

SANDFORD FLEMING FORUM

Minimising Loss, Accelerating Recovery in Commercial Real Estate





Problem

- Concentration of value and operational intensity
- Increasing dependency of operations on information systems and ICS
- Increasing cost sensitivity to business interruption
- Changing/increasing hazards and risks to operations
- Legacy systems and structures.



Solution

- Integrated operational resilience:
 - Quantitative systems level risk awareness
 - Resilient operational practices
 - Resilient operational program within the structure
 - Cyclical ongoing operational risk assessment and posture adjustment
- Integrated systems dependency model








RiskLogik

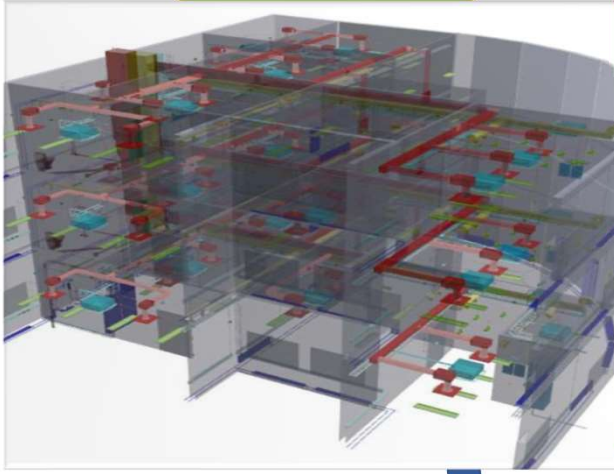
Operational Control Framework

Building systems inter-dependency BIM

Context

- Power 
- Emg Svc 
- Transit 
- Supply Chain 
- Food Svc 

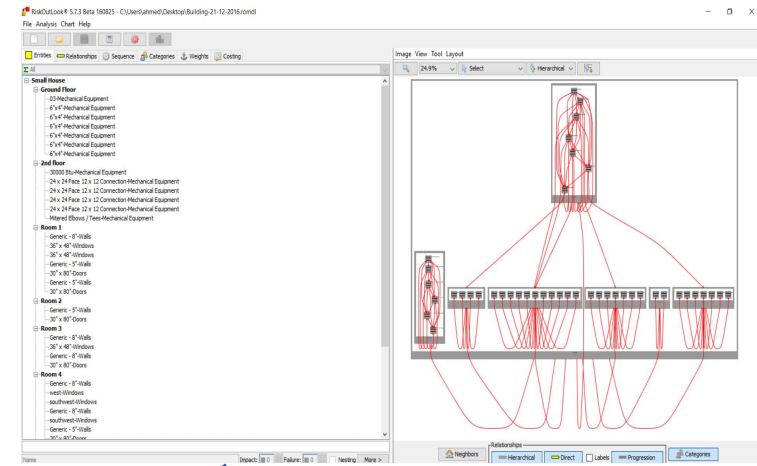
Content



Context

- Telecom 
- Water 
- Waste Water 
- Networks 
- Distribution 

Operations to building systems inter-dependency graph model

