

**Preparing & Strategizing for Future Technologies**  
Five Disruptive Technologies that are Driving Ten Transformational Megatrends



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Vice President, APPA Advisors  
APPAA|ADVISORS

APPAA Institute for Facilities Management

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A strategically-focused understanding of the technologies that are driving changes in our built environments.

The megatrends that are reshaping our profession.

The urgency of shifting our mindset of “doing more with less” to a strategy of “doing different with less.”

APPAA Institute for Facilities Management

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If the rate of change on the outside exceeds the rate of change on the inside, the end is near.

Jack Welch

QuoteNova.net

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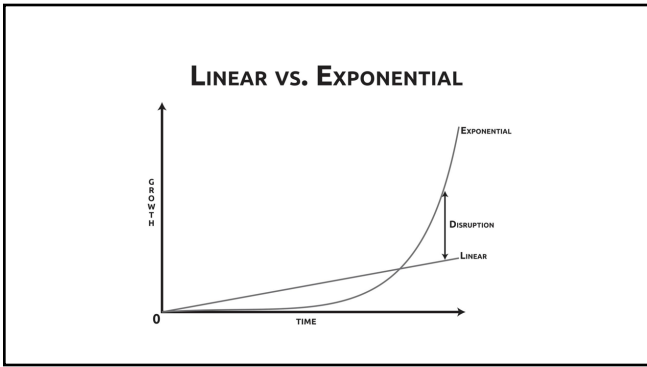
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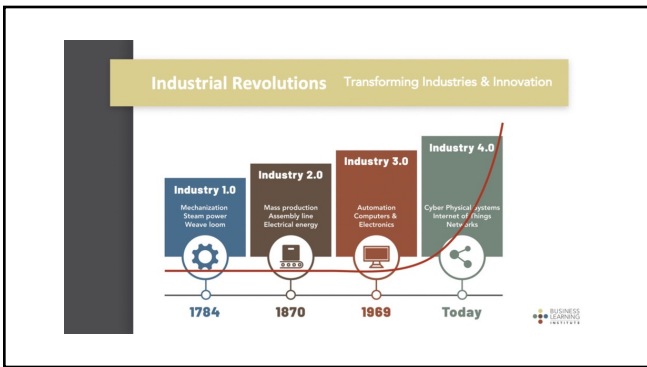
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THINGS WON'T CHANGE AS MUCH AS THEY WILL ACCELERATE. WHILE OTHER CRISES RESHAPED THE FUTURE, COVID-19 IS JUST MAKING THE FUTURE HAPPEN FASTER.

Scott Galloway  
Professor of Marketing  
NYU Stern Business School

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“The only smart strategy is to embrace and start leading the digital transformation of your company (organization).”



Andrew McAfee, MIT Research Scientist  
Coauthor of "The Second Machine Age"

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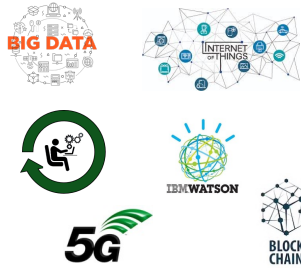
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### The Fourth Industrial Revolution

- Big Data Driven
- IoT Enabled
- OT Engineered
- AI Elevated
- 5G Fueled
- Blockchain Secured



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### Big Data Driven



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## What is Big Data?

The definition of big data is data that contains greater variety, arriving in increasing volumes and with more velocity. This is also known as the three Vs.

