POLL - WHICH OF THESE ARE TOP REQUIREMENTS FOR INNOVATION?

1. Employees who have been taught to think like innovators.
2. A shared definition of innovation.
3. Comprehensive innovation metrics.
4. Accountable innovation leaders.
5. Innovation friendly processes.
6. Large innovation budget.
7. Highly visible innovation leaders.
8. Strong government support.

Source: https://hbr.org/2015/04/the-5-requirements-of-a-truly-innovative-company
THE INNOVATION LANDSCAPE
Multiple, related advanced technology clusters are moving through the development process at varying speeds. All promise to have transformational impact if they reach scale.
POLL - RANK THE TOP 3 TECHNOLOGIES FOR BUSINESS TRANSFORMATION

1. Artificial Intelligence, machine learning
2. Virtual reality
3. Internet of Things (IoT)
4. Robotics and automation (autonomous vehicles)
5. Biotech, digital health
6. Robotic process automation (software bots)
7. Blockchain
8. Social networking technologies
9. Augmented reality
10. On demand marketplaces

Source: https://www.google.com/search?client=firefox-b-1-d&q=kpmg+technology+innovation+survey+2019
INNOVATION AND CREATIVE DESTRUCTION IN THE S&P 500
PACE OF CHANGE IS ACCELERATING
INNOVATION IN THE NEWS

Tata Motors plans test trials for electric vehicles across India

WILL A ROBOT STEAL YOUR JOB?

KILLER COMPUTERS

Bill Gates warns ‘dangerous AI’ poses a threat ‘like nuclear weapons’

AI WARNING: Robots will destroy a HUGE number of jobs, claims expert

AI could be used to TAKE OVER the WORLD

5G IS HERE TO KILL YOU
INNOVATION ASSESSMENT
POLL - HOW WOULD YOU RATE YOUR ORGANIZATION’S INNOVATION ECOSYSTEM?

1. People
2. Policy
3. Process
4. Climate

Source: https://newandimproved.com/2018/10/05/top-10-drivers-innovation/
CORPORATE INNOVATION ASSESSMENT
SEPARATING THE SIGNAL FROM THE NOISE

- Research Tracking (e.g. Commercial/Government Research Labs, Patents)
- Media Mentions, Google Trends, Research Reports
- Corporate Moves (e.g. M&A, Hiring)
- Historical Precedents (Big Data/Machine Learning Techniques)
- Start-Up Funding, Investment Flows
- Customer Experience
INNOVATION TRACKER
LIFE CYCLE TRACKING (2020-2023)

- **Evaluate**
  - Internal assessment of technology trends

- **Demonstrate**
  - Experiment with clients on validate advanced technologies.

- **Incubate**
  - Bounded demonstration of technology in a business solutions

- **Proliferate**
  - Full fledged delivery of technology solution to paying clients.

- **Saturate**
  - Technology is considered standardized/commoditized and not “advanced.”
POLL - WHAT’S THE BIGGEST INNOVATIVE THREAT THAT IS FACED BY YOUR ORGANIZATION TODAY?

1. The development of a new product that represents a significant improvement on an existing product.
2. The gradual improvement of an existing product.
3. A brand-new product or business model.
4. A technology breakthrough.
TYPES OF INNOVATION
UNDERSTANDING THE INNOVATION TAXONOMY

1. Incremental innovation does not create new markets and often does not leverage radically new technology.

2. Sustaining innovation is the opposite of disruptive innovation as it exists in the current market and doesn’t create new value networks.

3. Disruptive innovation is where traditional business methods fail and requires new capabilities. The risks are big, but there’s a huge growth potential.

4. Radical innovation is rare as it has similar characteristics to disruptive innovation but is different in a way that it simultaneously uses revolutionary technology and a new business model.
CORPORATE INNOVATION STRATEGY
SO HOW DO CORPORATIONS MAKE SENSE OF IT ALL?

CORPORATE STRATEGY & INNOVATION DECISION MAKING
## INNOVATION AT GE
### HITS AND MISSES

<table>
<thead>
<tr>
<th><strong>Gas Turbine</strong></th>
<th><strong>Wind Turbine</strong></th>
<th><strong>Distributed Energy Technologies</strong></th>
<th><strong>Disruptive Innovation</strong></th>
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<tbody>
<tr>
<td><img src="image1.png" alt="Gas Turbine Image" /></td>
<td><img src="image2.png" alt="Wind Turbine Image" /></td>
<td><img src="image3.png" alt="Distributed Energy Technologies Image" /></td>
<td><img src="image4.png" alt="Disruptive Innovation Image" /></td>
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**Sustaining Innovation**
Continuous increases in the size, flexibility and efficiency of gas turbines.
- Technologically Mature (Reliable, Low Cost)
- Compatible with distribution system (i.e., utility-scale)
- Sophisticated Supporting Infrastructure
- Favorable Market Rules / Government Policies
- OEM’s make money by selling equipment and services.
- Accounted for 95 percent of US capacity additions in 1990s.

