

CONGRESS '19

EAHM

BELGIUM - GHENT

INNOVATIVE HEALTHCARE STRATEGIES

11 > 14 SEPTEMBER 2019

THANKS TO OUR SPONSORS



DETOO
DESIGN TO OPERATE
ARCHITECTS





SMART BUILDING & LOGISTICS



Mr. Gerry O'Dwyer
CEO South-South West Hospitals Group,
Past-president EAHM
Welcome by the theme chair



Mr. Hans Crampe

Vice CEO AZ Delta

Scientific guest docent Lean Management

Value from lean in a Hospital



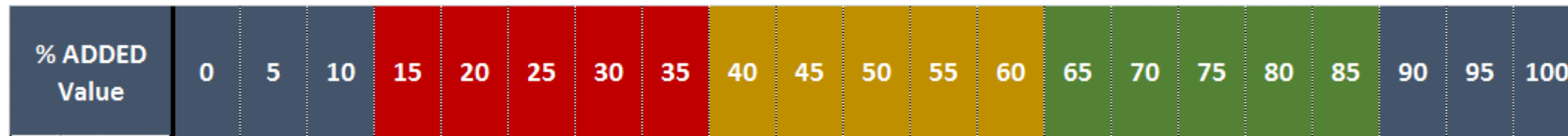
Value from lean in a hospital

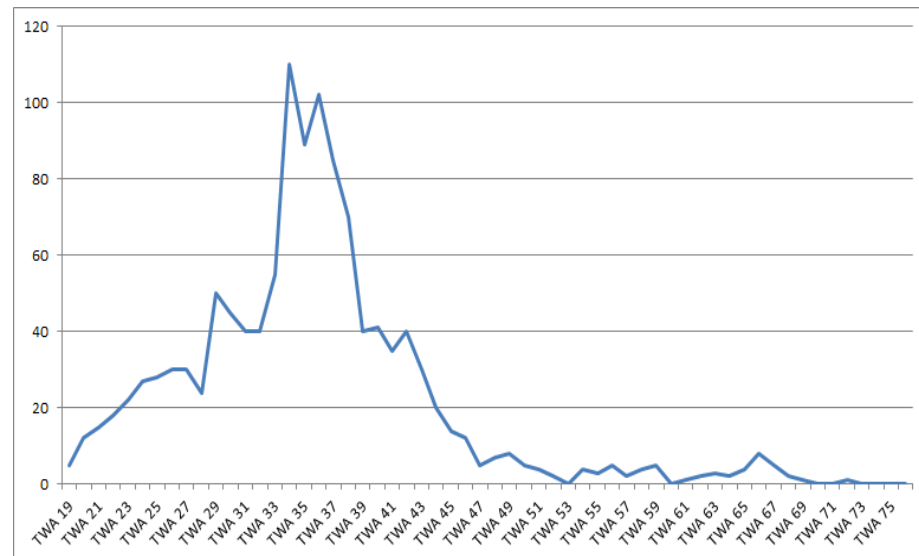
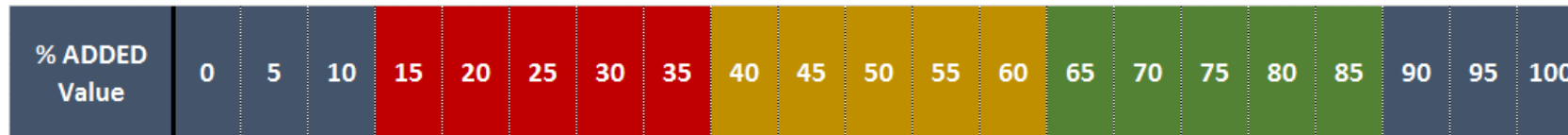
Hans Crampe - Vice CEO


Hans.Crampe@azdelta.be










% ADDED Value	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100		
 azdelta Uw ziekenhuis.	0	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220		







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Critical Successful Factors (CSFs) for
Successful Implementation of Lean Tools



S. No	Critical failure factors	References
1	Lack of top management commitment and involvement	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014), Antony <i>et al.</i> (2014), Jie <i>et al.</i> (2014), Pamfilie <i>et al.</i> (2012), Kwaka and Anbari (2006)
2	Lack of top management's awareness about benefits of Lean and Six Sigma	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014)
3	Lack of clear vision and future plans	Albliwi <i>et al.</i> (2014), Pamfilie <i>et al.</i> (2012)
4	Lack of leadership	Albliwi <i>et al.</i> (2014), Pamfilie <i>et al.</i> (2012), Sreedharan, Balagopalan, Murale and Arunprasad (2018)
5	Lack of proper communication about future benefits expected from project by top management	Delgado <i>et al.</i> (2010), Antony <i>et al.</i> (2014), Pamfilie <i>et al.</i> (2012)
6	Lack of reward and recognition by top management	Psychogios <i>et al.</i> (2012), Antony <i>et al.</i> (2014), Pamfilie <i>et al.</i> (2012)
7	Lack of Lean Six Sigma organization Structure	Psychogios <i>et al.</i> (2012)
8	Internal resistance against culture change	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014), Delgado <i>et al.</i> (2010), Desai <i>et al.</i> (2009)
9	Weak deployment infrastructure	Albliwi <i>et al.</i> (2014)
10	Poor project prioritization	Albliwi <i>et al.</i> (2014), Desai <i>et al.</i> (2009), Sreedharan and Sunder (2018)
11	Lack of knowledge about project selection tool	Psychogios <i>et al.</i> (2012)
12	Lack of alignment between the objective of the project and strategic objective of the company	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014)
13	Lack of experience in Lean Six Sigma deployment and implementation	Albliwi <i>et al.</i> (2014), Sreedharan and Sunder (2018)
14	Lack of resources	Albliwi <i>et al.</i> (2014), Desai <i>et al.</i> (2009), Kwaka and Anbari (2006)
15	Lack of refresher classes in the application of Lean Six Sigma	Desai <i>et al.</i> (2009)
16	Lack of process owner engagement	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014)
17	Lack of process owner's awareness about the Lean Six Sigma and process thinking	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014)
18	Poor selection of candidate for Belt training	Albliwi <i>et al.</i> (2014), Kwaka and Anbari (2006)
19	Ineffective training programs	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014), Andersson <i>et al.</i> (2014), Desai <i>et al.</i> (2009)
20	Lack of employee engagement	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014)
21	Lack of knowledge about Lean Six Sigma techniques, tools and practices	Albliwi <i>et al.</i> (2014), Delgado <i>et al.</i> (2010)
22	Lack of team autonomy	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014)
23	Lack of cross-functional team	Antony <i>et al.</i> (2014), Thomas <i>et al.</i> (2009)
24	Lack of roadmap to guide the project execution	Albliwi <i>et al.</i> (2014), Srinivas and Sreedharan (2018)
25	Ineffective project management	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014)
26	Poor selection of Lean Six Sigma tools	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014), Delgado <i>et al.</i> (2010)
27	Lack of understanding about customer type and their demand	Albliwi <i>et al.</i> (2014), Antony <i>et al.</i> (2014)
28	Lack of employees' awareness about Lean Six Sigma	Psychogios <i>et al.</i> (2012), Sreedharan, Raju, Rajkanth and Nagaraj (2018)
29	Lack of measurement system's performance	Albliwi <i>et al.</i> (2014), Desai <i>et al.</i> (2009)
30	Lack of usage of statistical tools for improvement	Albliwi <i>et al.</i> (2014), Rejikumar <i>et al.</i> (2018)
31	Poor communication and organization	Albliwi <i>et al.</i> (2014), Antony <i>et al.</i> (2014)
32	Lack of usage of information and communication tools	Psychogios <i>et al.</i> (2012), Sreedharan, Rajasekar, Santhosh Kannan, Arunprasad and Trehan (2018)


Assessment of critical failure factors (CFFs) of Lean Six Sigma in real life scenario

