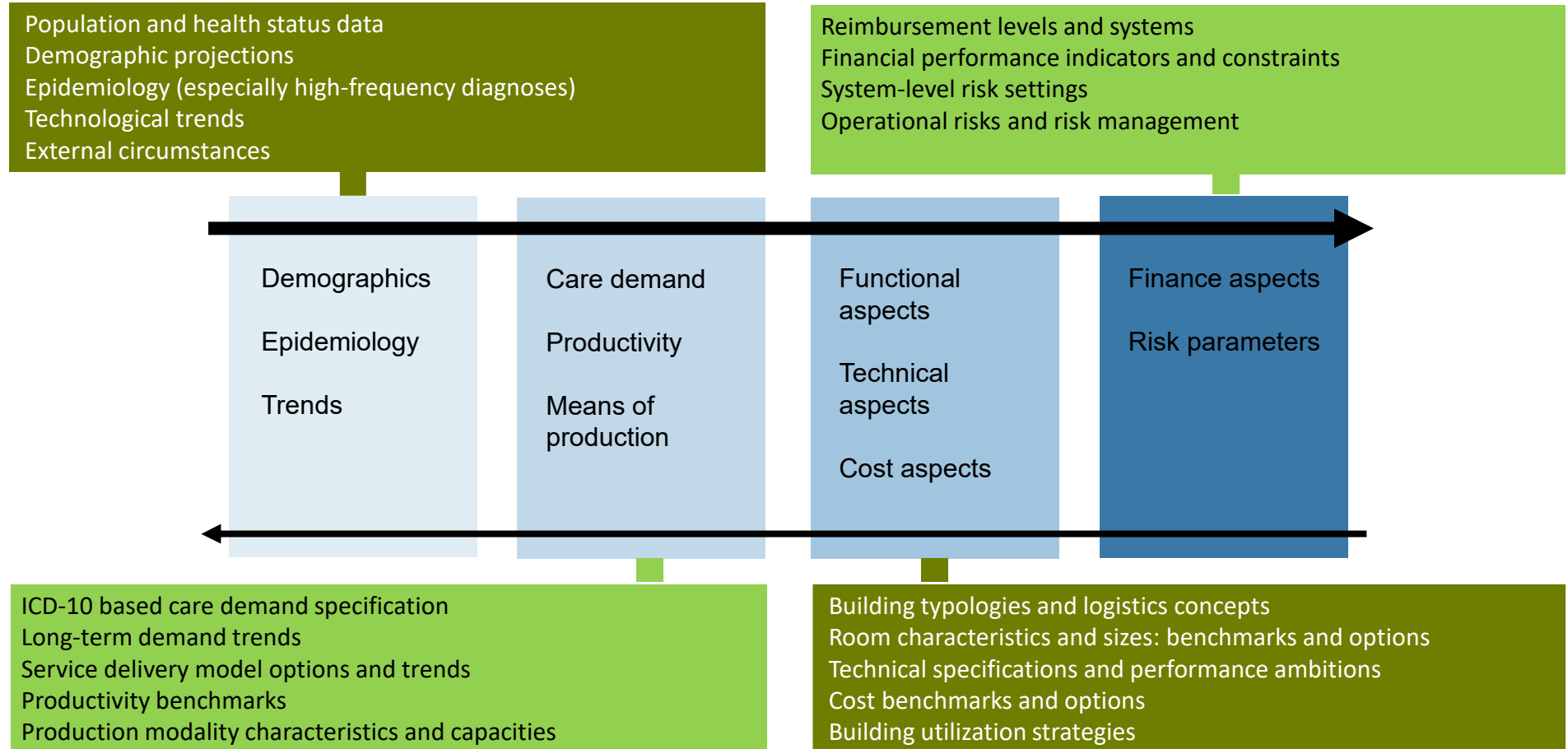


Finance aspects
Risk parameters

EFFICIENCY
COST
QUALITY

Analysis of
project
strategies

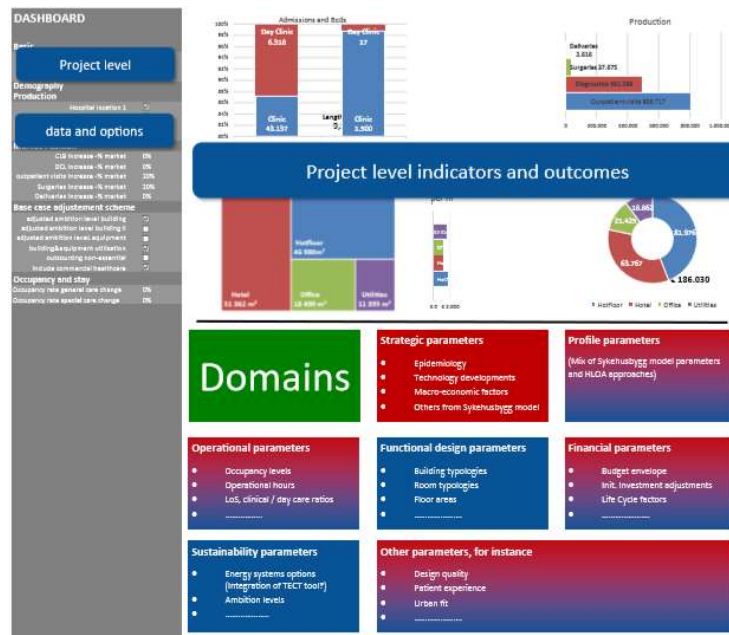
VHM ENGINE



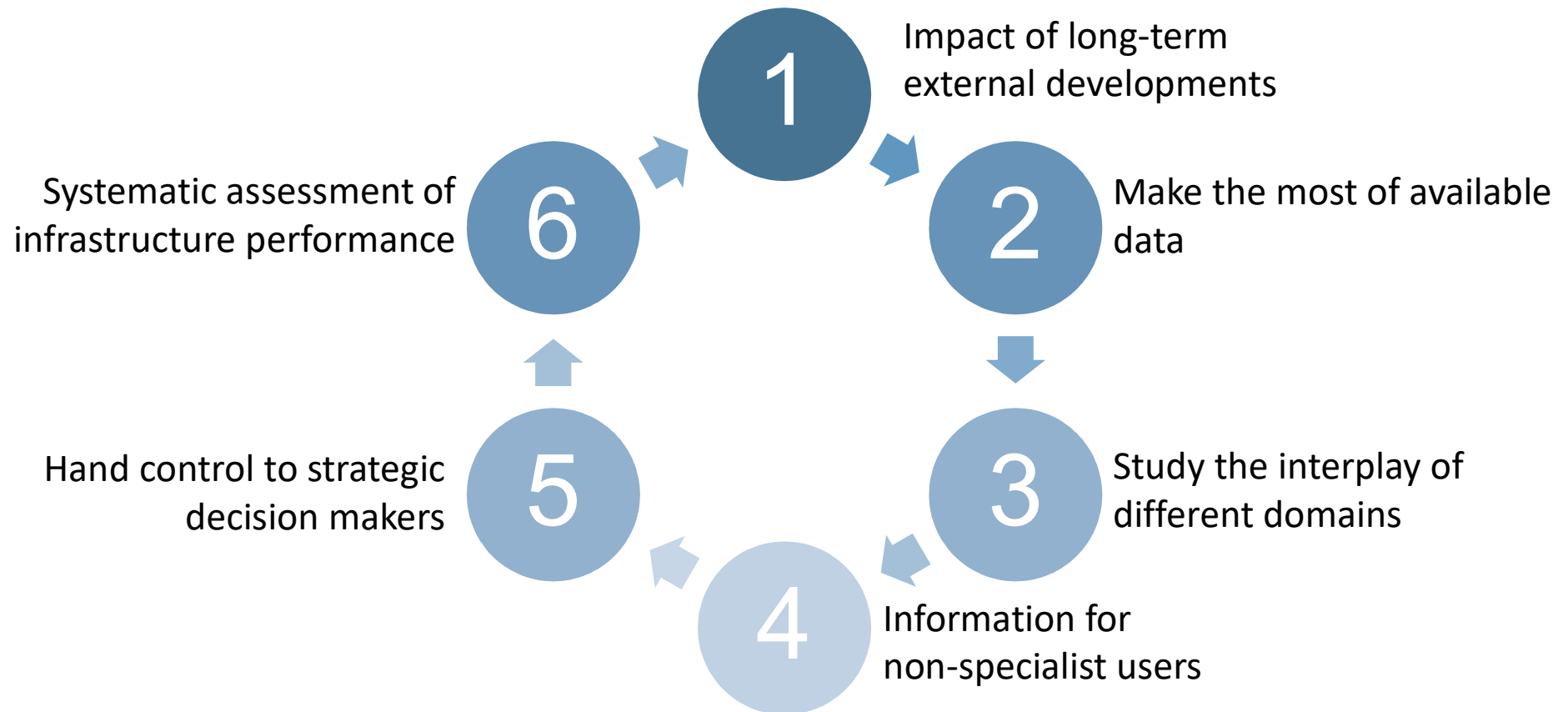
VHM DASHBOARD

'Information is not knowledge, knowledge is not wisdom, wisdom is not truth'
(Frank Zappa)

Dashboard layer



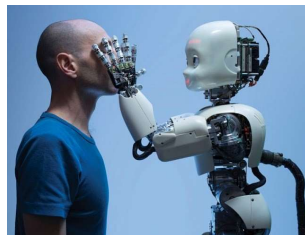
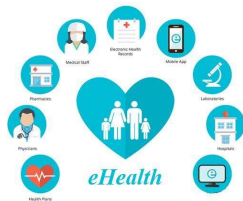
OBJECTIVES



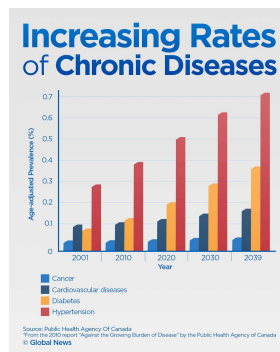
PRIORITIES AND APPROACHES

1

Impact of long-term external developments



Virtual Hospital Model



Policy and planning

- Interface policy and research information with VH-model engine
