

**Emergency COVID-19
interventions with the KZN &
Eastern Cape Departments of
Health – lessons in proactive
maintenance**

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3 Key messages to take home

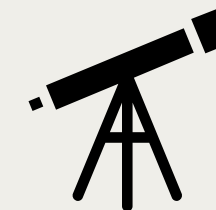
In the end, everything breaks down.



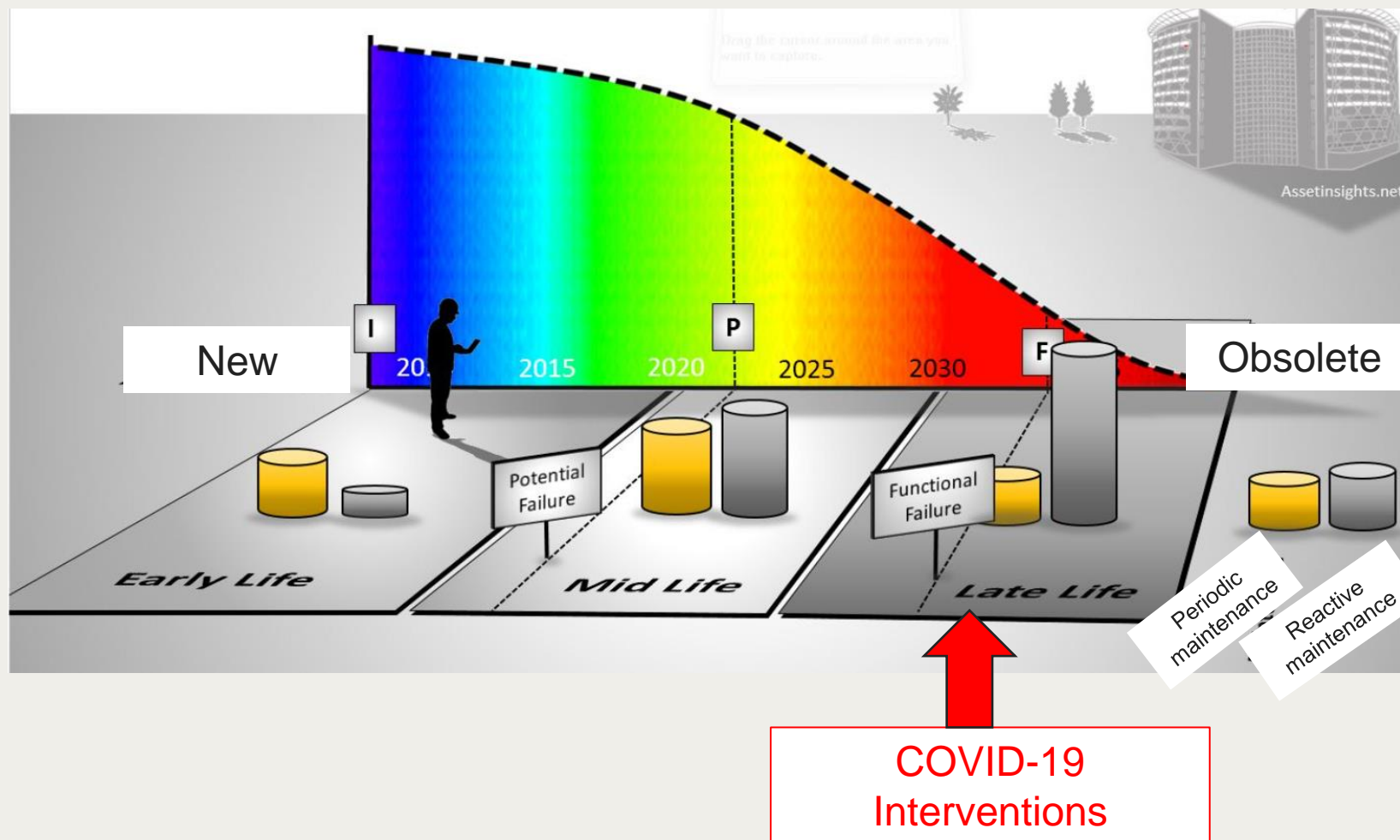
Ongoing condition assessments + proactive maintenance is more sustainable than emergency interventions



Facility management \neq maintenance of the status quo. When done right, it has the ability to predict the future (or *the range of possible risks*) using data capture & analysis tools



Lessons in lockdown : Maintenance in the life cycle of typical healthcare infrastructure



Profile of COVID Critical Projects in KZN & Eastern Cape

1. Typical client profile:

- Business as usual - Public health departments
- Emergency situations - Implementing agents & private donor funds such as the SPIRE Fund