Evidence from manufacturing and service industries

Raja Sreedharan V., Gopikumar V. and Smitha Nair

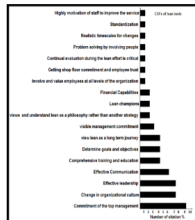
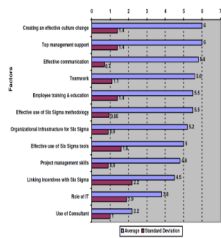
33	High implementation cost	Albliwi <i>et al.</i> (2014), Psychogios <i>et al.</i> (2012)
34	Poor estimation of project cost	Albliwi <i>et al.</i> (2014), Sreedharan and Sunder (2018)
35	More lead time	Albliwi <i>et al.</i> (2014), Delgado <i>et al.</i> (2010)
36	Lack of control techniques	Delgado <i>et al.</i> (2010)
37	Lack of human factors consideration	Psychogios <i>et al.</i> (2012), Albliwi <i>et al.</i> (2014), Delgado <i>et al.</i> (2010)
38	Lack of innovations	Antony <i>et al.</i> (2014)
39	Lack of concurrent approach in problem solving	Thomas <i>et al.</i> (2009), Sreedharan, Sandhya and Raju (2018)
40	Lack of knowledge about performance metrics	Franchetti and Roth (2010), Laureani <i>et al.</i> (2010)
41	Lack of continuous monitoring approach	Delgado <i>et al.</i> (2010), Sreedharan and Sunder (2018)
42	Lack of support from suppliers and service providers	Andersson <i>et al.</i> (2014)
43	Lack of linking of LSS with other quality tools like ISO, TQM	Albliwi <i>et al.</i> (2014), Wei <i>et al.</i> (2010)
44	Lack of linking of LSS with suppliers and other channel partners	Albliwi <i>et al.</i> (2014), Sreedharan and Sunder (2018)



% ADDED Value	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
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Critical Successful Factors (CSFs) for Successful Implementation of Lean Tools

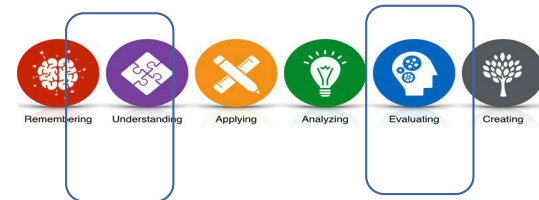
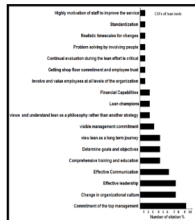
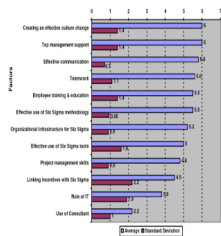
Employee training	<input checked="" type="checkbox"/>
Effective use of tools	<input checked="" type="checkbox"/>
Creating an effective culture change	<input checked="" type="checkbox"/>
Top management support	<input checked="" type="checkbox"/>
Teamwork	<input checked="" type="checkbox"/>



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Testing

Self-evaluation

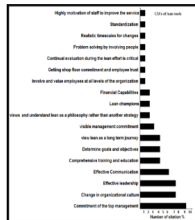
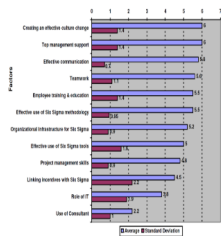
Critical Successful Factors (CSFs) for Successful Implementation of Lean Tools

Employee training	<input checked="" type="checkbox"/>
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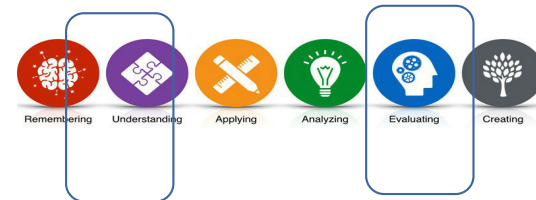
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Critical Successful Factors (CSFs) for Successful Implementation of Lean Tools

Employee training	<input checked="" type="checkbox"/>
Effective use of tools	<input checked="" type="checkbox"/>
Creating an effective culture change	<input checked="" type="checkbox"/>
Top management support	<input checked="" type="checkbox"/>
Teamwork	<input checked="" type="checkbox"/>



Testing

Self-evaluation

	Bewezen effect	Kennisniveau
5S	2/patiënt	35
Variantie analyse Cp /TAKT	17 /patient	3

		Mean	Correlatie
Algemene tevredenheid	8,2	Manier van lesgeven	7,8 0,4
		Toepasbaarheid	6,9 0,4
		Documentatie	4,7 -0,1
		Locatie	4,5 0,1

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azdelta Uw ziekenhuis.	0	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220


1

Remove waste

50 WASTE activities

1. Walking;
2. The intake;
3. The hand-overs;
4. Waiting

Toegevoegde Waarde Analyse A-dienst											Score	35
	8 uur	9 uur	10 uur	11 uur	12 uur	13 uur	14 uur	15 uur	16 uur	17 uur	gemiddelde	
VERPLEEGKUNDIGE	60	70	5	5	65	5	80	5	5	65	37	
FACILITAIR	80	90	5	5	60	5	45	5	5	30	33	
ERGO	5	5	85	85	5	5	5	85	75	5	36	
KINE	5	5	90	75	5	5	5	90	70	5	36	
	38	43	46	43	34	5	34	46	39	26	35	

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1


Remove waste

2

Remove variation

Capacity				Staffing			
FTE	availability/FTE			daily staffing			
Employer 1	1	1420		48			
Employer 2	1	1430		66			
Employer 3	1	1440		74			
Employer 4	1	1450		78			
Employer 5	1	1460		66			
Employer 6	1	1470		78			
Employer 7	1	1480		70			
Employer 8	1	1490		50			
Employer 9	1	1500		80			
Employer 10	1	1510		48			
Employer 11	1	1520		66			
Employer 12	1	1530		74			
Employer 13	1	1540		66			
Employer 14	0.5	1550		66			
Employer 15	0.5	1560		74			
Employer 16	0.5	1570		78			
Employer 17	0.5	1580		50			
Total FTE	15	1590		50			
		1600		66			
		1610		12			
		1620		23			
		1630		8398			
		1640		5			
		1650					
		1660					



% ADDED Value	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100		
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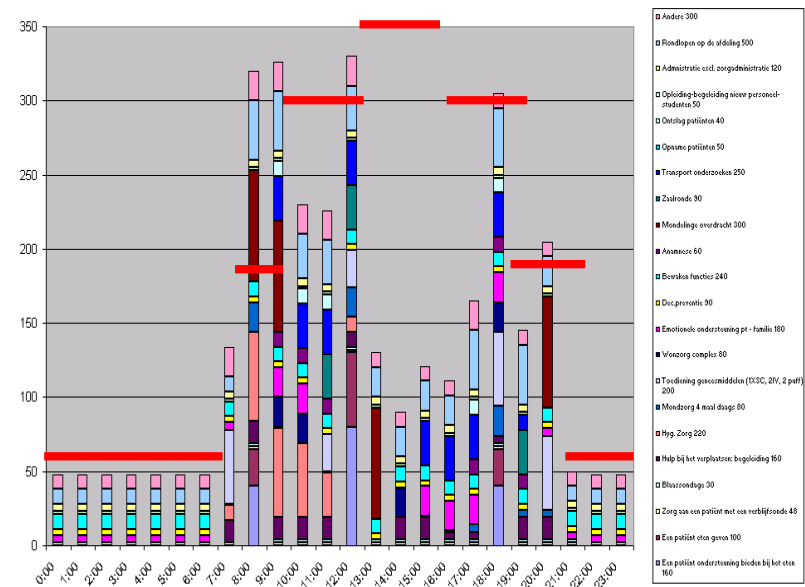
Remove waste


2

Remove variation

3

Balance



% ADDED Value	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100		
 azdelta Uw ziekenhuis.	0	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220		

1

Remove waste

2

Remove variation

3


Balance

4

Expedition teams

education program	170
LEAN project	50
mean value/project	100000




% ADDED Value	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
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Q4 2018 – Q1 2019

Value Stream Map "job application"	167.800	
Syst Lay-out "cleaning process"	86.135	
Value stream map "one day surgery"	161.000	
Optimisation "work scheduling"	45.000	
5 S "warehouse & stockrooms"	130.000	
Heijunka "medical imaging unit"	327.000	
Time Boxing "handovers geriatric unit"	45.000	
Added Value Analysis "line process"	152.300	
TAKT-times "coloscopie unit"	120.000	
Value stream map "cardiologic unit"	200.000	
Value stream map "medication"	500.000	
Value stream map "central sterilisation unit"	150.000	
Proces analysis "out patient clinic (10)"	90.000	
	2.174.235	10'