Source: Oracle

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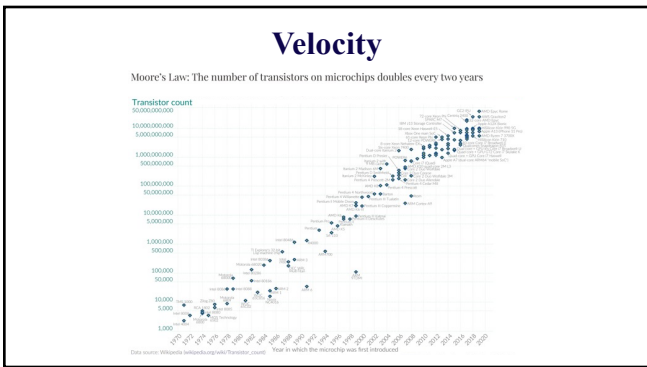
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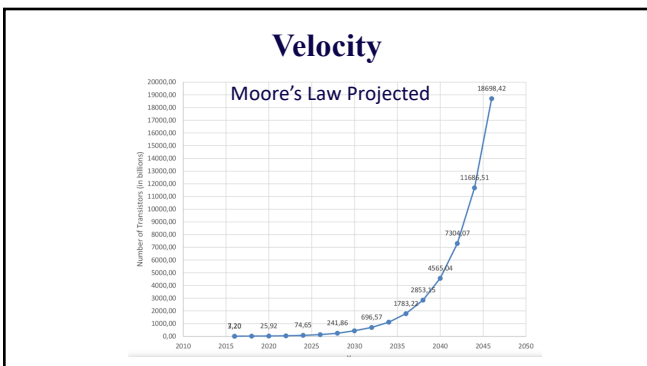
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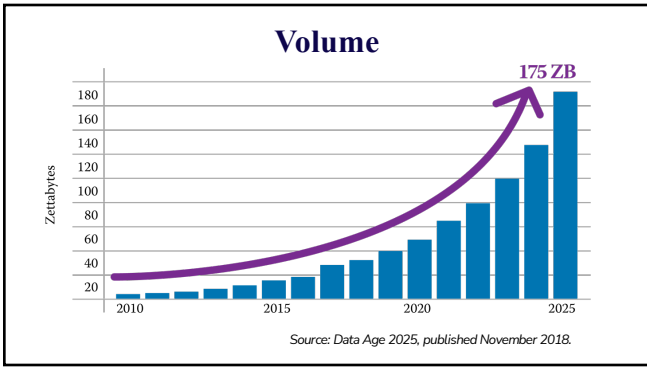
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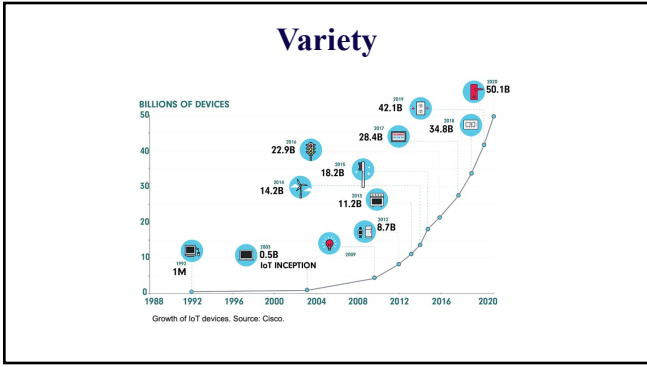
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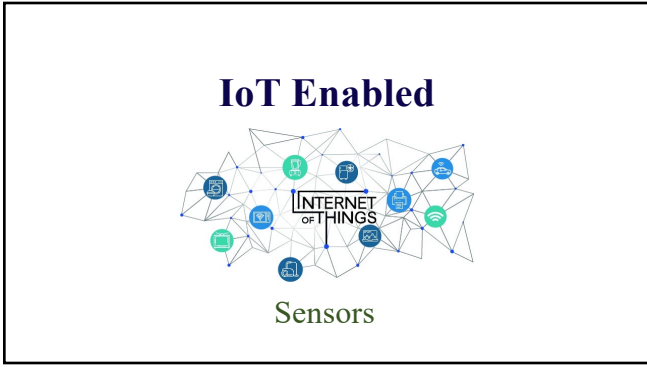
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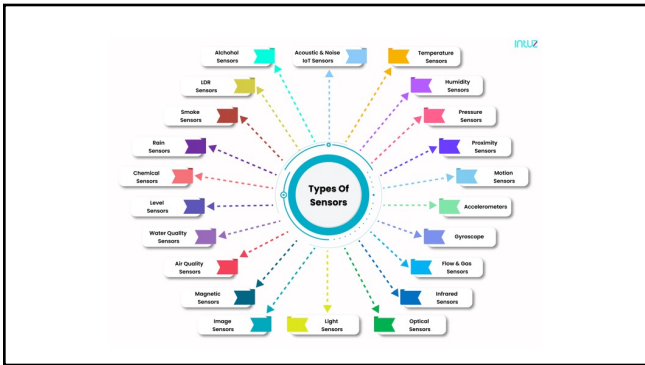
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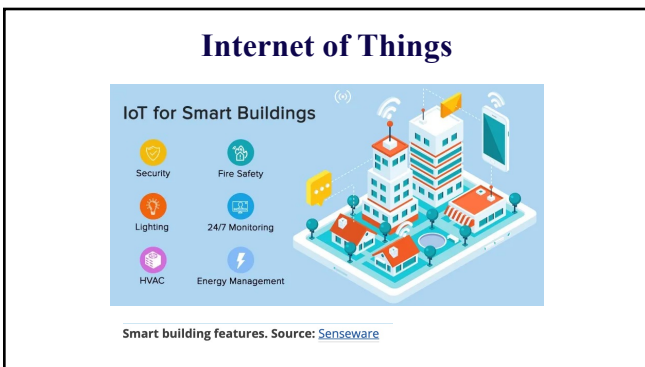
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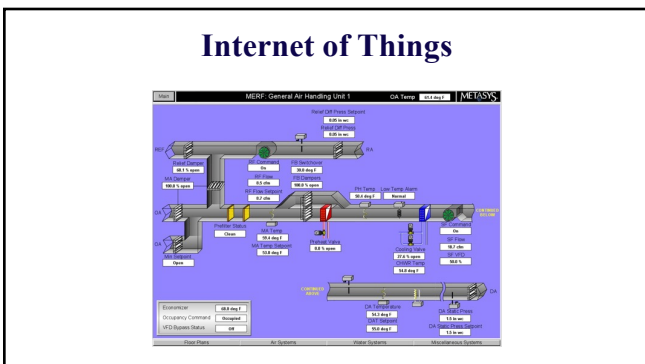
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### Internet of Things