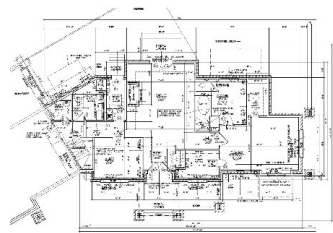


- Understand the System of Systems
- Understand Inherent Risk

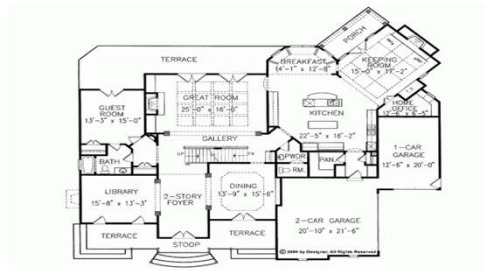
Constructing the Control Framework



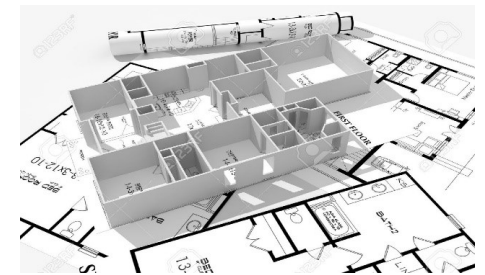
1 Scanning



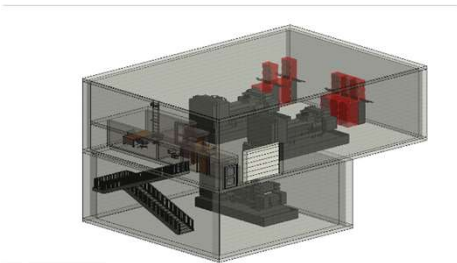
2 Design



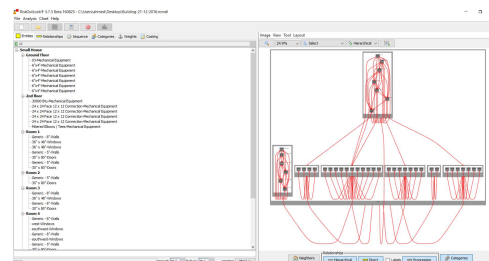
3 As Built



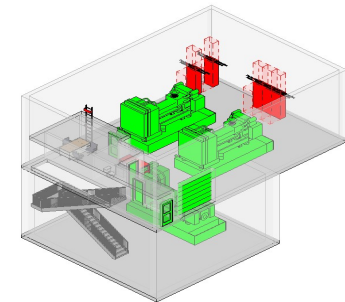
4 Revit Model



5 Interdependency Extraction

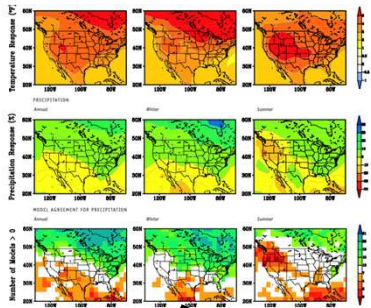


6 Inherent Risk Model

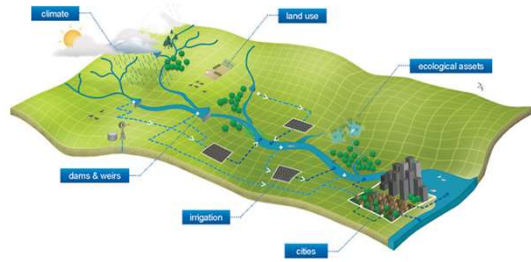


7 Visualization/Simulation

Apply Hazard

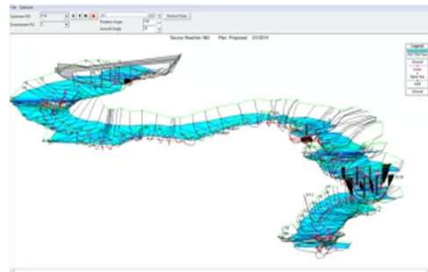


Downscaled Climate Models

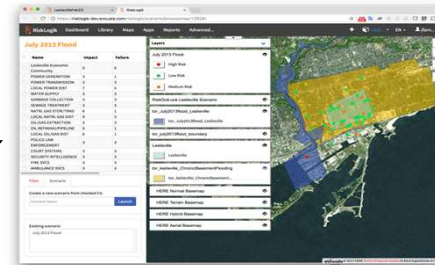


Digital Watershed Model

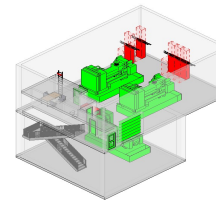
Infrastructure inter-dependency model



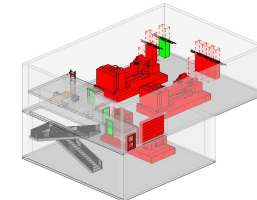
Hydrological Model



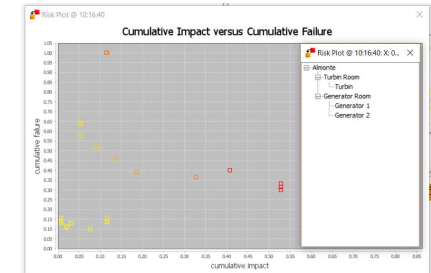
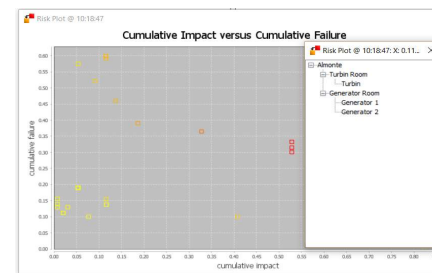
Integrated Hazard (Flood) Modelling