% ADDED Value	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
	0	11	22	33	44	55	66	77	88	99	88	121	132	143	154	165	176	187	198	209	220

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Q2 2019 Q3 2019

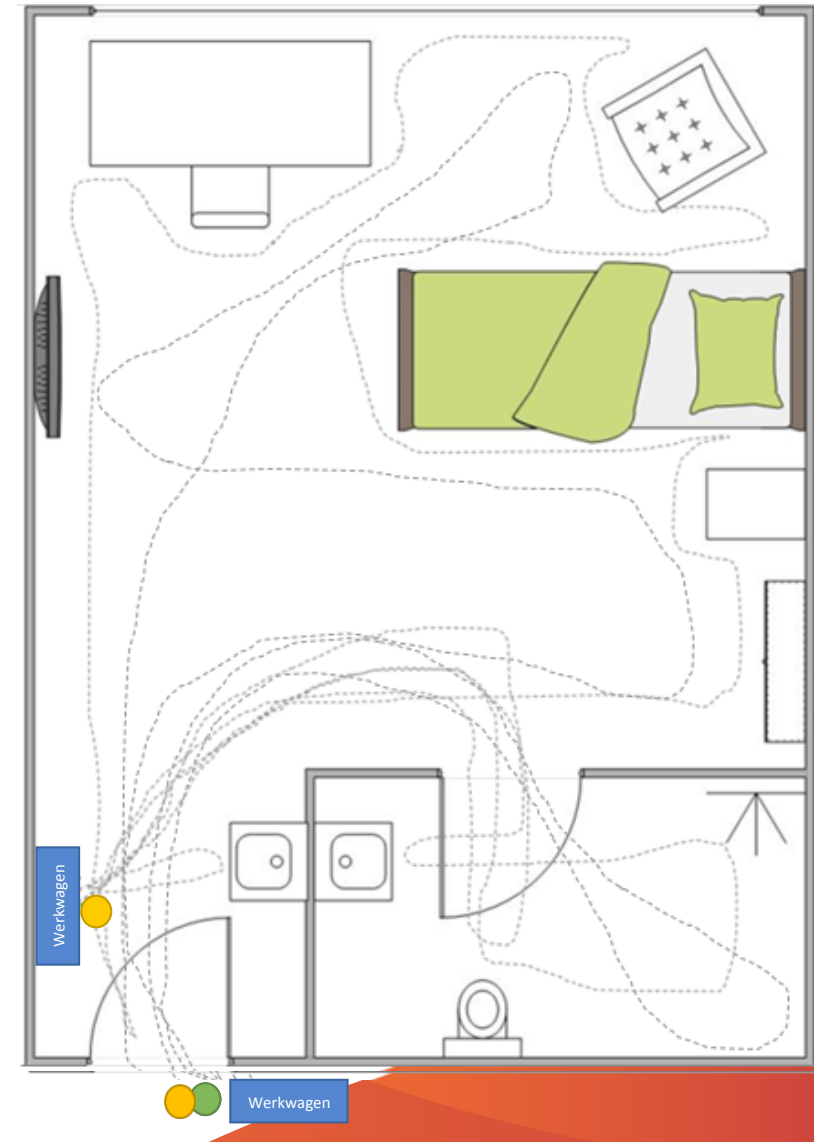
TCO "software lic."	350.000	
Value stream map "rehabilitation unit"	150.000	
Added Value Analysis "social workers"	150.000	
Value Stream Map "diabetes unit"	150.000	
Value Stream Map "GP"	150.000	
Time Boxing "handovers nursing unit"	150.000	
Added Value Analysis "paramedical services"	150.000	
Added Value Analysis "social workers"	150.000	
TAKT-times "internal patient transport"	150.000	
Added Value Analysis "external patient transport"	150.000	
Value stream map "lab"	150.000	
Value stream map "maternity ward"	150.000	
Proces analysis "psychiatric unit"	150.000	
	2.150.000	10'



1. **AS IS routing:** 16,37 min (mean + 2*STDEV)
2. **TO BE routing:** 15,27 min (mean + 2*STDEV)
3. **TO BE routing:** 13,89 min (mean + 2*STDEV)



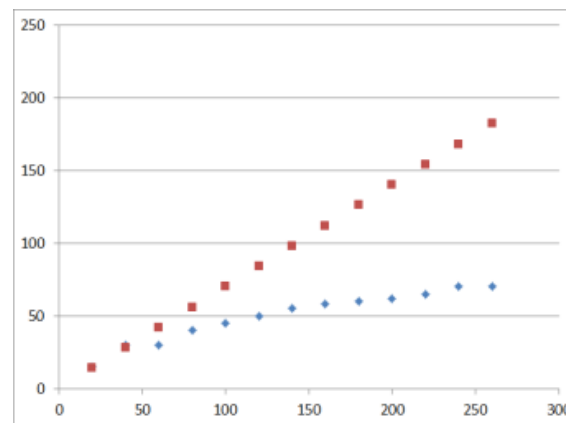
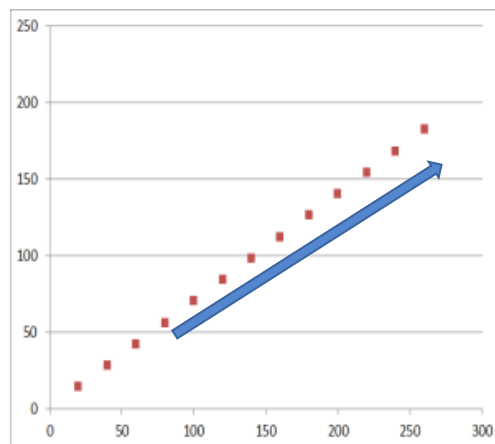
86.835,96




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1

Increase staf levels



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 Uw ziekenhuis.	0	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220		

1

Increase staf levels

2

Solution is more expensive than problem



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1

Increase staf levels

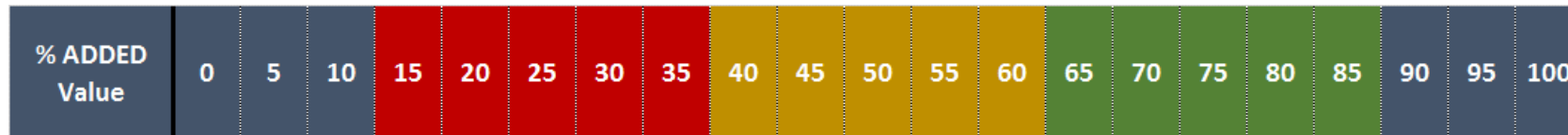
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Solution is more expensive than problem

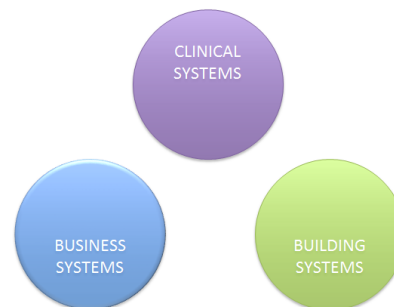
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Inform/autom. process which is not under control





The combination of bidirectional communication between clinical, business, and building systems, the implementation of smart, semi-autonomous devices or sensor networks, and the use of analytics within a hospital creates endless possibilities for the development of smart, efficient, and effective hospital processes
("MacKenzie Health")





Mr. Dipak Duggal

**Director Global Solutions & Marketing Dispensing
Hospital International BE**

theme





Dr. Ana Herranz-Alonso

**Director Assistant Hospital Pharmacy,
Hospital General Universitario Gregorio Marañón**

Improving patient safety and efficiency through an
integrated medication management approach



Improving patient safety and efficiency through an integrated medication management system

Hospital General Universitario Gregorio Marañón. Madrid



**Hospital General Universitario
Gregorio Marañón**

Dra. Ana Herranz Alonso

Servicio de Farmacia

aherranza@salud.madrid.org

HGU Gregorio Marañón

www.madrid.org/hospitalgregoriomaranon/farmacia

 [@farma_gregorio](https://twitter.com/farma_gregorio)

GREGORIO MARAÑÓN HOSPITAL. MADRID



Public Hospital property of Community of Madrid Health Network

- 350,000 population
- 20 buildings & 1,225 beds (148 Pediatrics)