#### Air Handler Performance

- Fan Runtime
- Fan Power
- VFD Control
- Static Pressure
- Heating Control
- Cooling Control
- Ventilation Air Control
- Economizer Control
- CO2 Control
- Outside Air Temperature
- Return Air Temperature
- Make-up Air Temperature
- Supply Air Temperatures
- Freeze Stat Alarms
- Smoke/Fire Alarm
- Pressure Drop Alarm

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### Fault Detection & Diagnostics

- Simultaneous heating and cooling
- CHW valve leaking by
- Steam valve leaking by
- Heat rec. running when it shouldn't
- Heat Recovery leaking by
- Dirty filters
- Not maintaining static
- CHWS temp too high
- DAT off set point
- Humidification when it shouldn't
- Not meeting humidity set point
- Humidity high limit
- CO2 sensor out of calibration
- Any current senses zero for a fan
- Multiple units running out of sync
- Air flow thru unit that is off
- Ave valve position versus OAT
- Economizer Optimization
- CW valve staging incorrectly
- Avg CHW delta T versus OAT

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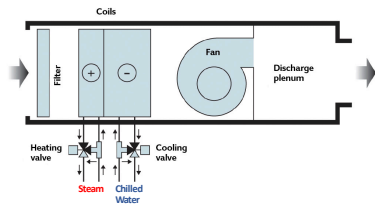
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### Fault Detection & Diagnostics

- Simultaneous heating and cooling




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# OT Engineered (Operations Technology)



Applications

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# OT Engineered



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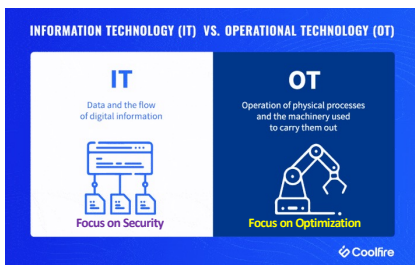
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# OT Engineered



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## AI Elevated



Machine Learning

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## 5<sup>th</sup> Generation Fueled