- Focus on effects for the public sector
- Scenario-based approach

Infrastructure

- Focus on network and portfolio requirements and effects
- Focus on long-term resilience
- Assess alternate use and redeployment of parts of the estate

PRIORITIES AND APPROACHES

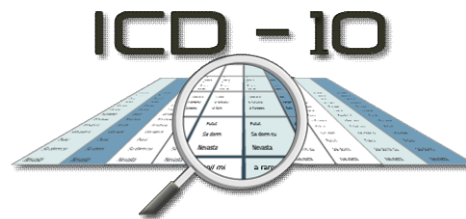
2

Make the most of available data

Problems

- **Data selection:** which data is relevant?
- Too early / **no time** for dedicated data collection
- **Reference projects** function in other countries and systems
- Data must be understood by **non-specialists**

Virtual Hospital Model



Approaches

ICD-10 based classification system for demand, production and spatial organization.
Helps comparability across national and system boundaries

Minimum data set for early strategic modelling
Avoid extraneous detail
Appropriate granularity for long-term options assessment

PRIORITIES AND APPROACHES

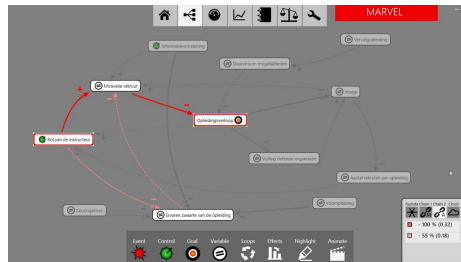
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Approaches

Building bridges Development of a flexible interface to handle data from different health systems and in different formats

Probabilistic modelling Use of scarce-data probabilistic software to structure qualitative inputs and expectations into model and scenario content