**Incremental Innovation**
GE purchases Enron wind in 2002 and scales the business.
- Early commercial with reliability and cost challenges
- Increasingly compatible with distribution system (i.e., utility-scale)
- Able to plug into existing infrastructure
- Market rules and govt policies changing to adapt.
- OEMs make money by selling equipment.
- No new market disruption

**Distributed Energy Technologies**
- Includes lighting, solar, energy efficiency, and distributed energy.
- Efforts to integrate technologies and develop a single energy management digital platform were unsuccessful.
- GE existed solar and distributed energy space.
- Current business retrenched focused on existing LED products and controls systems.

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<th><strong>1980s</strong></th>
<th><strong>1990s</strong></th>
<th><strong>2000s</strong></th>
<th><strong>2010-2015</strong></th>
<th><strong>2015-2020</strong></th>
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<tr>
<td>GE is the undisputed global leader in power equipment with a reputation as the world’s greatest technology innovator.</td>
<td>Gas turbines account for almost all electric capacity additions. GE invests heavily in gas turbine improvements.</td>
<td>Wind power policies and improved technology emerges (engineering), processes (sales) and values (low cost electricity, high cost equipment)</td>
<td>GE purchases a solar OEM, but later sells the company when production cost fall below module sales prices.</td>
<td>GE purchases large plant OEM competitor Alstom, just as wind and distributed power takes off.</td>
</tr>
<tr>
<td>GE purchases Enron wind and applies its resources (engineering), processes (sales) and values (low cost electricity, high cost equipment)</td>
<td>Wind power’s characteristics are increasingly compatible legacy power system.</td>
<td>GE launches “Distributed Power” business unit, but unable to successfully pivot.</td>
<td>GE establishes “Current” in 2015.</td>
<td>Disruptors cannibalize market for new plants and services.</td>
</tr>
<tr>
<td>GE supports market rules, policies that align with wind and gas.</td>
<td></td>
<td>GE executives dismiss sign posts of emerging technology disruption.</td>
<td>November 2018, GE announced that it would sell Current to American Industrial Partners.</td>
<td></td>
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RENEWABLE ENERGY GROUP
PIONEERED AN INDUSTRY

**Biodiesel**
- Industry pioneer in biodiesel taking agricultural soy oil waste.
- Agricultural roots built a global business NA leader in biodiesel.
- Various blends up to B20 used in conventional engine. Some use cases at B20 B50.
- B100 possible with dual system.
- 13 plants producing 630MM+ gallons annually.
- Biodiesel reduces GHGs up to 86% compared to diesel.
- Biofuels account for 5% market share in US transportation market.

**Renewable Diesel**
- Acquired Dynamic Fuels, LLC to process renewable diesel production.
- Renewable diesel uses waste fats and oils as feedstocks.
- Renewable diesel reduces GHG up to 85%.
- Low carbon markets including CA, OR, Canada, Nordic.
- Ability to blend biodiesel and renewable diesel provides competitive advantage.

**REG Ultra Clean®**
- Tracking industry trends and customers needs focused on reduced cost and emissions.
- Deep domain expertise creates the opportunities for novel cleaner fuel solutions.
- Maximize the opportunity in low carbon fuel states.
- Creates differentiation and value.
- 13 plants producing 630MM+ gallons annually.
- Biodiesel reduces GHGs up to 86% compared to diesel.
- Biofuels account for 5% market share in US transportation market.

**1995**
- West Central Coop makes first investment in soybean oil refinement in Ralston, IA.

**2003-2006**
- West Central forms Renewable Energy Group LLC to build biodiesel production facilities.
- REG Inc. is formed and announces $100MM PE & Partnership Investment.

**2007-2012**
- Era of scaling the business with multiple biodiesel manufacturing plants were built and acquired across the USA.
- REG launches new products like REG 9000, etc.
- Unique competitive differentiation through agile feedstock strategy.
- 2012 REG goes public as REGI on the NASDAQ.

**2013-2017**
- REG continues to acquire biodiesel manufacturing plants in US and Germany.
- REG acquires LS9 Inc. and forms Life Sciences, LLC.
- REG acquires renewable diesel production facility and enters renewable diesel market.
- Creates REG Energy Services to sell heating oil, biodiesel and blends of biodiesel.