Inherent Risk Profile

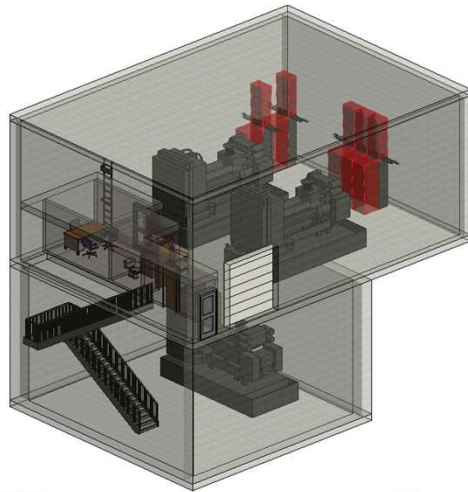


Hazard Risk Profile

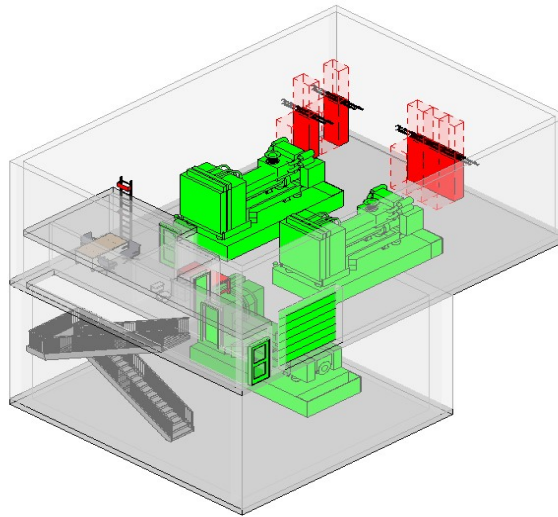


Visualization and Simulation

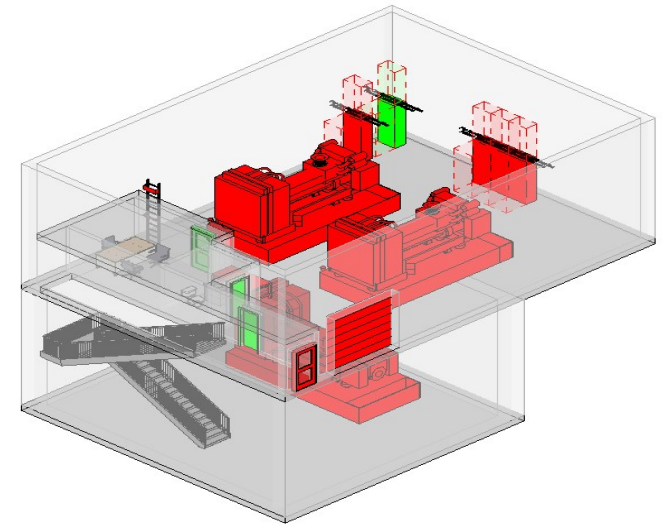
BIM Model



Normal Operation

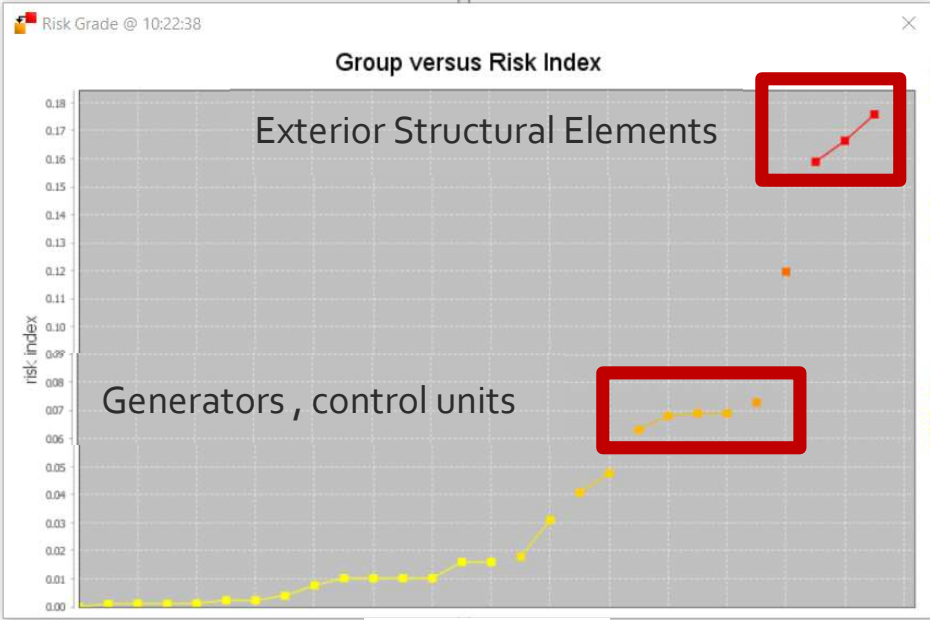


Flood Hazard

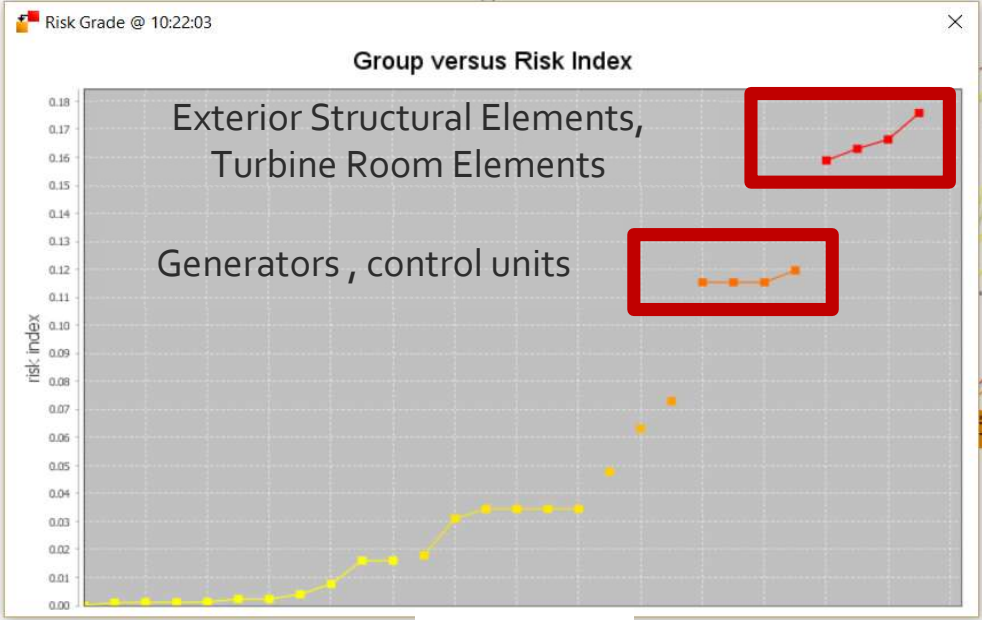


<https://www.youtube.com/watch?v=acsIDaGhXos&feature=youtu.be>

Inherent vs Hazard Risk Profiles



Inherent Risk



Hazard Risk

Hazard Risk Scenario Cost Profile

Asset Class	Fixed	Day 1 Variable	Day 2 Variable	Day 3 Variable	Scenario Cost