PRIORITIES AND APPROACHES

3

Study the interplay of different domains

Problems

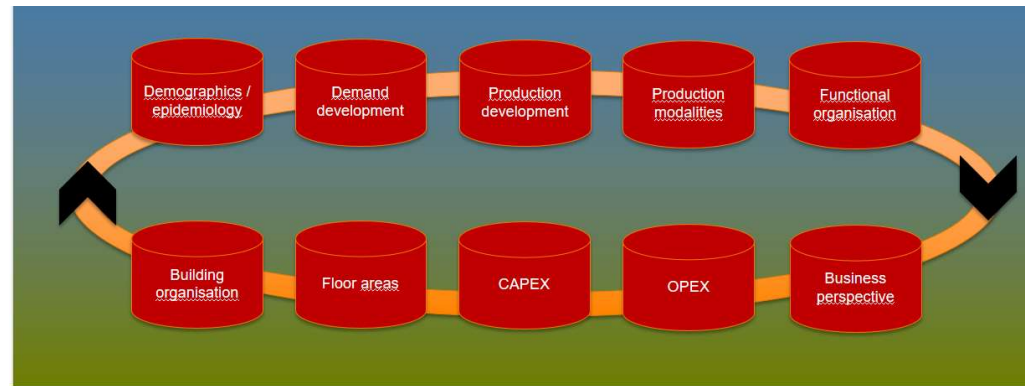
- Plan domains are organically linked, dedicated data systems are not
- Interdependencies are poorly understood
- Logic and consistency of scenario studies are often strained

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Approaches

Algorithms for dynamic link-ups between domains

Analysis of interdependencies and elasticity



Realistic bandwidths and limitations on options

Pre-sets and options menus for scenario development

PRIORITIES AND APPROACHES

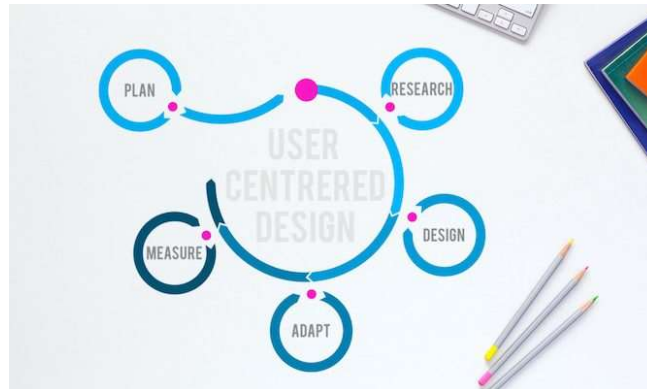
4

Information for non-specialist users

Problems

- Specialist data is poorly suited for strategic use
- Specialists in different fields speak different languages
- Specialists and strategists speak different languages
- Long-term planning is unknown territory for many decision makers

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Approaches

Interface development to suit

- User priorities
- User competencies
- User reference frames

Interface design to allow direct manipulation of parameters in real time

Collaborative design and development in pilot projects with prospective users and stakeholders