HGUGM 2018

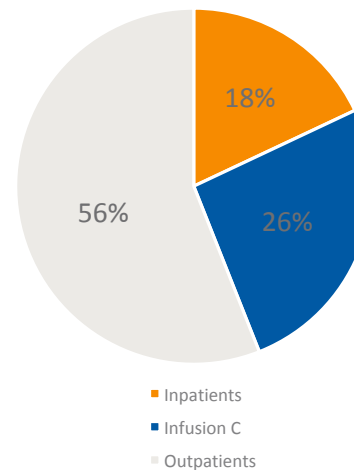
- 50,000 In-patients
- 250,000 emergency
- 900,000 Outpatients

Profesionalls

- 1,000 Doctors (+ 540 Residents)
- 1,750 Nurses
- 24 Pharmacists(+ 8 Pharm-residents)

Pharmacy Department 2018

Budget



Practice

- CPOE 100%
- 10,500 outpatients/year
- 165,000 Non-sterile
- 57,000 Sterile
- 52,000 Cytotoxics
- 16,000 TPN



New Era of Hospital Pharmacy

Ageing of the population and prevalence of chronic diseases

Greater need for care integration: treatment complexity

Increasing hospital pharmaceutical expenditure

Incorporation of ICT



New Hospital Pharmacy has to Meet Hospital Needs:

Clinical & Financial

More **specialised**, more **efficient**, and
closer to the patient,...

...thanks to the use of technology.



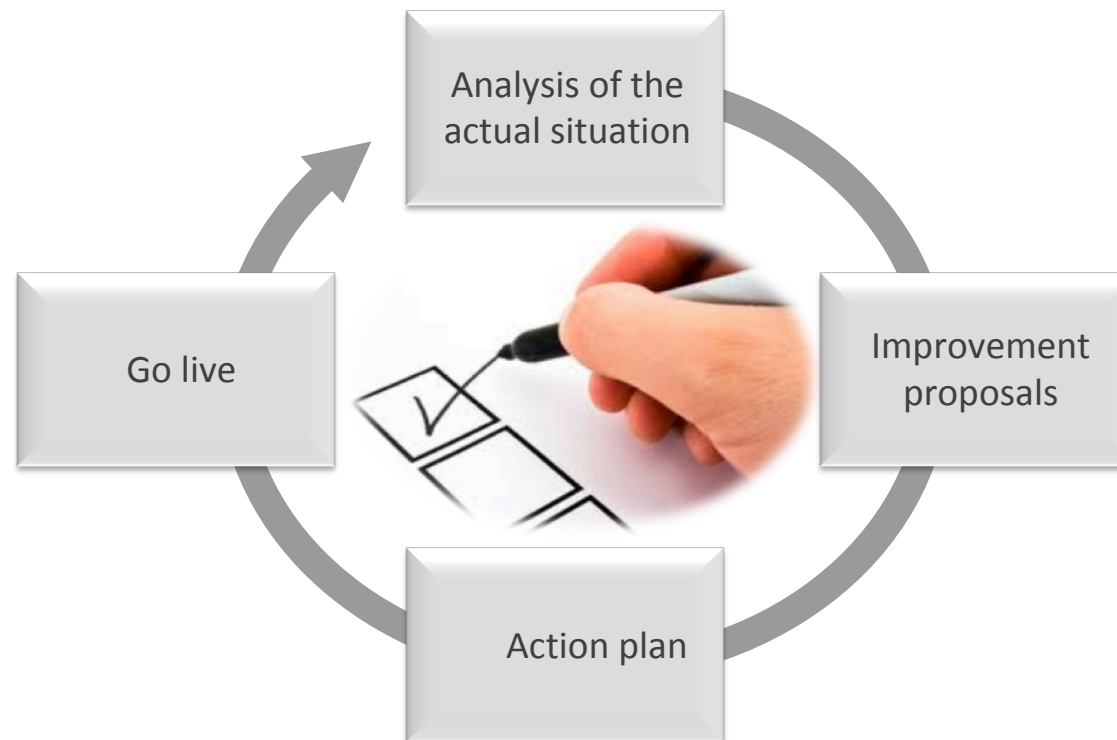
Characteristics of an Ideal Medication Management System

- ***Integrates*** all steps of the medication process
- Is ***connected*** to the **patient's electronic medical record**
- Oriented to obtain the best **health outcomes**
- Focused on ***safety*** (able to detect and prevent adverse events)
- Facilitates ***communication*** and real time information between different levels of care
- Contributes to guarantee the ***economic survival*** of the system



Managing the Change...

Restructuring the Pharmacy Department



...is a Continuous Process

Logistics

2000



First SAD

2003



Central Pharmacy automation (Kardex)
2019: 55 SAD profiled

2009



Smart Infusion pumps

2010



Outpatient Automation (Rowa)

2012



Compounding

2017



Barcode Chemotherapy administration

Clinical

2003



CPOE

2008



Emergency Department

2010



Outpatient CPOE

2012



CPOE Ambulatory

2016



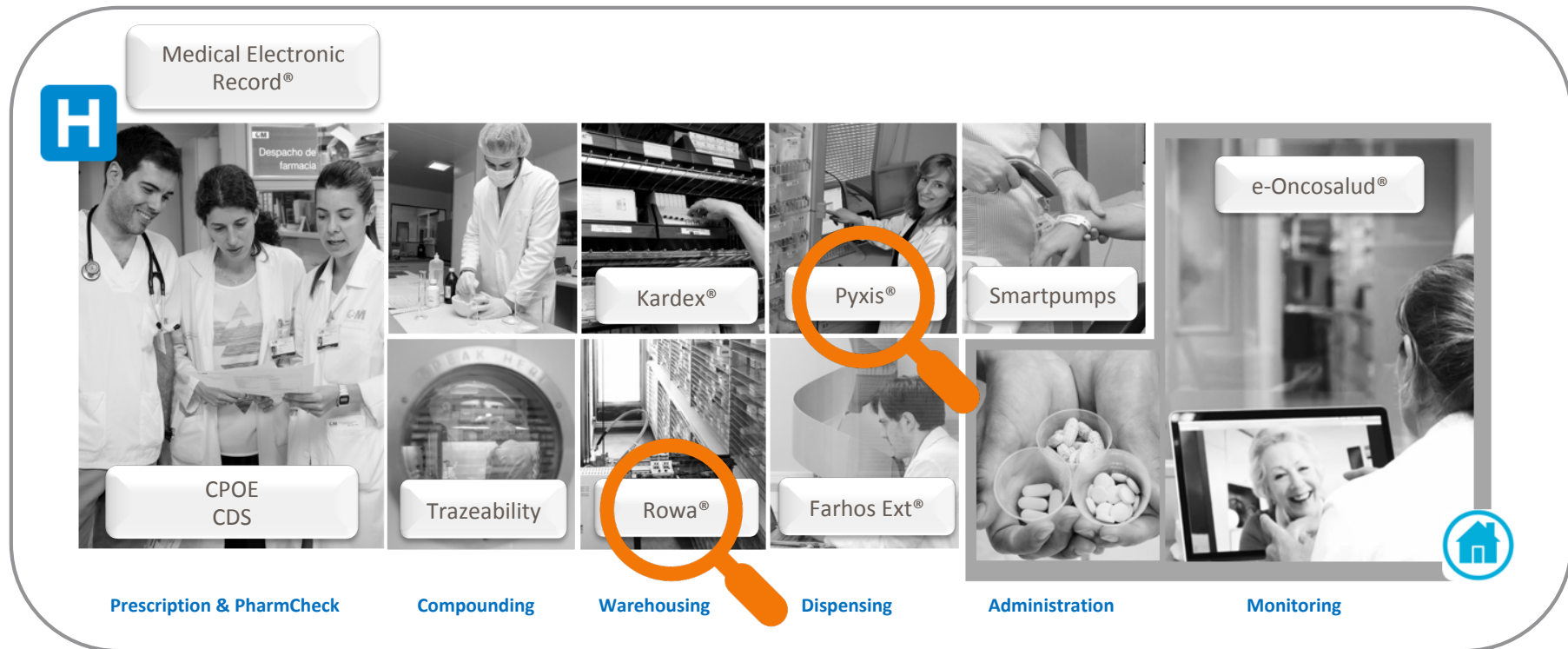
Farmaventura

2017



HCIS. eMAR

IT Systems: Essential Tools to Support Medication Management



Herranz A, Rodríguez CG, Sanjurjo M. Information technology and automation in hospitals: Strategies and experience in a tertiary hospital in Spain. EJHPP. 2011; 17(4): 26-31