Structural Elements	\$62,184,450.00	\$2,552,337.00	\$5,104,674.00	\$7,657,011.00	\$77,498,472
Turbines	\$81,082,091.00	\$1,194,221.00	\$2,388,442.00	\$3,582,663.00	\$88,247,417
Generators and Control	\$9,582,000.00	\$9,250.00	\$18,500.00	\$27,750.00	\$9,637,500
Totals	\$152,848,541.00	\$3,755,808.00	\$7,511,616.00	\$11,267,424.00	\$175,383,389



Prepared for Sir Sandford Fleming Forum

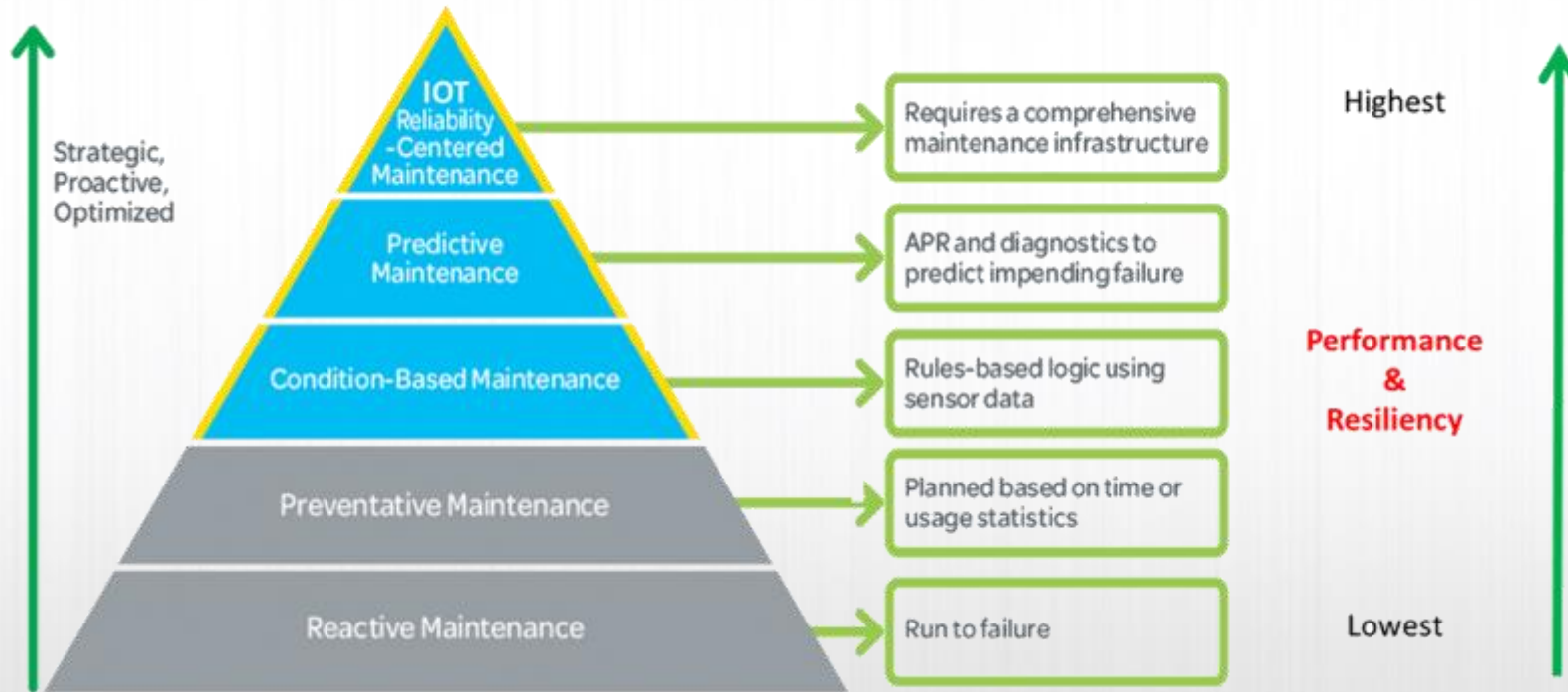
Maintenance Activities That Informs Operational Resiliency & Enablement