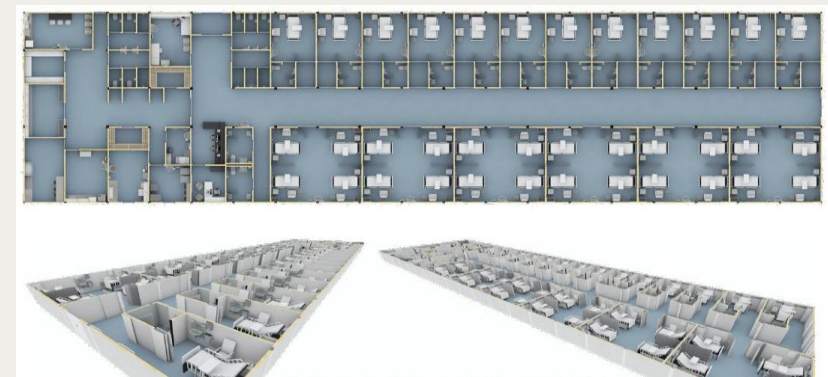
2. Zutari services deployed:

- Facility condition assessments
- Health facility planning
- Building services design

3. Rapid conceptualisation & parametric modelling for temporary (and convertible to permanent) COVID wards



**FIRSTRAND ESTABLISHES
THE SA PANDEMIC
INTERVENTION AND
RELIEF EFFORT (SPIRE)**



Eastern Cape

- Livingstone Hospital – December 2020; HVAC services to COVID wards
 - 36 year old system was recirculating Covid ward air, no cooling or heating capability; no negative pressure capability;
 - Full fresh air unit providing two stage filtration, dehumidification, cooling and reheating / heating which is all exhausted to outside to provide a negative pressure in the COVID sensitive areas.
 - The ward needed to remain functional therefore we had to devise a plan to reduce the disruption of operations as much as possible. The ducting in the ceiling were semi rigid flexibles pulled through rather than removing ceilings. The work was done inside plastic sheet covered mobile scaffold box to contain dust and noise as much as possible



Newly installed systems are integrated into BMS, or have the ability generate and store usage data for future predictive analytics.

KwaZulu Natal

- King Edward Covid High Care Unit upgrade – April 2021
 - A normal ward was refurbished as a HCU ward.
 - The design allows for variable conditions of the perimeter zone and more constant conditions of the internal zone. The air conditioning system dehumidifies and cool the air with reheating correcting the temperature to final room temperature.
 - Split type AHU's were used to accommodate units inside the ward where fresh air can be taken in away from high risk areas such as patient waiting areas;
 - Existing slab were extremely brittle therefore ducting was cantilevered off beams
- Newly installed systems are integrated into BMS, or have the ability generate and store usage data for future predictive analytics.



KwaZulu Natal – multiple HVAC upgrades triggered by aged systems & total failure

- Estcourt – November 2021
 - Condition assessment performed
 - HVAC upgrade to operating theatres due to system failure;
 - New system was designed and installed according to IUSS standards
- Greytown Hospital – May 2021
 - Condition assessment performed
 - HVAC upgrade to operating theatres due to system failure;
 - New system was designed and installed according to IUSS standards
- RK Khan – current
 - Condition assessment
 - HVAC upgrade due to system failure;
 - New system to be designed to IUSS standards
- Ngwelezane – current
 - Condition assessment performed
 - HVAC upgrade due to system failure;
 - New system to be designed to IUSS standards