1

Ind. Hosp. Servicio MICROBIOLOGIA (CTT) Talla 184 Ton. 80 kg
Modificado [A] 5/12/2018 - Fecha Validado [F] Roberto Colado Berrill - 30/07/2018 13:43 Estado Revisada INM 23.63 S.C. 2.03 m³
Médico responsable Fecha inicial [D] 07/2018 13:43 Tipo Prescrip. [PRESCRIPCIÓN (P.EXT.) - MICROBIOLOGIA (CTT)] P.M. 27 kg Ideal 23.7 kg

Alertas: Sin alertas medicamentosas HES

Paciente Ingreso Premedicación Hosp. Día Externos Oncología

+ Central Pharmacy Automation Results

Farhos
Gestión de farmacias hospitalarias

Validar Salir Medicamentos Generar



Our Pharmacy Before & After Automation

PRE - IMPLEMENTATION



POST - IMPLEMENTATION



The warehouse has moved to the basement



The unit space is intended for direct patient care with the robot and a conveyor belt



Benefits of Automation:

Safety

Rodríguez-González CG, et al. J Eval Clin Pract. 2018 Aug 22.

DISPENSING ERROR
PREVALENCE



MANUAL (CB)
1.31%

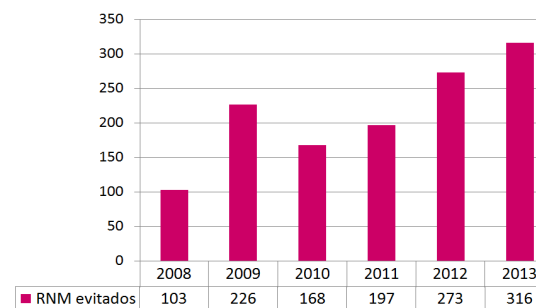


ROBOT
0% (0.12%)

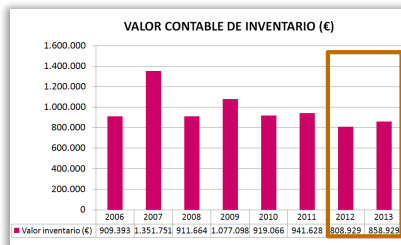
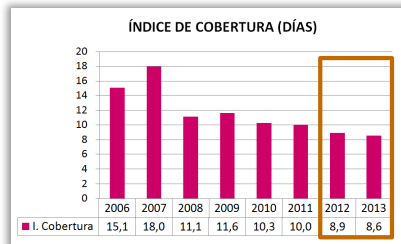
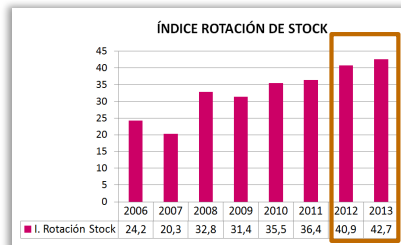


GLOBAL
0.63%

ERROR AVOIDANCE FOR
INCREASING TIME FOR
CLINICAL ACTIVITIES

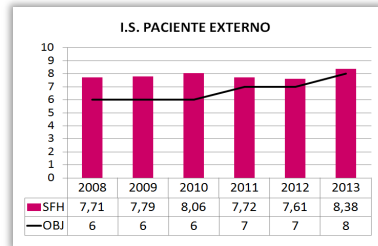
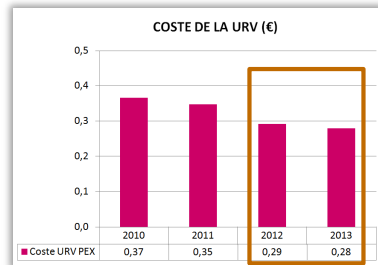
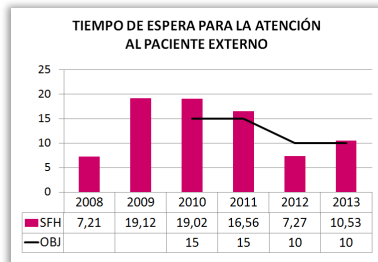


Benefits of Automation: Efficiency



- The stock rotation index increased from 36,4 to 42,7 (inventory for 8,6 vs 10 days)
- The inventory value decreased 10% with an increase of 10% patients dispensed
- Reduction of personnel global time dedicated to medication management decreased 80%

Benefits of Automation: Efficiency



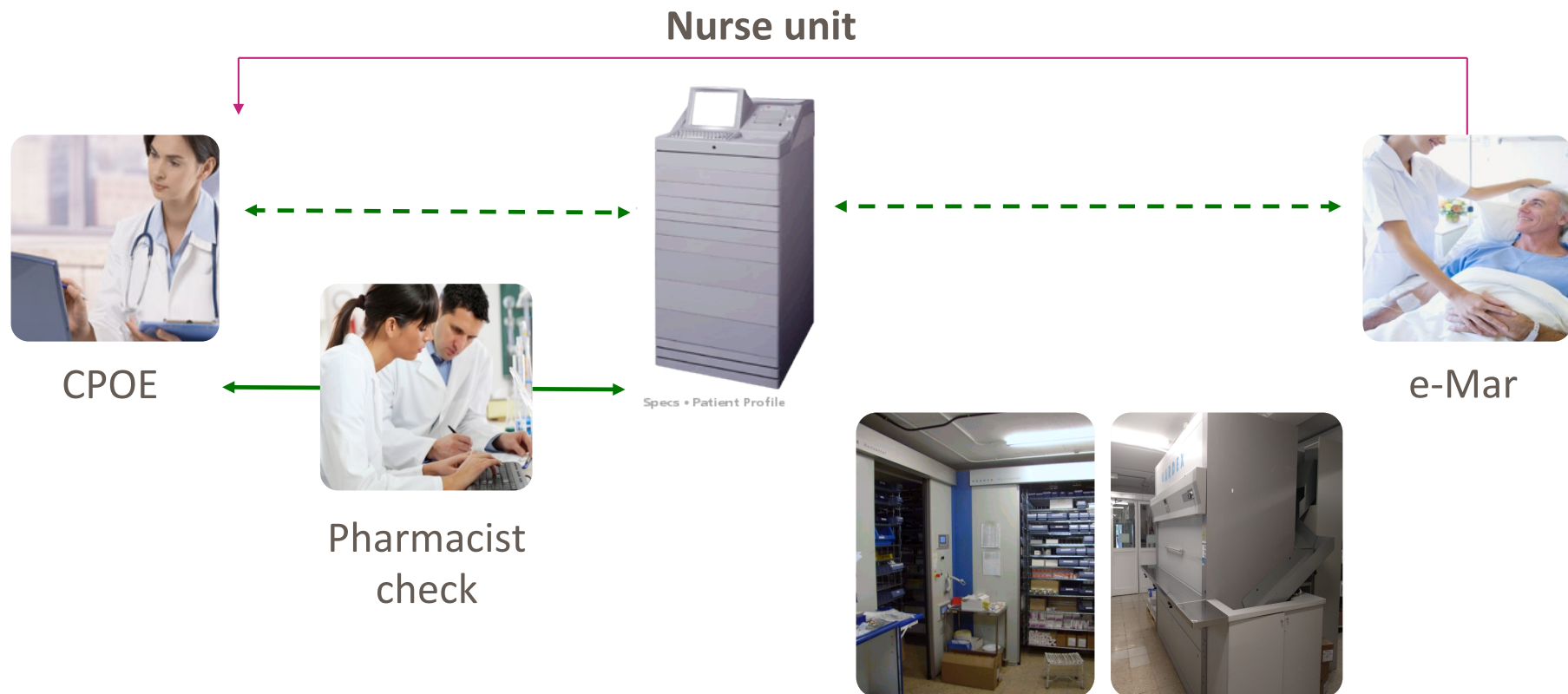
- Reduction of 30% of patients' waiting time
- Reduction of cost per patient dispense 20% (0,35 to 0,28 euros)
- Patient satisfaction increase
- 100% of the users recomend the system to others

2

+ Nurse Unit Automation



How is the circuit in the nurses' units now?