Forward

Prior to reviewing this presentation, it is recommended that you read the one page briefing document that provides the necessary context.

Maintenance Pyramid



***Self Evaluation –
Where does your
operation fit?***

Typical Maintenance Activities

Outcome & Information

Facility Assets	Outcome & Information
Central Plant (Chiller/Boilers/Pumps)	<ul style="list-style-type: none">• Confirmation of operational status• Completed tasking checklist• Inspection/Service Records• Maintenance Reports• Repair Recommendation• Incident Reports• Up-to-date BAS Software and Firmware• Janitorial schedule and scope compliance• Periodic cleaning compliance• Services are based on number of labour hours and the frequency of visits with an expectation of certain outcome• Information capture today represents a “snapshot” at time of activity
Ventilation System (AHUs/RTUs/FCs)	
Motors	
Backflow Preventor	
Sanitary System	
Building Automation System	
Electrical Assets	
High Voltage Assets	
Exterior Shell	
Interior Furniture, Fixture & Equipment (FFE)	
Contact Surfaces Hygiene	

What's the Business Outcome?

Does it inform you about resiliency, performance & operational risk?

Outcome & Information

- These assets may be *working*, but to what extent do you know how they are *performing* (efficiency, reliability, etc.)
- Are the maintenance & cleaning activities providing ongoing relevant data that informs decision making and reduces risks?
- This informed decision making contributes to your overall operational resiliency and building performance.
- Resiliency and operational matrices that are Specific, Measurable, Attainable, Relevant, Time-based (S.M.A.R.T.)

What We Measure ≠ What We Want

What We Measure Today	What We Really Want – Are You Receiving It?
Frequency of service on ventilation system	IAQ that contributes to the health & well-being of the occupants
Frequency of interior surface cleaning (High Touch vs. Low Touch)	Low count of pathogen on surface that contributes to the health of the occupants
Confirmation of HVAC seasonal service is complete	Energy efficient operation, minimal risk of failure and optimal longevity of the equipment
Frequency of emergency power generator testing	A reliable emergency power source and a well-function life safety system

And the list goes on...

Although there is merit to measuring leading indicator, we shall not forget about the lagging indicator which is essentially our end goal. This discrepancy creates a blind spot in our operational resilience planning and results in common challenges that we have all experienced.