Connectivity & Instant Data

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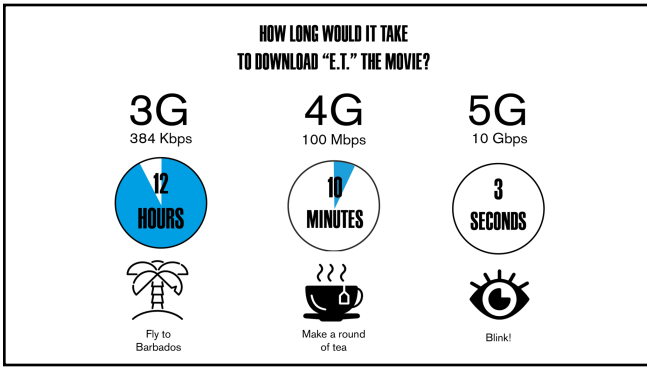
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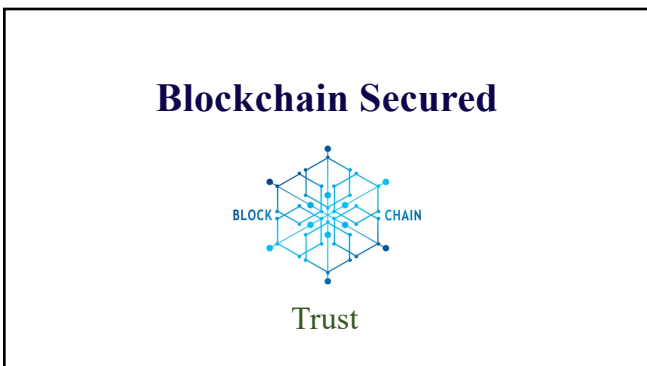
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### Blockchain Secured




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### Blockchain Secured




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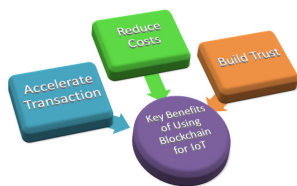
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### Blockchain Secured




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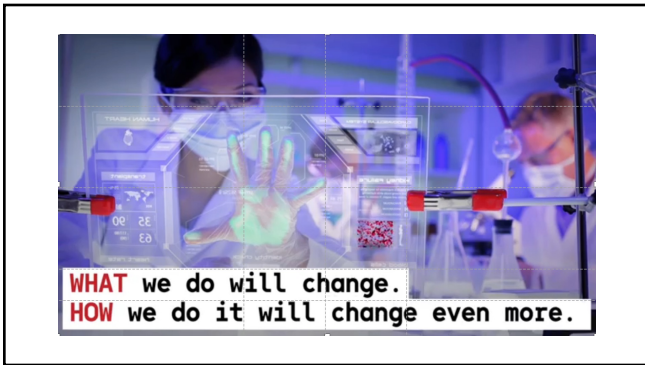
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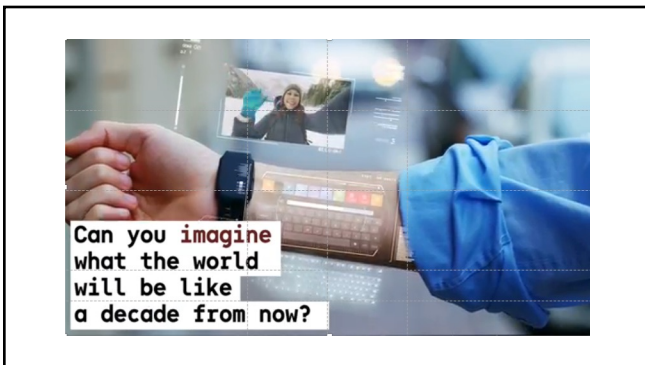
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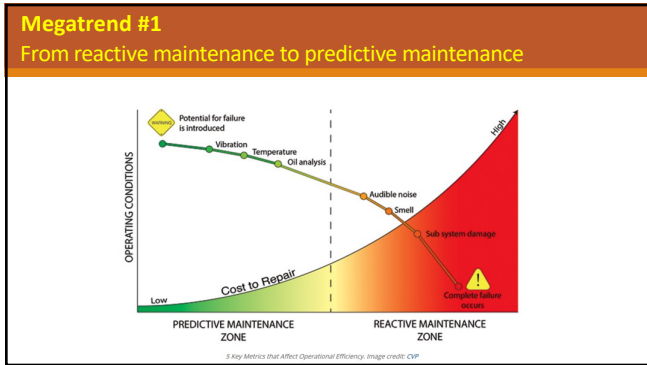
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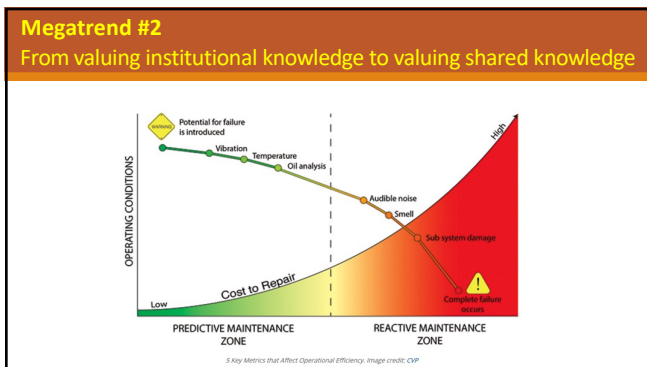
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**Megatrend #2**  
From valuing institutional knowledge to valuing shared knowledge