Benefits of Nurse Unit Automation: Efficiency



- Reduction of preparation workload with 66%:
from 3 tec/340 beds to 1 tec/340 beds
- Reduction of returned medication from 18% to 0.45%
- ICU: 45% inventory reduction, reduction of time-around medication, and simplified narcotics management

SUCCESS STORY: EMERGENCY ROOM

- Reduction of floor stock
- Pharmacists' office in the old stock room -> accessible for professionals and patients





... Automation in drug use process
increases **safety** in dispensing and
efficiency in inventory management,

...facilitating *greater dedication of the
pharmacist to clinical activity* and an
improvement in the **quality** perceived
by *patients* and *personnel* satisfaction



Thank you very much

Dra. Ana Herranz Alonso

Servicio de Farmacia

HGU Gregorio Marañón

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aherranza@salud.madrid.org



Mr. Kristof Dupon

Chief Innovation Officer EEG Group

Smart Hospitals, when the infrastructure starts
to peak



SMART HOSPITALS

EEG GROUP

When the infrastructure starts to speak

Kristof DUPON, ir.
CIO



HVAC & Plumbing



LEROY

EEN FRISSE VISIE OP VERWARMEN



DE KOCK

HVAC - SAN



DANNEELS



EEG

VAN BRAECKEL



BESSEMANS

HVAC - SANITAIR



MARECHAL

SANITAIR - ZINKWERK

 **BELTHERM**
LUCHTBEHANDELING

**Verwarmings
Technieken
erelst** bvba



Digital



EEG

GROUP



BUILDING-IQ

BUILDING INTELLIGENCE