Typical Challenges & Solutions

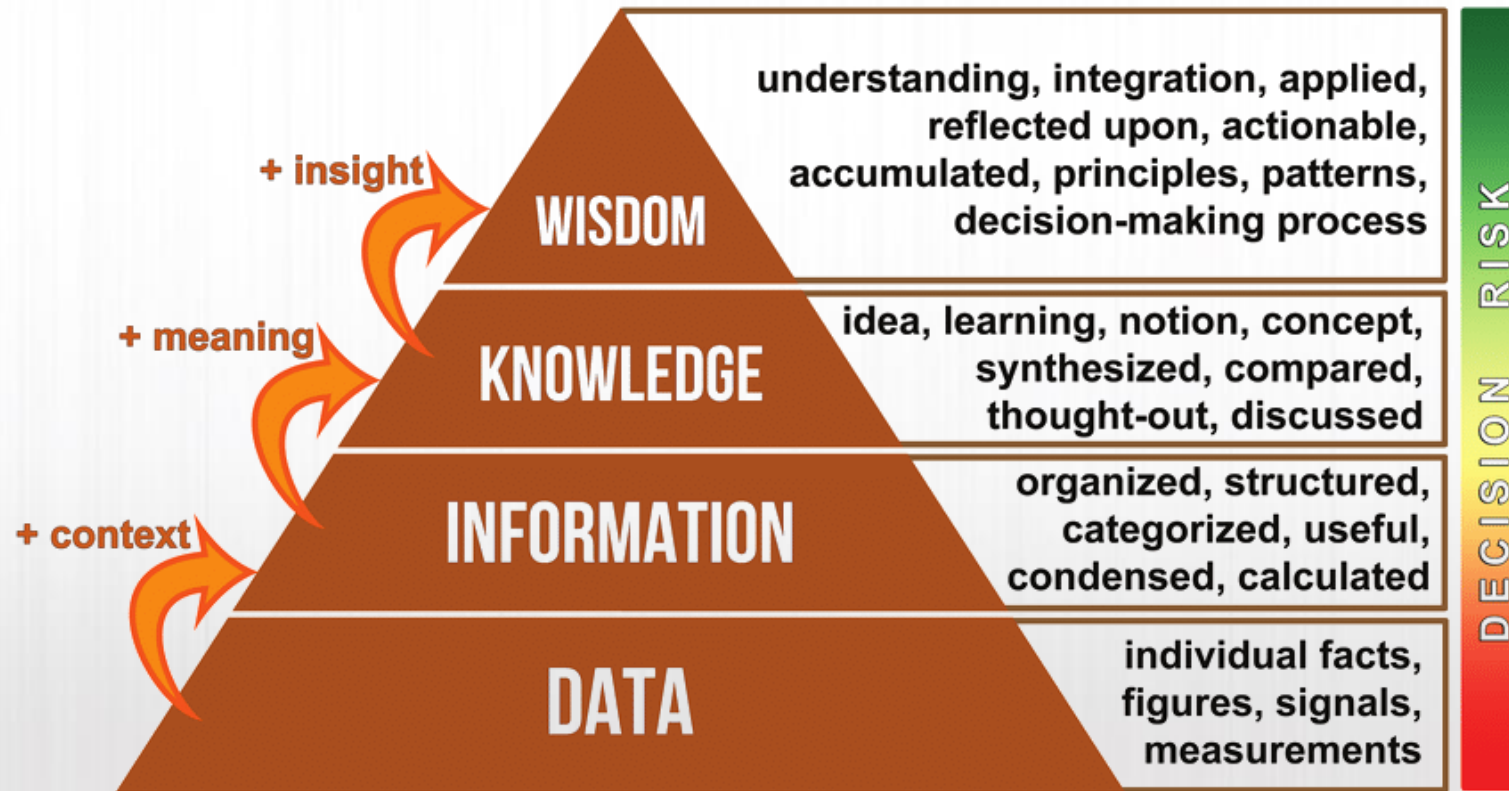
Common Challenges	Solution to mitigate risk and improve resiliency
<p>We constantly worry about unexpected failure of key components in building system impacting our resiliency and occupant satisfaction</p>	<p>Continuously measure and monitor the performance of critical mechanical and electrical components in real time. Observe performance deviation and implement informed maintenance practice. (Reliability Centre Maintenance)</p>
<p>We collect tons of data from various building systems but how is it helping us achieve a higher level of resiliency and performance?</p>	<p>Maintenance program that can combine raw data with trade specific knowledge to convert useful information into optimal decision making. Please see Appendix A&B to further evaluate where your operation is at.</p>

Typical Challenges & Solutions

Common Challenges	Solution to mitigate risk and improve resiliency
<p>Our occupants complains about poor indoor air quality (Comfort & Health) due to imbalance air distribution or presence of odors & pathogens</p>	<p>Use virtual model that simulate the air movement to visualize and understand how the air distribution impact occupant comfort and potential contribution to health concerns</p>
<p>High risk Issues that impact operations are not addressed with appropriate sense of urgency and clarity. (i.e. Recommendations identified on service reports may not rise to the level of priority required)</p>	<p>Real time service video call between technicians and customers to outline the problems and recommendations. Service report contains image and video to provide visual records.</p>
<p>It is a challenge to stay on top of every square foot of my building everyday.</p>	<p>Extend the value of contracted cleaning personnel who already are in the building everyday. Equip them with simple video/photo technology that capture identified area during their activities</p>