PRIORITIES AND APPROACHES

5

Hand control to strategic decision makers

Problems

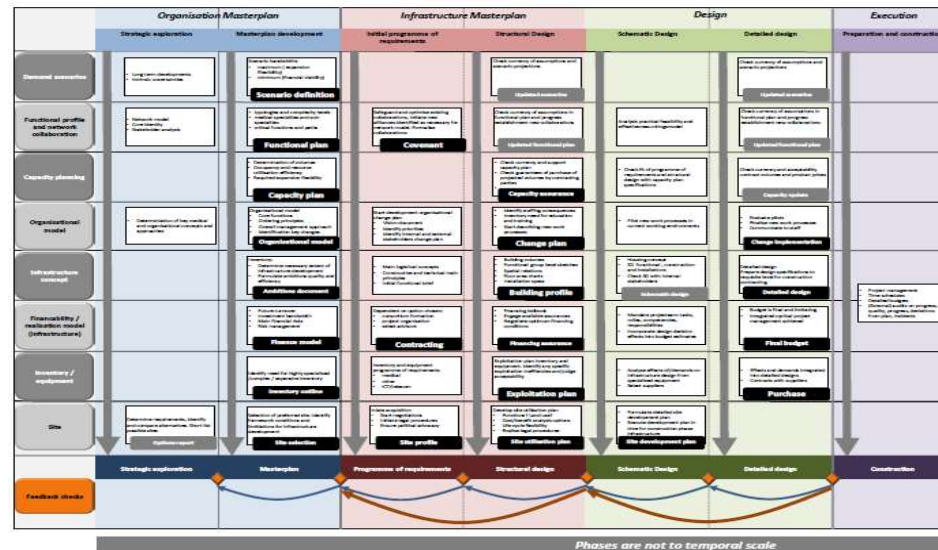
- Long project timelines require in-project reassessment
- Strategic considerations do not translate easily to project metrics
- Strategic decision makers unfamiliar with KPI setting
- Vagueness in early stages leads to project drift

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Approaches

Input for integrated master planning and monitoring

KPI-based scenario outcomes



PRIORITIES AND APPROACHES

6

Systematic assessment of infrastructure performance

Problems

- Current infrastructure underperforms
- Opportunities for improvement through redevelopment go unused
- There is as yet no culture of systematic assessment and evaluation in long-term planning

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Approaches

Retrograde analysis of
existing infrastructure

Cost-benefit analyses of
redevelopment / redeployment



CURRENT WORK

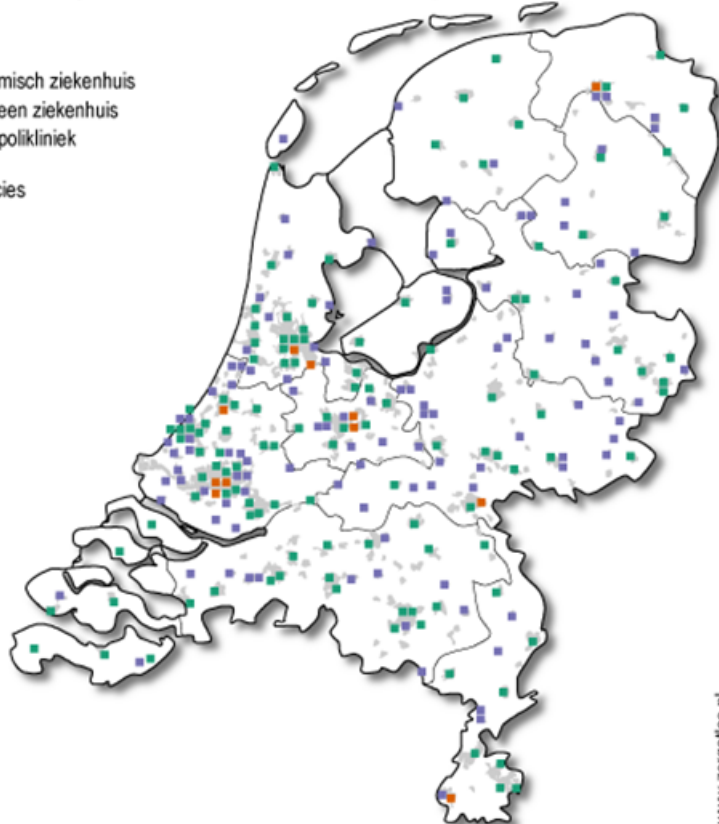
Locaties ziekenhuizen juli 2014

academische en algemene ziekenhuizen inclusief buitenpoliklinieken

Soort

- academisch ziekenhuis
- algemeen ziekenhuis
- buitenpolikliniek

— provincies



Bron: RIVM

www.zorgatlas.nl

Dutch macro-level scenario study

Hospital infrastructure effects of two long-term trends

1) *eHealth*

2) *Outcome-based reimbursement*

- Differentiated effects on utilization of the healthcare estate
- Relative effectiveness of different network models
- How much of the current estate will be surplus to requirements?
- Options for redeployment and alternative use