“The intuition about how a machine is operating on a factory floor used to come from working there thirty years and being able to detect a slightly different sound signature emanating from the machine, telling us something is not exactly right. That is a weak signal. Now with sensors, a new employee can detect a weak signal on the first day of work – without any intuition.”

Thank You for Being Late  
An Optimist's Guide to Thriving in the Age of Accelerations  
Thomas L. Friedman

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**Megatrend #2**  
 From valuing institutional knowledge to valuing shared knowledge

“Experienced workers knew how to process weak data. But now with Big Data, with a much finer grain of fidelity we can make finding a needle in the haystack the norm - not the exception. And we can augment the human worker with machines so they work as colleagues and enable them to process weak signals together and overnight become like a thirty year veteran.”

Thank You for Being Late  
 An Optimist's Guide to Thriving in the Age of Accelerations  
 Thomas L. Friedman

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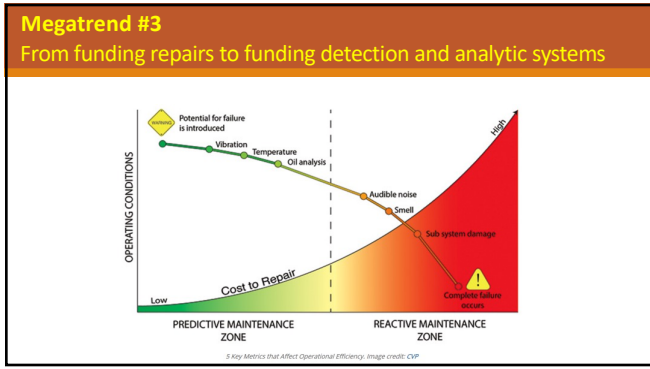
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**Megatrend #3**  
 From funding repairs to funding detection and analytic systems

- Better occupant experience
- Healthier building environments
- Reduced risk of business disruptions
- Increased productivity & wrench time
- Decreased cost of repairs
- Reduced scheduled PM activities
- Lower energy costs
- Retained energy conservation savings
- Improved turnover of new construction

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**Megatrend #4**  
From preventative maintenance to condition-based maintenance

**Industry 2.0**  
Mass production assembly lines using electrical power

**Industry 3.0**  
Automated production using electronics, programmable logic controllers (PLC), IT systems and robotics

**Industry 4.0**  
The Smart Factory. Autonomous decision making of cyber-physical systems using machine learning and Big Data analysis. Interoperability through IoT and cloud technology.

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**Megatrend #4**  
From preventative maintenance to condition-based maintenance

“Preventative maintenance was: change the oil every six thousand miles, whether you drive it hard or not. The new approach is “predictive maintenance” and “prescriptive maintenance” We can now predict nearly the exact moment when a tire, engine, car or truck battery, turbine fan or widget needs to be changed.”

