Reimagining Manufacturing with Digital Technologies

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The Digital Five Forces and Composite Forces
Neural network based AI systems with hardware acceleration aided by GPUs and FPGAs have surpassed human cognitive capabilities in key areas.

<table>
<thead>
<tr>
<th>Task</th>
<th>Humans Accuracy</th>
<th>AI Performance</th>
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</thead>
<tbody>
<tr>
<td>Voice Transcription (word error rate)</td>
<td>5.1%</td>
<td>Google: 4.9%</td>
</tr>
<tr>
<td>Image recognition (ImageNet top 5 categories error)</td>
<td>5.1%</td>
<td>ResNet152: 2.25%</td>
</tr>
<tr>
<td>Detecting skin cancer based on images</td>
<td>Dermatologists: 86.6%</td>
<td>CNN: 95%</td>
</tr>
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Enterprise Reimagination Driven by Digital

Leveraging next generation technologies to reimagine an enterprise along six dimensions

- Business Model
- Products & Services
- Customer Segments
- Sales Channels
- Business Processes
- Enterprise Experience

DOMAIN + TECHNOLOGY + CREATIVITY + CONTEXT
Digital Creates New Enterprise Equity

Business Model + Products & Services = Data Equity

Customer Segments + Sales Channels = Brand Equity

Business Processes + Enterprise Experience = People Equity
American Engine Manufacturer Creates New Source of Revenue with Digital

Business Challenge

Maturing product lines in competitive industry limit revenue growth
Lack of demand visibility for spare parts
Customer dissatisfaction due to sudden product failures

Solution

Telematics data from engine transmitted to Cloud in near real-time
Stream processing of engine telematics data using Big Data on the Cloud to proactively predict failures hours in advance
Advisory messages to driver with route map to nearest service station

Benefits

Proactive prediction of engine failures prevents unexpected breakdowns
New revenue source from predictive maintenance service
Use of actual engine data (compared to limited test-bed data) for product design improvements
Global Oil & Gas Engineering Leader Aspires to Create New Business Models with Digital

**Business Challenge**

- Need to find new sources of revenue leveraging core capabilities
- Lack of visibility into platform performance post installation
- Difficult to penetrate maintenance business due to heavy dependence on skilled workforce

**Solution**

- Digital Twin of operational platform with sensor data integrated with platform PLM model
- Real-time data ingestion, distribution and processing using modern Big Data technologies and AI
- Prioritized statuses, alarms, and actuations for predictive performance

**Benefits**

- New commercial offering of digital enabled maintenance services with disruptive business model
- Increase project win rate by differentiating from a technology enabler perspective
- Platform for add-on new services and better platforms design
Middle-east Shipping Company Enforces Safety Policy with Computer Vision

**Business Challenge**

Accidents causing avoidable loss and production downtime

Manual enforcement of safety is error prone and costly

Cannot install additional equipment and have to use existing cameras and sensors

**Solution**

Convolutional Neural Network based Deep Learning algorithms to detect presence or absence of personal safety equipment on workers

Lowering of bandwidth usage by using low frame rate (as low as 1 frame/second)

Evidence stored based on activity detection

**Benefits**

Accurate detection of safety equipment use violations

Use of already installed cameras. No additional hardware investment needed

Reduction of safety related unplanned downtime
Global Printer Manufacturer Creates New Distribution Model for Consumables

Business Challenge

- Unexpected toner outage results in lost productivity and customer dissatisfaction
- Lack of demand visibility causes inventory mismatch and pricing inefficiency
- Channel dependency removes direct connect to consumers

Solution

- Sensors in printers to detect toner ink levels and communicate to central Big Data system
- Streaming data collection and processing at very high data velocities
- Interconnect with e-commerce system to enable automatic ordering of ink based on prior contract

Benefits

- Better experience for customer due to availability of ink always
- Better prediction of inventory levels, demand and production forecasting
- Direct connect with customers
Australian Retailer Wants to Reduce Shrinkage with AI

**Business Challenge**

‘Sweet-Hearting’ problem and other internal theft in liquor stores leading to 1/3rd of all shrinkage

Manual enforcement of Point-Of-Sale discipline is costly and unpleasant

Cannot install additional equipment and have to use existing store setup such as cameras

**Solution**

Advanced ‘activity detection’ algorithms using Convolutional Neural Networks

Video from existing cameras

Interconnect with Point-Of-Sale data for forensic evidence

**Benefits**

Reduction of $25 million in shrinkage per year

High-level of accuracy without additional hardware investment
European manufacturer reduces unplanned downtime with predictive analytics

Business Challenge

Unplanned conveyor belt downtime costly

Scheduled maintenance also not most optimal

Excess inventory to account for possible breakdowns

Solution

Inexpensive smart sensors retrofitted into existing conveyor belt motors

Comprehensive rules for condition monitoring and prediction of failures

Benchmarking of quality and efficiency through KPI monitoring

Benefits

Excess inventory no longer needed to cover possible breakdowns

Parts and supplies replaced only when needed

Cost effective and highly scalable
Global Car OEM Wants to Personalize Cabin Experience with AI

**Business Challenge**

- Opportunity to provide personalized in-car experience for comfort and safety features
- Drivers not keen on intrusive and user driven personalization
- Cost of car components need to be kept to minimum

**Solution**

- Neural network based vision algorithms for driver identification, emotion detection, gaze direction and distraction level
- Driven by video from in-cabin camera
- Integration with car systems for proactive responses from car

**Benefits**

- Effective personalization without user intervention
- Single in-cabin camera can detect and track driver and passenger behavior – cost effective
- Drastic improvement in safety in addition to occupant comfort
Welcome to possible