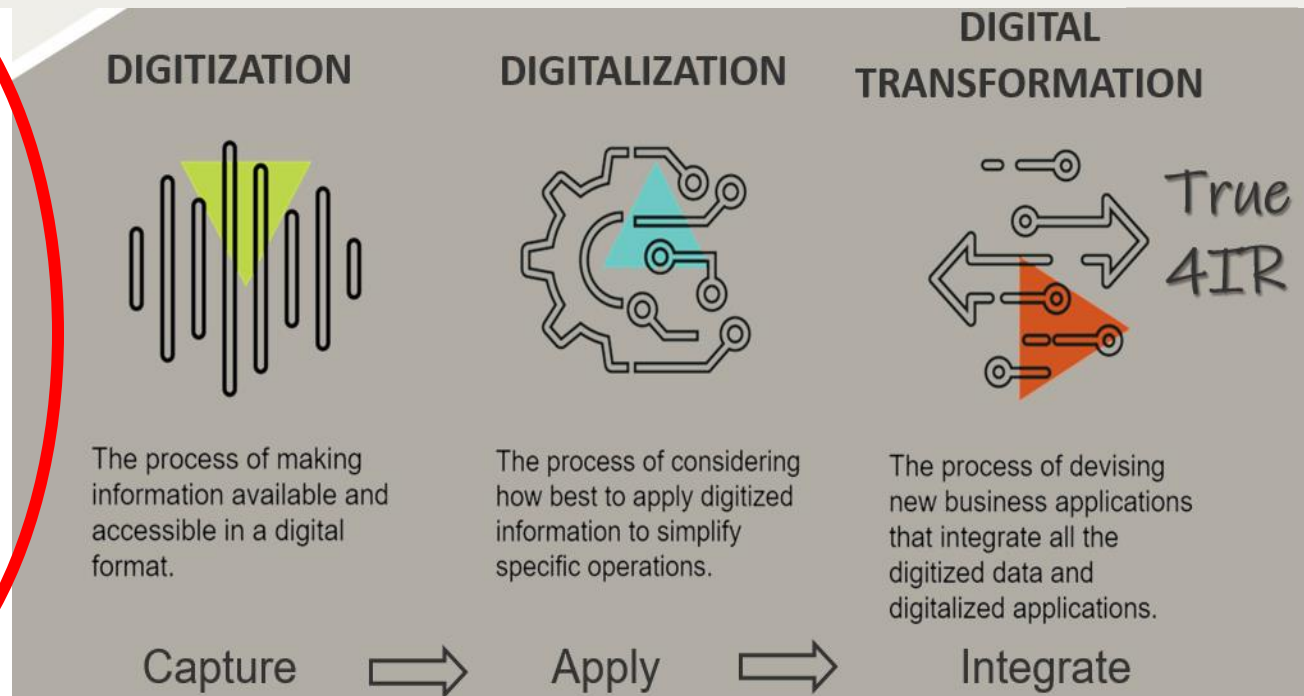
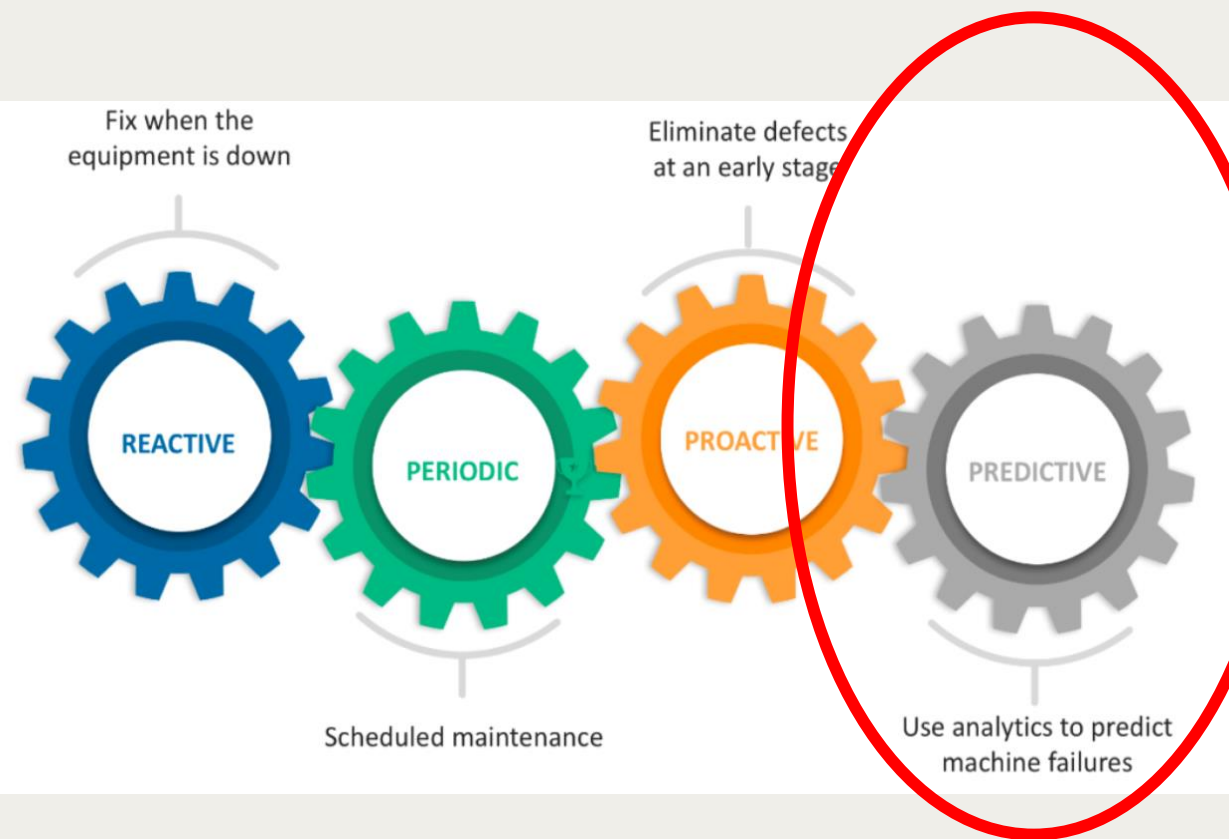