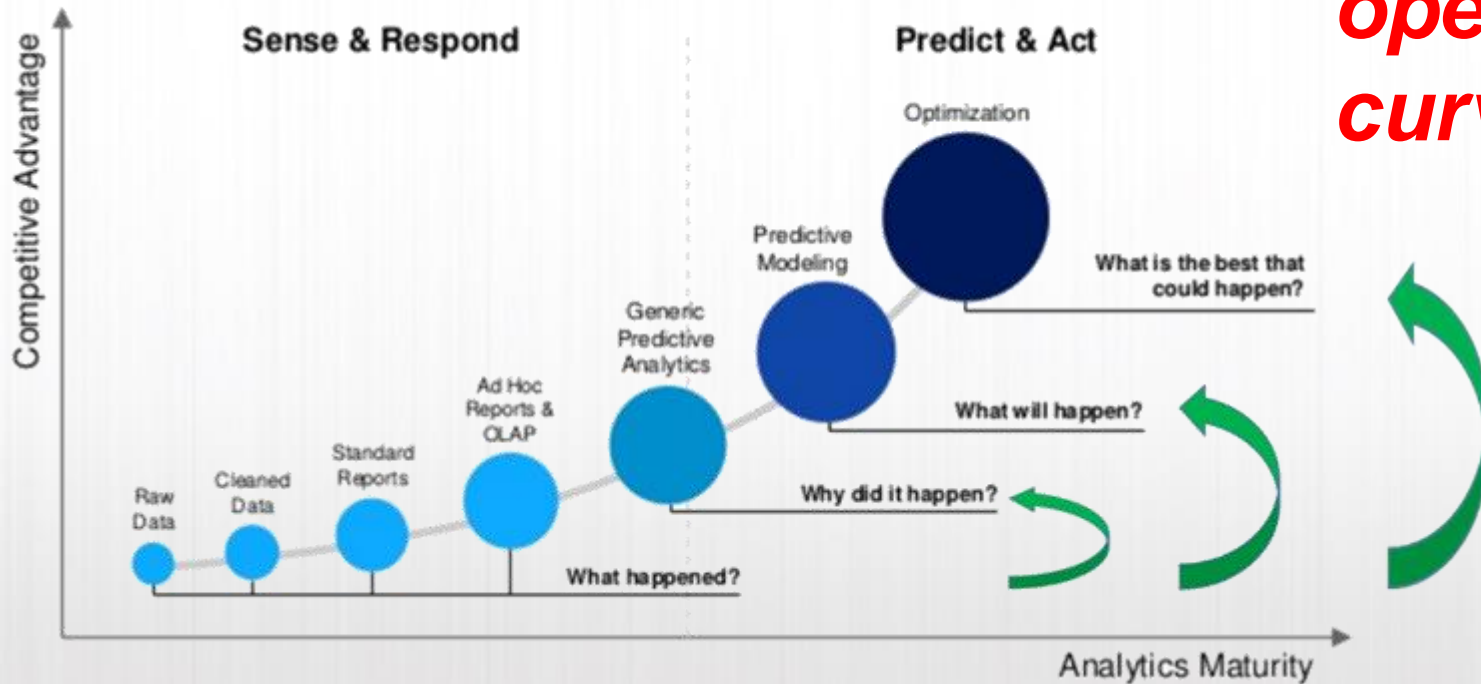
APPENDIX

Appendix A – Knowledge Hierarchy



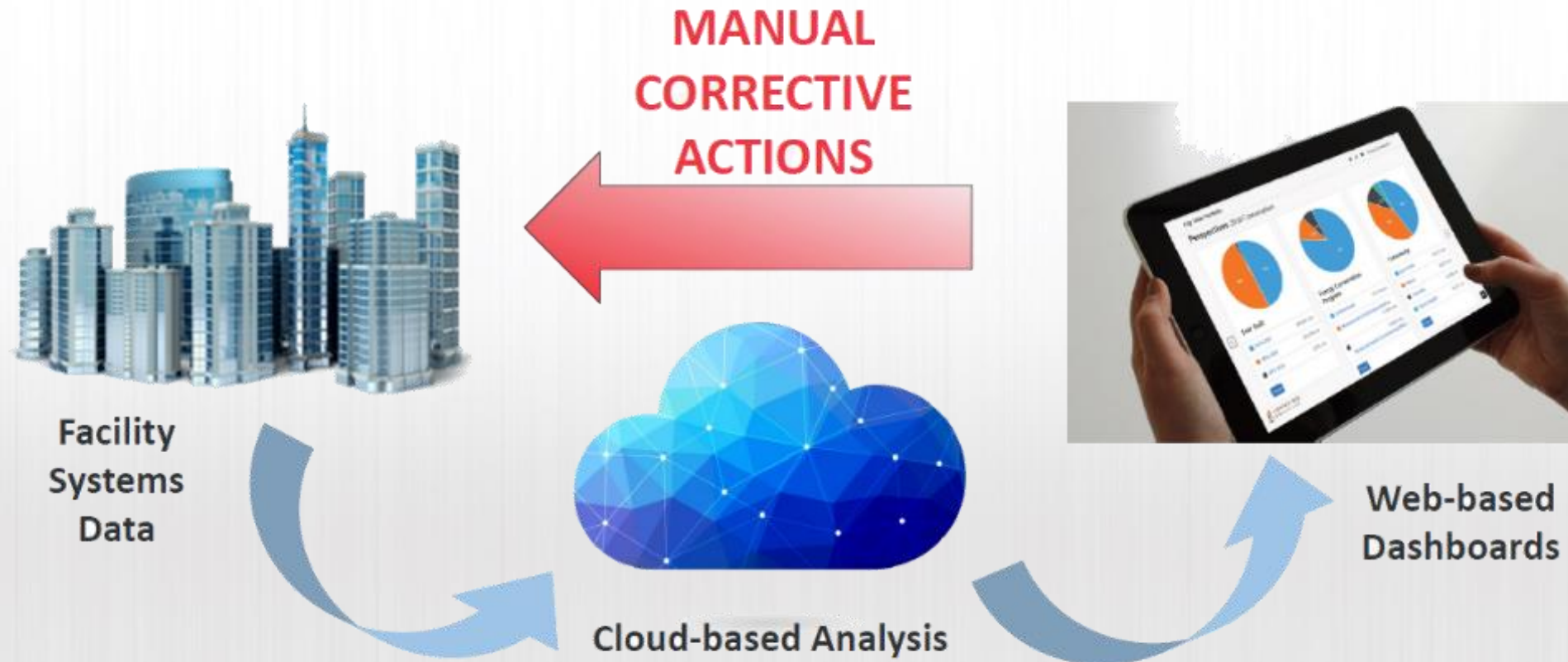
Appendix B – Using Data the Right Way

Where does your operation fall on the curve?



