# introduction



Expansive Solutions

Solving Digital Challenges from Frontline Operations to Boardroom

# About Expansive Solutions

## Estd. 2014

Consulting

Products

Cloud Solutions

Digital Transformation

## Products

XPlan
XSight
CXODesk
XBridge
XML
XIoTA

## Services

Consulting
Projects
Custom Development
Training

## Industry

Oil & Gas
Chemicals
FMCG
Metals, Mining
Cement
Engineering
Manufacturing
Life Sciences
Retail
Transportation & Logistics
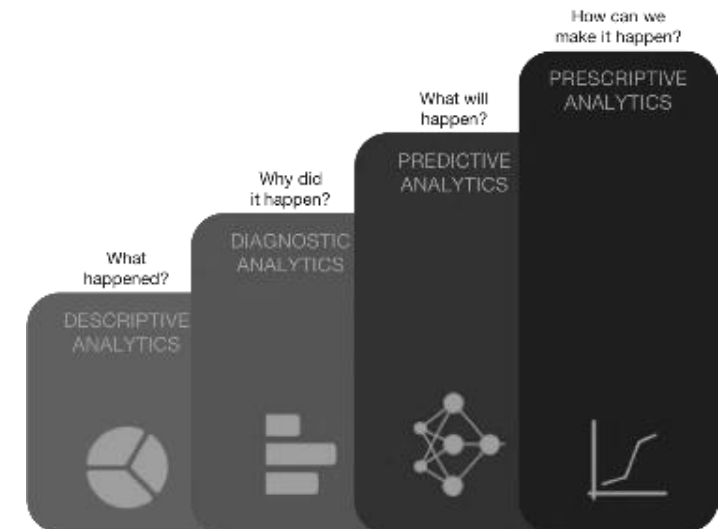Utilities
Hospitality, Education

## Solutions

Analytics- Predictive, Prescriptive, Descriptive
Supply Chain advisory & Solutions
Six Sigma & Lean advisory
Business Process Reengineering
Digital Transformation

What happened?
DESCRIPTIVE ANALYTICS

Why did it happen?
DIAGNOSTIC ANALYTICS

What will happen?
PREDICTIVE ANALYTICS

How can we make it happen?
PRESCRIPTIVE ANALYTICS

# Services

| | Key Service Categories | Guiding Principle |
|---|---|---|
| **Consulting** | Digital Transformation | |
| | Lean and Six Sigma Consulting | |
| | Request for proposal | Outcome based consulting |
| | Solution Architecting | |
| | Supply Chain Network Design | |
| **Solution Delivery** | Visualization / Dashboard solutions | |
| | Planning and Scheduling Solutions | |
| | Big Data Analytics / Forecasting Solutions | Value delivery |
| | Machine Learning / Artificial Intelligence | |
| | Data acquisition / Integration | |
| **Training** | Technology Trainings | |
| | Six Sigma & Lean Management Training | Development goal based |
| **Custom Development** | Helping choose from Wide array of possibilities | |
| | Business Process Automation | |
| | Planning & Scheduling | Fit for Purpose, best TCO |
| | System Integration | |
| | Lifecycle Support | |

# Products

| | Use Cases | Value Delivery |
|---|---|---|
| **CXODesk** | Visualization Dashboards<br>Situational Awareness<br>Operational Intelligence<br>Performance Dashboard | • Visibility<br>• Single version of Truth<br>• Collaboration<br>• Mistake proofing<br>• Situational awareness<br>• Performance Assessment |
| **XSight** | Segmentation & Inferential analysis<br>Sales Forecasting<br>Causal Modeling | • Causal modeling-Insights<br>• Forecast – Prediction<br>• Alignment between functions<br>• Inventory reduction<br>• Better order fulfilment<br>• Sales Target management |
| **XPlan** | Sales and Operations Planning<br>Multi-echelon Logistics / Distribution Planning<br>Staff Planning/Roster Scheduling<br>Investment Planning | • Better demand fulfillment<br>• Revenue & Cost Optimization<br>• Outsourcing, Fleet size,<br>maintenance planning<br>• Design & Investment Study<br>• Bottleneck Studies |
| **XML** | Image Processing (Medical diagnostics, Object identification, Defect detection…)<br>Sentiment analysis<br>Recommendation engine<br>Fraud detection | • Lead /cycle time reduction<br>• Service level improvement<br>• Variable Cost reduction<br>• Mistake proofing<br>• Bias & Fraud case reduction<br>• Overhead cost reduction |
| **XIoTA** | Data acquisition (image, Barcode, Sensors, API, Social media feeds)<br>AI (Artificial Intelligence) applied | • Improved controls & coordination<br>• Lead /cycle time reduction<br>• Service level improvement<br>• Cost reduction<br>• Mistake proofing<br>• Bias & Fraud case reduction<br>• Transparency & auditability |

