Research to Development

Industry viewpoint: Ideas to Value
Janice Zdankus, HPE
Chandrakant Patel, HP Labs
Kirk Bresniker, HPE Labs
Research to Development

Industry viewpoint: Ideas to Value

Janice Zdankus, HPE
Chandrakant Patel, HP Labs
Kirk Bresniker, HPE Labs

May 7, 2019
HPE and World Economic Forum have created **Tech Impact 2030** to bring together industry, technology, academia and government to solve several key societal challenges.

We believe that technology has the potential to drive real change if we are able to harness it effectively. Like the Forum, we recognize that open collaboration with sustained commitment is necessary to quickly innovate and implement change.

Through **Tech Impact 2030**, we’ll work with customers, partners, employees and leaders from around the world on several key challenges and achieve meaningful change by 2030.
Innovation with Impact
Steve Jobs knew it then…..

"You can't start with the technology and then figure out where to sell it..."
Breakthrough Innovation
The infamous 1991 Radio Shack ad: 13 products worth over $5k replaced by a single integrated product for under $200
Idea-to-Value innovation framework

A holistic perspective

Megatrends:

- Technological, social, ecological, economic trends

End to End Perspective

Advanced development, engineering and industrialization

Research

Scale

Flex, Adapt, Iterate

Multi-Disciplinary

HP Enterprise
Megatrends & the Rise of the Cyber Physical Age

Social, economic, ecological and economic megatrends
Supply Demand: Buffeted by Social, Economic and Ecological Megatrends

Supply Side

- Food, Clothing, Shelter
- Power, Water, Waste
- Transport
- Health
- Finance
- Training
- Community
- Entertainment
- Safety (Cyber Physical)
- Cyber security & Privacy

Demand Side

- Food, Clothing, Shelter
- Power, Water, Waste
- Transport
- Health
- Finance
- Training
- Community
- Entertainment
- Safety (Cyber Physical)
- Cyber security & Privacy

What is the role of technology given the perturbations from the megatrends

Author: Chandrakant Patel, HP Labs
What is the role of technology given the perturbations of the megatrends?

Core beliefs

1. Data is the new intellectual property
2. Intelligence will be everywhere from edge to core
3. The security paradigm will be redefined
4. Consumption based models will dominate
5. Experiences will be delivered as-a-service
6. Infrastructure will self-manage and self-service
Technology trends

Rise of Cyber-Physical Systems

Machine (Physical) Age
19th Century

Domain Driven

Tech Depth

Structured data, few channels

Miniaturization of semiconductor technologies

Information (Cyber) Age
20th Century

Data Driven

Tech Breadth

Cyber Physical Age
21st Century

Domain + Data Driven

Depth + Breadth

Data + Tech + Domain

Chaitali Patel
The promise of the Cyber Age was not Realized

*Failed to connect critical physical systems that matter*

https://www.linkedin.com/pulse/computing-way-we-were-chandrakant-d-patel-pe
Cyber Physical Systems require Systemic Multi-Disciplinary Perspective

Auto Steer

<table>
<thead>
<tr>
<th>Historical Data Mining, Thousands of Vehicles, Motif Mining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy Based Control System</td>
</tr>
<tr>
<td>Knowledge Discovery</td>
</tr>
<tr>
<td>Machine Generated Data Management</td>
</tr>
<tr>
<td>(rich data, velocity, variability, volume)</td>
</tr>
<tr>
<td>Connectivity: GIS, People, Vehicle and Disparate Field Devices</td>
</tr>
<tr>
<td>Rich Sensing: LIDAR, RADAR, structured data</td>
</tr>
<tr>
<td>Flexible Actuators: Steering, Braking, Motor Control</td>
</tr>
<tr>
<td>Physical Domain Knowledge</td>
</tr>
<tr>
<td>First Principles:</td>
</tr>
<tr>
<td>Energy Supply, Motor Design, Dynamics of Structures</td>
</tr>
<tr>
<td>Charging System, Fast Charging/Thermal Management,</td>
</tr>
<tr>
<td>Charging Infrastructure</td>
</tr>
</tbody>
</table>

Multi-input, Multi-output closed loop control

plant function

Diagram of a car with sensors and labels: friction, sensors, video.
An Exciting Future

*at the crossroads of people, profit, planet and petabytes of data*

21\textsuperscript{st} Century Cyber Applications present an exciting course ahead. Success necessitates a multi-disciplinary systemic perspective and domain knowledge that combines the past with the present.

Success necessitates:

1. Depth in fundamentals
2. Multidisciplinary perspective
3. Systemic innovations through multidisciplinary collaboration
4. Storytelling (vision, experience, results)