CURRENT WORK

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Collaboration agreement



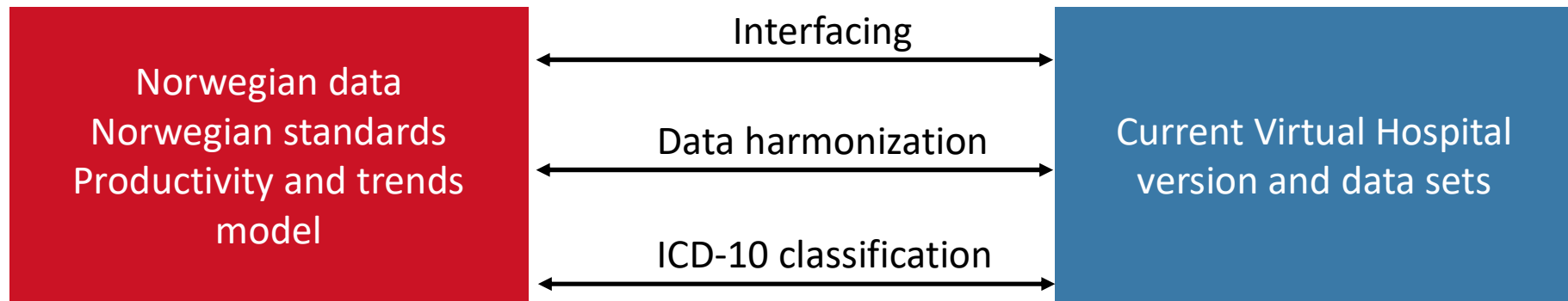
CURRENT WORK

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Joint work in dashboard development and interfacing



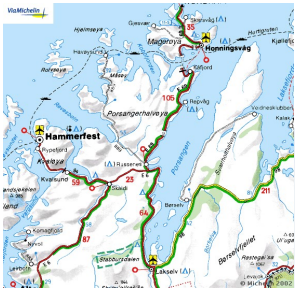
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CURRENT WORK

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SYKEHUSBYGG

TNO innovation
for life



Hammerfest Hospital



Case study

- Reference case for technical work and dashboard development
- Assessment of project in development
- Retrofit project requirements for strategic needs
- Explore alternatives and identify optimization opportunities
- Test added value Virtual Hospital approach for Sykehusbygg and hospital

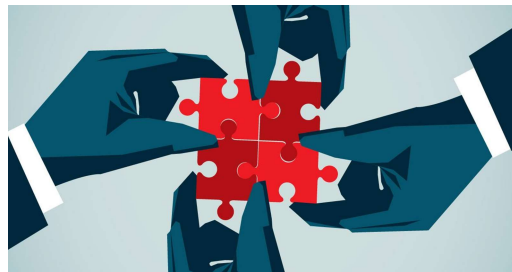
AMBITIONS (WELL, SOME OF THEM)



Develop probabilistic and
scarce data modelling



Integrate data and
benchmarks from more
countries and systems



Collaborations

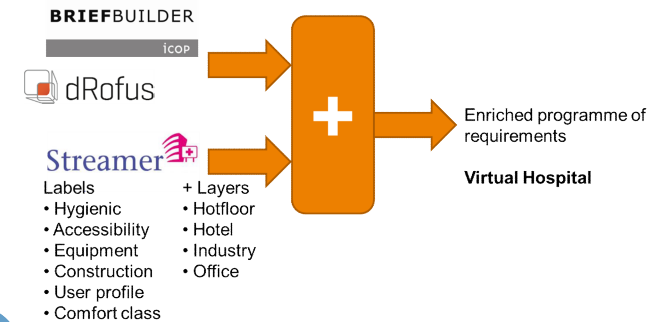
Assignments

AMBITION: FRAMEWORK FOR INNOVATIONS

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Contamination control



Semantic labels



Virtual Hospital Model

VH
programme



Energy concepts



› **WANT TO KNOW MORE?**

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