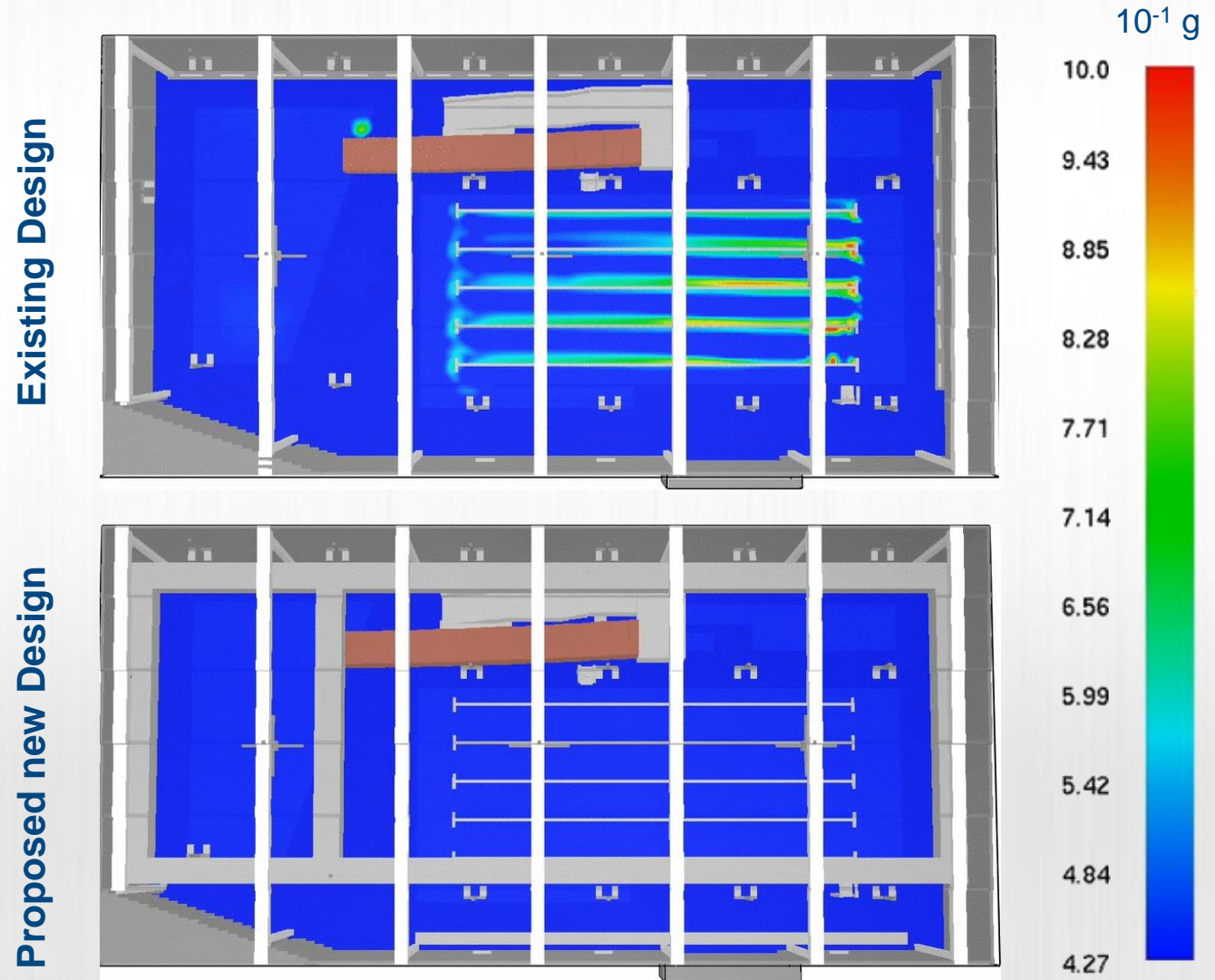
Appendix C – Leveraging Data into Actions

Generating Insights and Resolving Issues using Building Data



Appendix D — An example of Computational Fluid Dynamics Simulation

- Air above pool has high trichloramine (NCL3) concentration
- Swimmer complains with headache, nausea, burning eyes, itchy skin
- Can be applied to all ventilation applications



Appendix E – Leverage Technology for Communication



- See what field personnel see via their phones or tablets
- Hands Free – Remote control during live call (zoom/flash/draw)
- Field to Field or Office to Field
- Multi-platform from desktop to mobile

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