**2018-2020**
- REG hits $2.5B in sales and $1B market cap.
- Creates new REG Ultra Clean fuels blending biodiesel and renewable diesel to meet growing fleet customer needs.
- Divested Life Science business to focus on core innovation.
- Refined strategic roadmap to accelerate profitable growth, innovation and ESG.
XL FLEET
ACCELERATING THE PATH TO SUSTAINABLE FLEET TRANSPORTATION

Hybrid Electric
- Developed hybrid technology to be installed on a variety of commercial vehicles (Ford, GM, Isuzu, etc.)
- Installed on new or existing vehicles
- Built seamless business model for easy adoption
- Focused on fuel and CO2 reductions for customers
- Not reliant on subsidies
- Provides demonstrable fuel economy improvement and emissions savings with no operational disruption

Plug-in Hybrid Electric
- Proven hybrid technology allowed expansion to plug-in hybrid solutions
- Installed on new or existing vehicles
- Leveraged seamless business model for easy adoption
- Differentiator for commercial fleets to maximize fuel and CO2 savings
- Not reliant on subsidies
- Provides significant fuel economy improvement and emissions savings with no operational disruption

XL Link
- Developed software platform with hybrid technology from Day 1
- Collecting data on every vehicle to track duty cycle, fuel, diagnostic details
- Providing insights for customers on future fleet deployment and infrastructure requirements
- Over 10 years and 120MM miles of data collected that supports innovation roadmap and customer insights
- Over 24MM gallons of fuel saved, 24K metric tons of CO2 eliminated

2009
- MIT Technology concept transitioned to be incubated and commercialized.
- Launched new company, XL Hybrids.

2013
- Raised additional funding.
- Business building stage established production, reduced costs and deployed more vehicles.
- Built partnership ecosystem including OEMs, upfitters, customers and supply chain.
- Grew customer portfolio to get real world data to ensure achievement of economic and environmental outcomes.

2015-2017
- Raised additional funding.
- Technology proven, expanded hybrid technology on multiple OEM chassis Ford, GM, Isuzu, etc.
- Accelerated customer acquisition to deliver revenue growth.
- Expanded technology portfolio and developed plug-in hybrid technology.

2018-2020
- Raised additional funding.
- Launched plug in hybrid technology and innovation roadmap to expand platform.
- XL business model differentiated thrived while others who manufactured new vehicles exited.
- New leadership, functional collaboration and integration, and Op Excellence to scale and accelerate profitable growth.
INSIGHTS

• Pace of change is accelerating - corporations must adapt.
• Need to track innovation trends and customers changing needs in a systematic manner.
• Understand the type of innovation — incremental, sustaining, disruptive and radical.
• Apply operational excellence to succeed with incremental innovations.
• Grow and scale to succeed with sustaining innovations.
• Disruptive innovations are a greater challenge for incumbents but important.
• Radical innovations change the world – a challenge to incumbents and startups.
HOW IS TECHNOLOGY CHANGING THE WAY WE WORK & LIVE DURING A PANDEMIC?

WORK

• REMOTE WORK – VPNS, VIRTUAL MEETINGS, WORK COLLABORATION TOOLS, ETC.

• SUPPLY CHAIN 4.0 – DISRUPTION TO THE GLOBAL SUPPLY CHAIN. BIG DATA, IOT, BLOCKCHAIN ARE BUILDING A MORE RESILIENT SUPPLY CHAIN FOR THE FUTURE.

• 3D PRINTING – MASSIVE SHOCKS TO SUPPLY CHAIN FORCED CHANGE, E.G., PPE

• ROBOTICS & DRONES – LABOR INTENSIVE BUSINESSES, E.G., RETAIL, FOOD, MANUFACTURING HIT HARD. ROBOTS CAN DISINFECT, DELIVER FOOD.

• 5G – ALL OF THE ABOVE TECHNOLOGIES RELY ON A STABLE, AFFORDABLE, HIGH SPEED NETWORK.

LIFE

• ONLINE SHOPPING – A MUST HAVE NOW BUT REQUIRES A RELIABLE DELIVERY SERVICE. AAS MODELS HAVE BECOME ESSENTIAL.

• DIGITAL & CONTACTLESS PAYMENT – E-WALLETS, CARDS ARE HERE TO STAY. FUTURE OF CASH WILL BE INTERESTING.

• DISTANCE LEARNING – SCHOOLS AND UNIVERSITIES ARE USING SAME TECHNOLOGIES AS REMOTE WORK, E.G., VIRTUAL AND AUGMENTED REALITY, 3D PRINTING, ETC.

• TELEHEALTH – ESSENTIAL PRIMARY CARE. WEARABLE PERSONAL DEVICES, CHATBOTS.

• ENTERTAINMENT – ONLINE GAMING, VIRTUAL TOURS, CONCERTS.
WHICH TECHNOLOGY AREA WILL BE MOST IMPACTED BY COVID-19 IN THE NEXT 2-5 YEARS?

FIRESIDE CHAT