25⁸



Electro



EEG

ELECTRO ENTREPRISE



ELECTROLYSE

SMET
ELEKTRO KAMIEL SMET NV



Medical



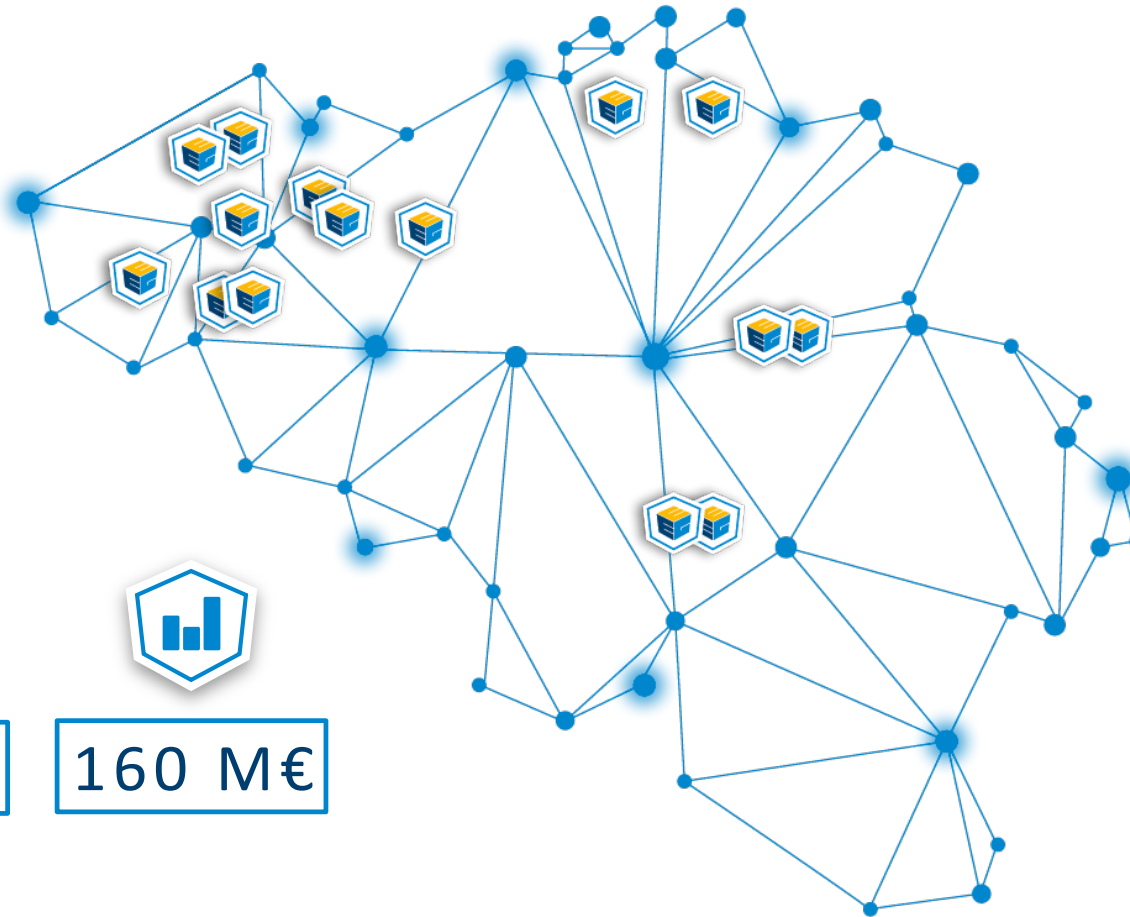
HEYER

MEDICAL TECHNOLOGY



DANNEELS

EEG GROUP



850
FTE



160 M€

TECHNOLOGY ENABLERS



CONNECTIVITY

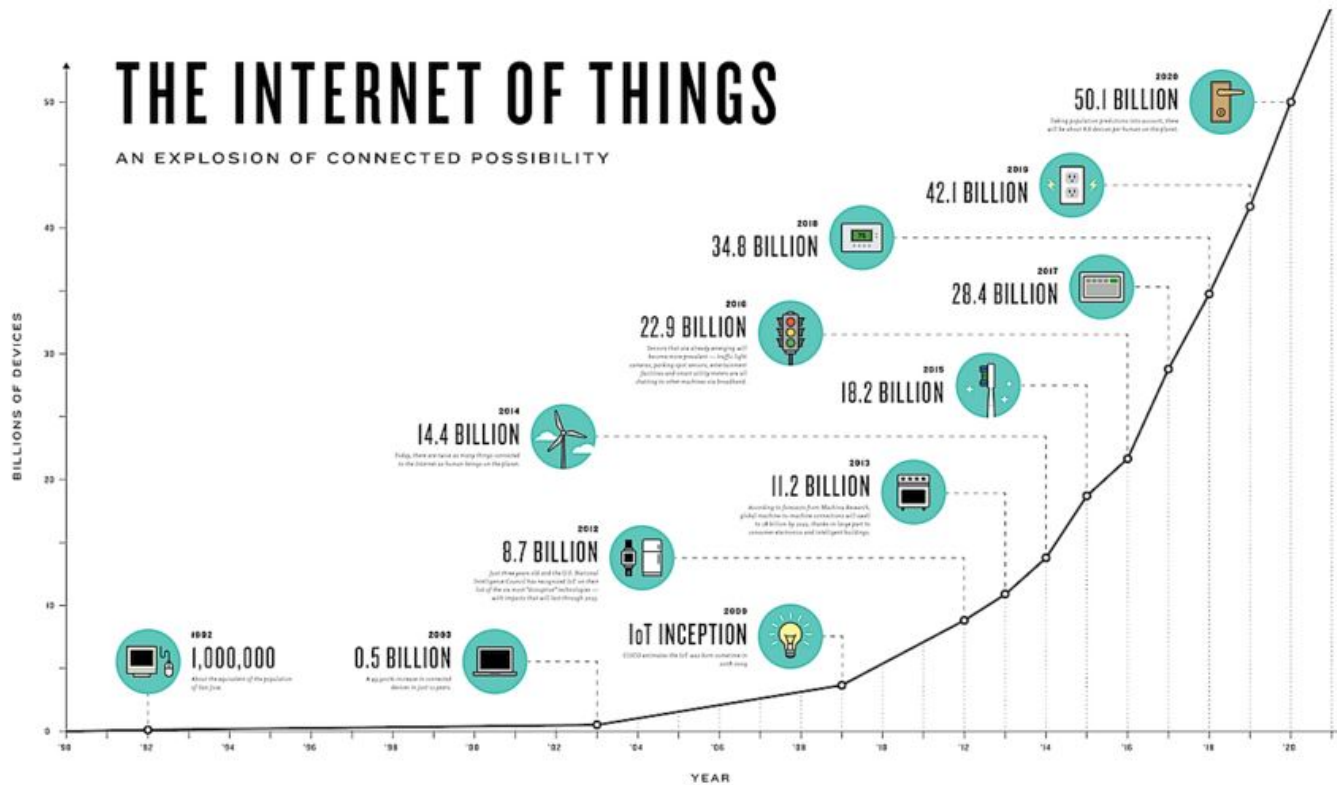


DATA SCIENCE

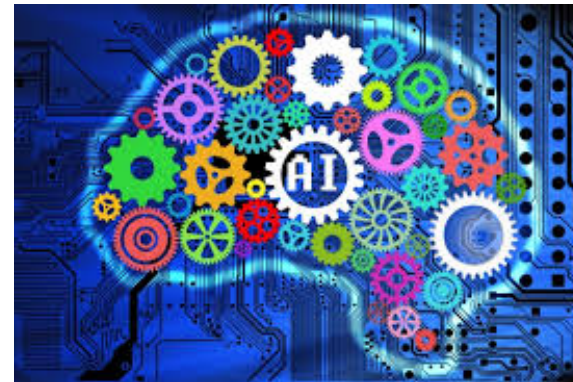
CONNECTIVITY



CONNECTIVITY



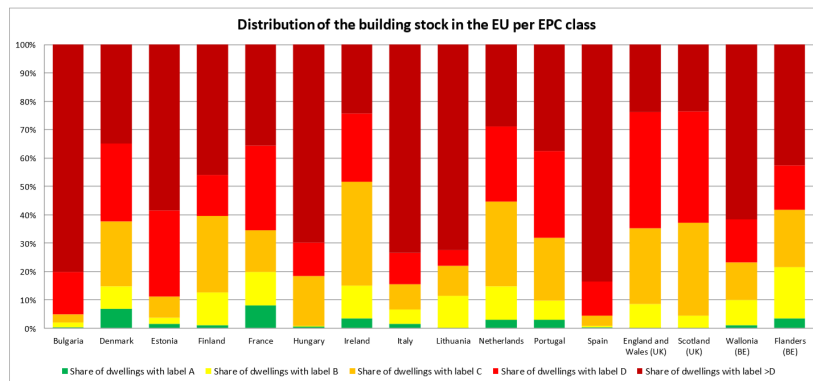
DATA SCIENCE



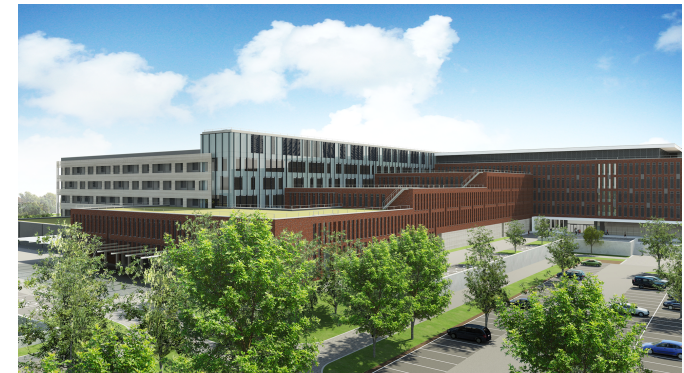
HOSPITAL INFRASTRUCTURE

The climate challenge and European Directives which go along with it, lead to far more complex installations (retrofit or new)

Air handling units, heatpump, geothermal energy, biomass, combined Heat/power production, demand driven ventilation, ...



97% of buildings in the EU need to be upgraded to achieve a decarbonised building stock by 2050 (source BPIE)





391



962



3.277



256



15.507



Hospital wide – 15.507 datapoints

- 15' samples
- 62.028 samples / hour
- 1,5 Million samples / day



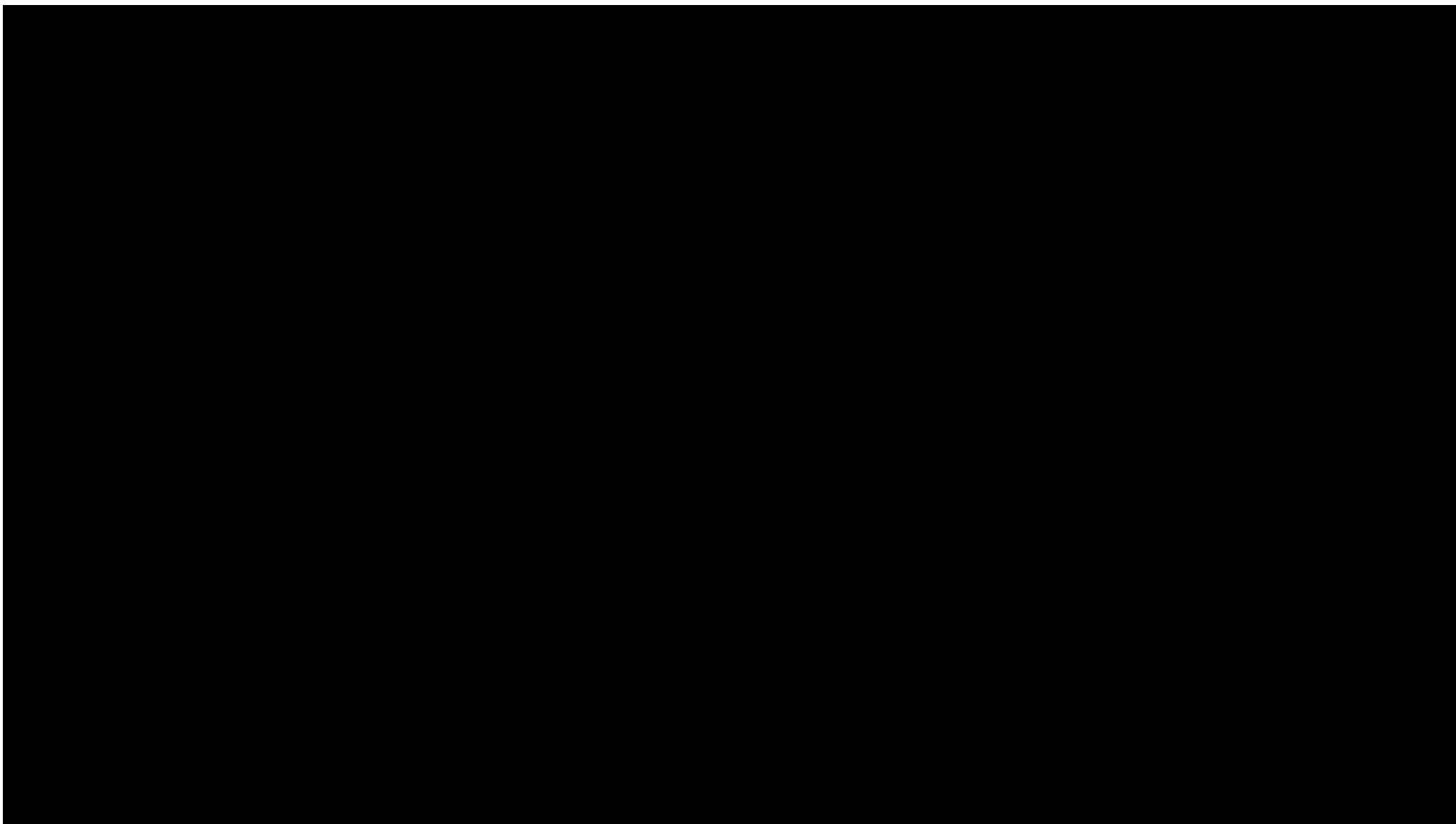
Operating theatre - 60 datapoints

- 5' samples
- 720 samples / hour
- 17.280 samples / day

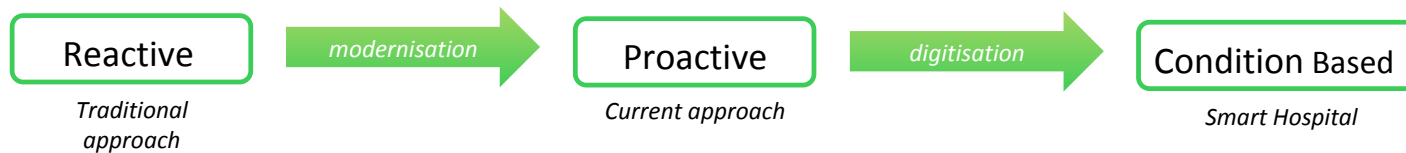


1.5 Million samples / day...





O&M – SCHNEIDER BUILDING ADVISOR



5x

More expensive
than proactive
maintenance

10x

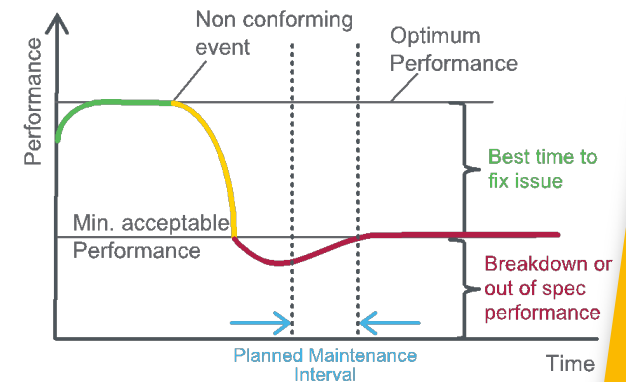
More expensive
than condition
based
maintenance