Lockdown lessons - into the future

- Facilities
 - Ventilation (natural, mechanical, forced) & water systems of all hospital areas decline with time as equipment ages and spaces are re-purposed for dire needs
 - Low level hygiene factors (ingress of water, mould, perforation of material such as partitions, floors, ceilings) exacerbate the impact of ventilation issues, which together then make for poor conditions for infection control to prevent e.g. TB, COVID, etc;
 - Maintenance of the existing is far cheaper than new capital projects;
- Clients:
 - Public clients for capital projects are not necessarily the same clients for life-cycle facility management & maintenance;
 - Private donors (e.g. SPIRE Fund) can enter public – private partnerships for rapid addressing of public health needs; while it is early days, there has to be some lessons brought into future funding of infrastructure & capacitating of delivery teams where urgent needs arise;
- Approach to involvement of healthcare engineering & technical professionals:
 - Low level of skills employed in maintenance functions on site & long process to escalate “issues” until health care professionals are involved;
 - Condition assessments allow skilled professionals into a typically “maintenance environment”, which can prompt proactive upgrades, which allows for new technology to meet growth in personnel skills & service delivery standards over time;
 - Facility stagnation (or being reactive only) is not a sustainable option – facilities work hand in glove with medical professionals' skills growth & the expectations of patients & communities;

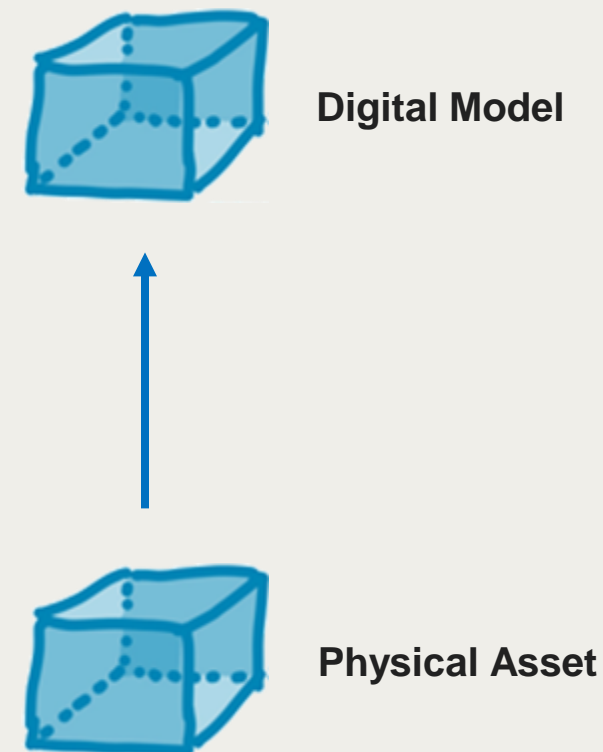
Despite the incredible challenges faced by public healthcare professionals & facilities which we observed, the future of healthcare maintenance is an inevitable combination of technology - gathering, modelling, performance monitoring & human centered improvements.

Bringing maintenance into a technology driven service via data



Where does this "data" come from?

- New projects - now commonplace to begin in 3D at the outset with data intensive models;
- New projects on existing facilities – reality capture tools + combined with 3D design
- Live facilities - reality capture + BMS + equipment self generating data based on usage;
- Future facilities - fully equipped with IoT sensors that complement a 3D model;



Why are we talking about digital tools & health system maintenance in the same breath?

Dave Rhew, Chief Medical Officer, Samsung Electronics America:

“Our belief is that in order to improve outcomes, you need to focus on the patient experience, the consumer experience, the physician experience. And in order to do this you have to make these solutions seamless, part of one’s lifestyle.”

A few realisations as an engineer in 2020:

- There is no separation of public health & private – everyone’s health matters once they step into a bus / office / home.
- Healthcare facilities are “living” buildings that need as much care as the patients to prevent pandemic spread and allow health personnel to perform to the best of their ability; modelling this infrastructure digitally is another way to “bring it to life”;
- Proactive maintenance is more critical in public health facilities than in most other public infrastructure in the built environment due to its direct correlation to community health. The opportunity to deploy digital tools is far too valuable to pass up.

▶ Thank you