*Thank You for Being Late  
An Optimist’s Guide to Thriving in the Age of Accelerations  
Thomas L. Friedman*

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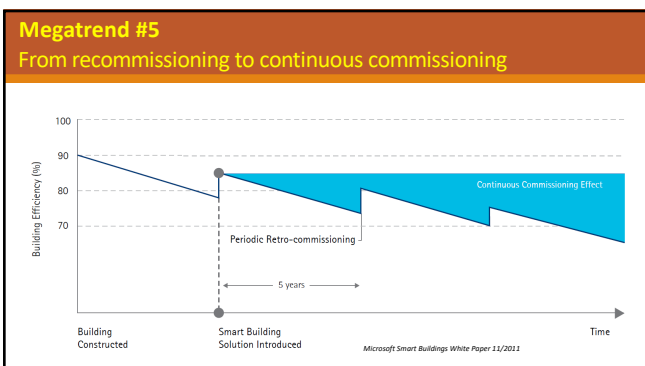
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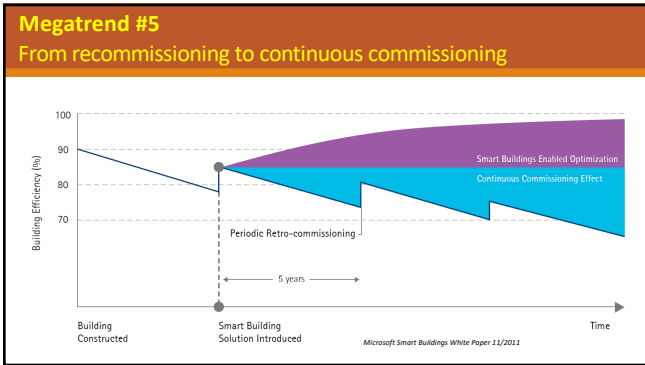
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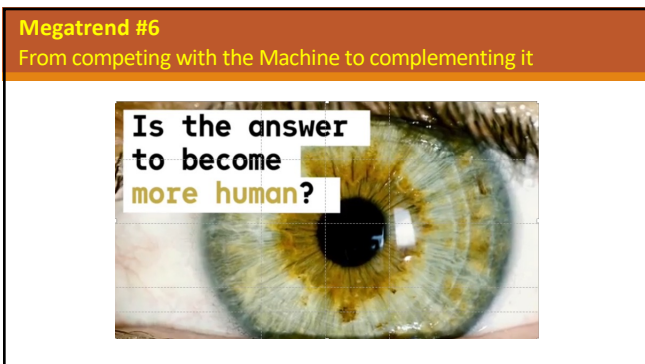
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**Megatrend #6**  
From competing with the Machine to complementing it



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**Megatrend #7**  
From rewarding expertise to rewarding collaboration



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**Megatrend #8**  
From managing facilities to managing occupant experiences



“...spend less time and resources on running buildings and more time on what is important – the occupant.”

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**Megatrend #8**  
From managing facilities to managing occupant experiences

**3-30-300 Rule**  
Jones Lang LaSalle

\$3 ON UTILITIES  
\$30 ON BUILDINGS  
\$300 ON EMPLOYEES

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**Megatrend #8**  
From managing facilities to managing occupant experiences

- Create environments for enhancing the student experience
- Provide places to work that attract smart, sustainability-minded employees
- Ensure comfort with temperature, humidity and lighting tailored to occupant preferences
- Raise productivity, health and wellness through indoor air quality
- Empower individuals with control of occupant personal workspace
- Accommodate schedules and workflows of business operations
- Manage the indoor environment to pre-empt issues before they surface
- Deliver 100x value of energy efficiency

Source: 75F

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**Megatrend #9**  
From owning physical assets to ensuring systems performance

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**Megatrend #10**  
From leading top-down to leading bottom-up and outside-in



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**Megatrend #10**  
From leading top-down to leading bottom-up and outside-in



**Chief Operations Technology Officer**

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**Megatrend #10**  
From leading top-down to leading bottom-up and outside-in