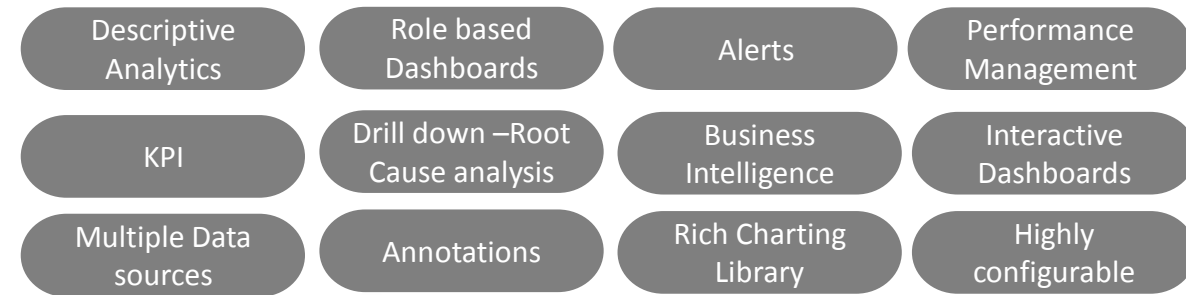# Capabilities

Use cases - Experiences

# A. Situational awareness/Visualization

**P R O D U C T**

**D E S C R I P T I V E**

**A.** **Industry:** All

**B.** **Challenges:** A complete set of information needed for insights and informed decision making, requires several data pieces residing across several systems or files or with people. A full picture cannot be painted without bringing them together in a meaningful contexts.
In lieu of this information organization operates at risk, which is hard to quantify but there is a general consensus on severity of the problem. Senior management functions don't have point solutions like CRM, LMS, MES, ERP etc. and needs keep evolving. The importance of timeliness, accuracy and completeness increases as you go up the organization hierarchy and so does the monetary impact of their decisions.
Tech Organizations have to deal with challenges of integration, data warehouse, contextualization, dashboard visibility, alerts, security to get to a meaningful information system. Often, in the maze of new generation technology offering, the right balance of business requirements, extensibility, cost of ownership is lost.

**C.** **Solution:** Standardization of data across multiple data sources, handling different formats, consolidation, extraction, transformation and loading to dynamic dashboards with putting together a near complete picture around the subject. Visualization initiative delivery around requirements of Role based dashboards, Self service visualization, integration, data security, Metric / KPI calculations etc.

**D.** **Benefits:** Create situational awareness by contextualizing different pieces of data so that personnel's can make informed decisions. This would help avoid making informed decision, monitor operations, timely action to prevent mistakes, Performance management, quick alignment, removing bias as information is data driven etc.