18%

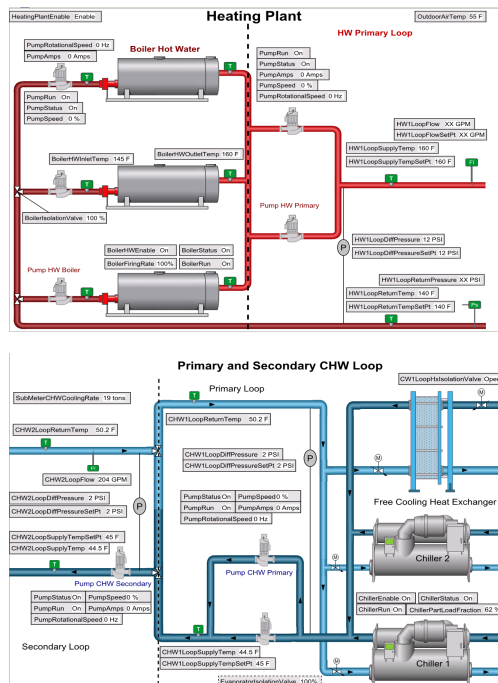
of failures are age
related

82%

of failures are
random



Connecting Assets



Polling & Distribution



Desktop



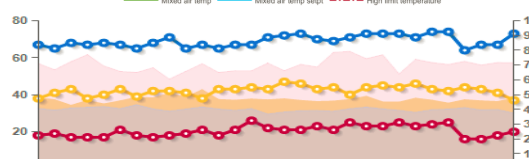
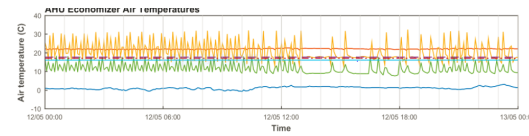
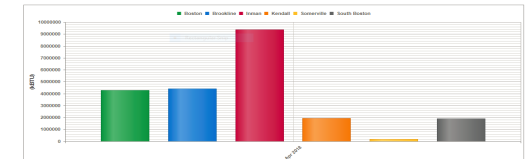
Mobile



Worldwide

Leveraging Data

Heating on, economizer should be off. OA damper should be min. Mixed air temp lower than setpoint.	1	\$165	10	6
Over-aggressive freeze prevention. Leaking cooling valve. No supply temp reset.	0	\$127	10	6
Supply temp lower than setpoint. Low loop temp difference. Flow sensor miscalibration. Sensor error /flat	4	62 €	10	5



O&M – SCHNEIDER BUILDING ADVISOR

SFG20 Maintenance Scope 1620 Data Points across 350 assets

Data point checks by Maintenance Engineers if
in line with SFG20 scope

1,620 checks
per annum

Proactive

Current approach

Building Advisor Service Plan 1620 Data Points across 350 assets

Building Advisor checks every data point,
every 5 mins, every day

170 Million+ checks
per annum

Condition Based

Smart Hospital



MONITOR



Space

Occupancy, utilization



Comfort

Temperature, Humidity



ASSIST



Find

Spaces, people, services



Book

Rooms, workplaces, services



TRANSFORM



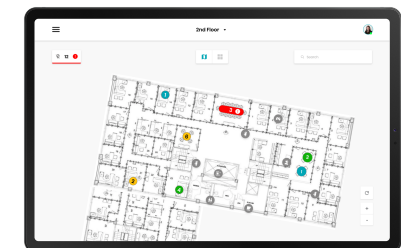
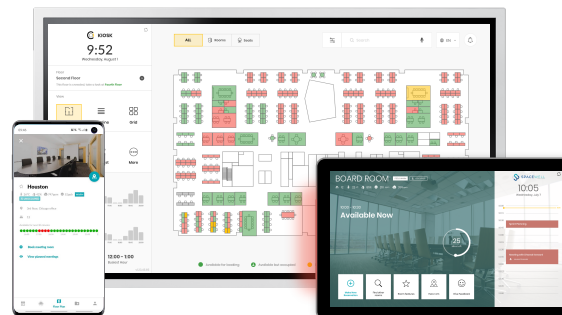
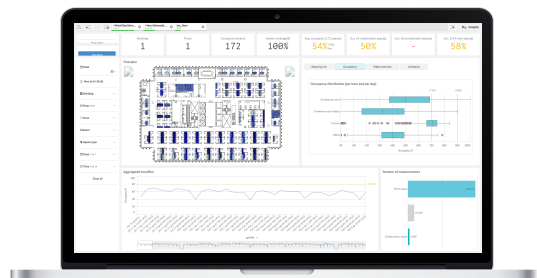
Cleaning

Activity based, real-time follow-up

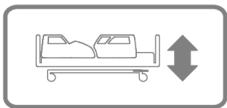
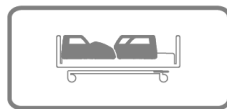


Repairs

Direct response, real-time view



PATIENT EXPERIENCE & SAFETY HAELVOET/UNMATCHED - SMART BED



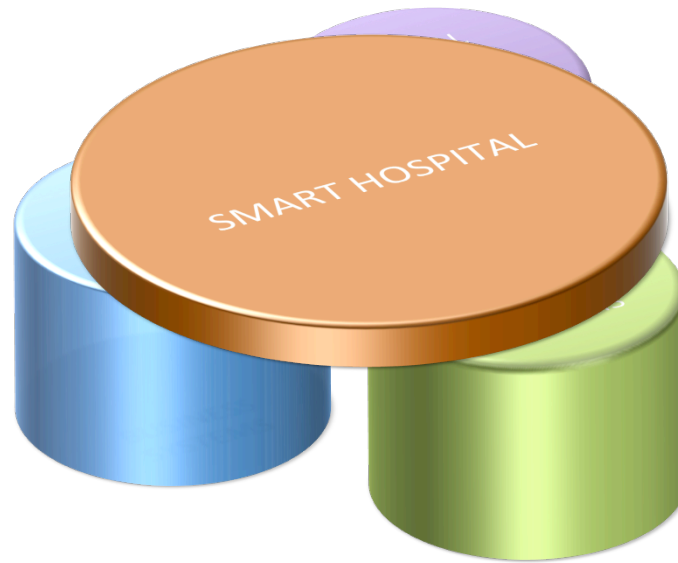
OPPORTUNITY

The combination of bidirectional communication between clinical, business, and building systems, the implementation of smart, semi-autonomous devices or sensor networks, and the use of analytics within a hospital creates endless possibilities for the development of smart, efficient, and effective hospital processes
("MacKenzie Health")



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The combination of bidirectional communication between clinical, business, and building systems, the implementation of smart, semi-autonomous devices or sensor networks, and the use of analytics within a hospital creates endless possibilities for the development of smart, efficient, and effective hospital processes
("MacKenzie Health")





Hospital visit:

Guided tour of the new building

A part of the building is still under construction, please wear adapted, comfortable shoes and flat heels.



**THANK YOU
FOR YOUR
ATTENTION**

**WISHING YOU
AN INSPIRATIONAL TOUR**



**SAFE TRIP BACK
TO THE MEET & GREET
CENTER**