**Facilities Technology Strategist**

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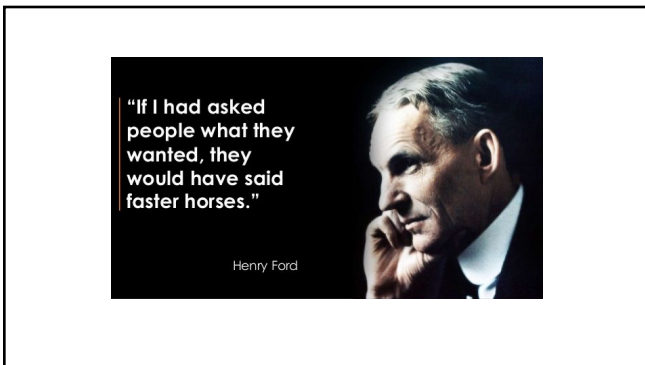
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### The More and Less of Doing More With Less

- More Demands & Deadlines
- More Workload
- More Stress
- More Risk
- More Errors & Mistakes
- More Staff Turnover
- More Burnout
- More Reactive Mindset
- Less Training & Development
- Less Peer Networking
- Less Responsiveness
- Less Communication
- Less Quality
- Less Job Satisfaction
- Less Innovation
- Less Strategic Mindset

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Stop doing more with less...and start doing different



Let's do a Fosbury Flop!!

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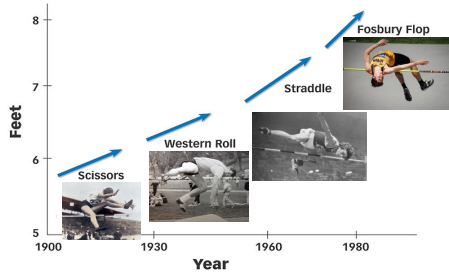
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### Doing Different



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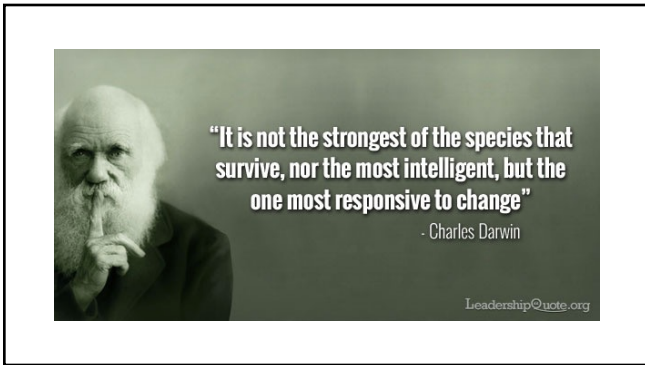
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### Preparing for Disruptive Change

Maintain at least a basic understanding of the disruptive technological forces and embrace the Operations Technology role of your organization.

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### Preparing for Disruptive Change

Be positioned and prepared for the megatrends reshaping the profession.

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### Preparing for Disruptive Change

Think "doing different" when others are thinking "doing more."



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### Preparing for Disruptive Change

Maintain at least a basic understanding of the disruptive technological forces and embrace the Operations Technology role of your organization.

Be positioned and prepared for the megatrends reshaping the profession.

Think "doing different" when others are thinking "doing more."

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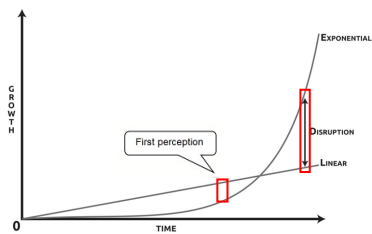
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### Preparing for Disruptive Change



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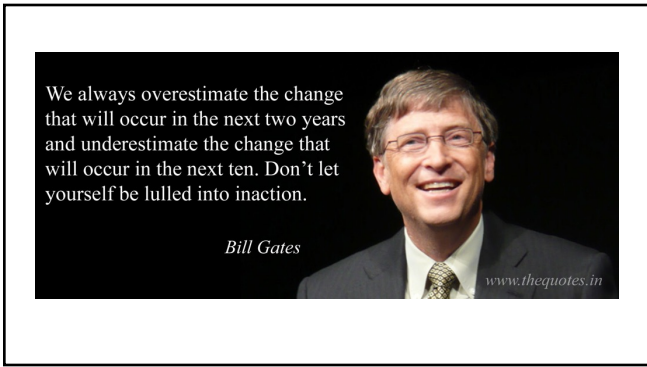
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