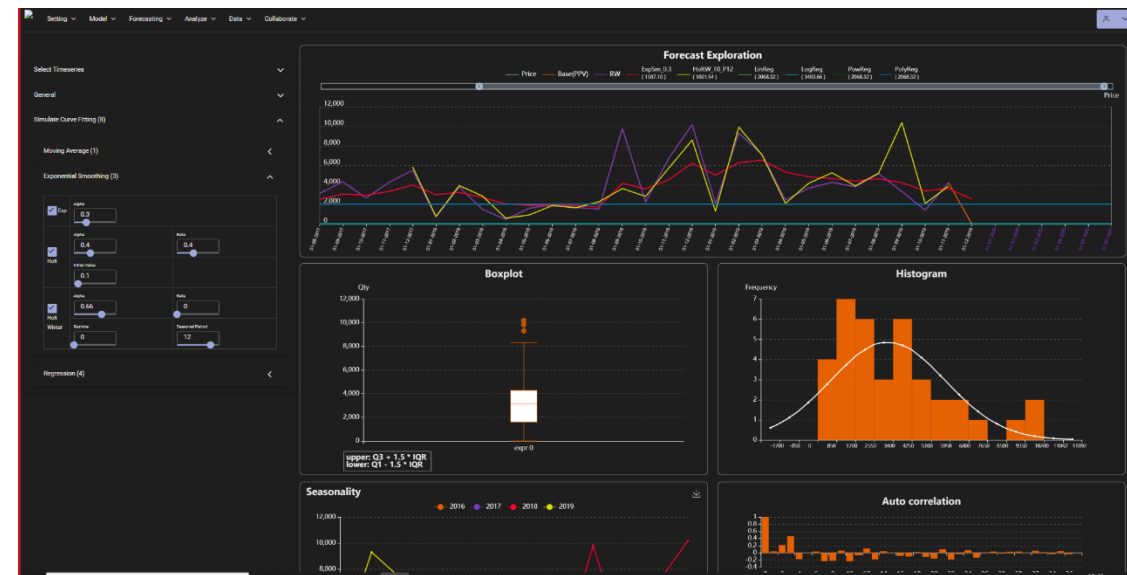| Descriptive Analytics | Role based Dashboards | Alerts | Performance Management |
| KPI | Drill down –Root Cause analysis | Business Intelligence | Interactive Dashboards |
| Multiple Data sources | Annotations | Rich Charting Library | Highly configurable |

# B. Demand Forecasting

**A.** **Industry**: Several. More challenges in retail, e-services space

**B.** **Challenges:** With hundreds of products and thousands of customers, preparing Demand forecast for the purpose of Sales Planning, Replenishment Planning, Annual operating plans, is a difficult task. Frequent promotions, competition events, stock outs etc. induces a lot of noise in the data which intervenes with good quality forecast. Manual or spreadsheet based forecast is not well equipped with handling data, model updates required, slicing and dicing of data and visibility that organization needs to get aligned on demand signal. Collaboration and Governance of forecast are other challenges which require
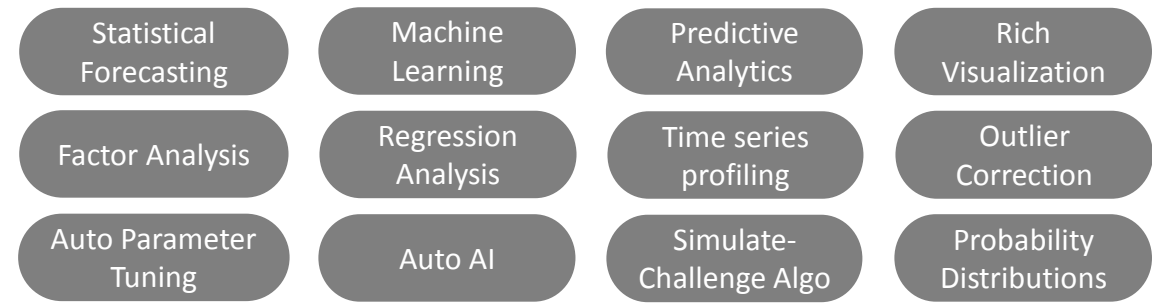
**C.** **Solution:** ingesting historical data and relevant meta data that may influence demand, data cleanup and forecasting using advanced algorithms and making it available on web based platform rich in visualization for the organization.

**D.** **Benefits:** Accuracy improvement, Reliability (less surprise swings), Enabled collaboration, visibility and informed decision making, improved order fulfilment and better inventory positioning across network.

| Statistical Forecasting | Machine Learning | Predictive Analytics | Rich Visualization |
| Factor Analysis | Regression Analysis | Time series profiling | Outlier Correction |
| Auto Parameter Tuning | Auto AI | Simulate-Challenge Algo | Probability Distributions |

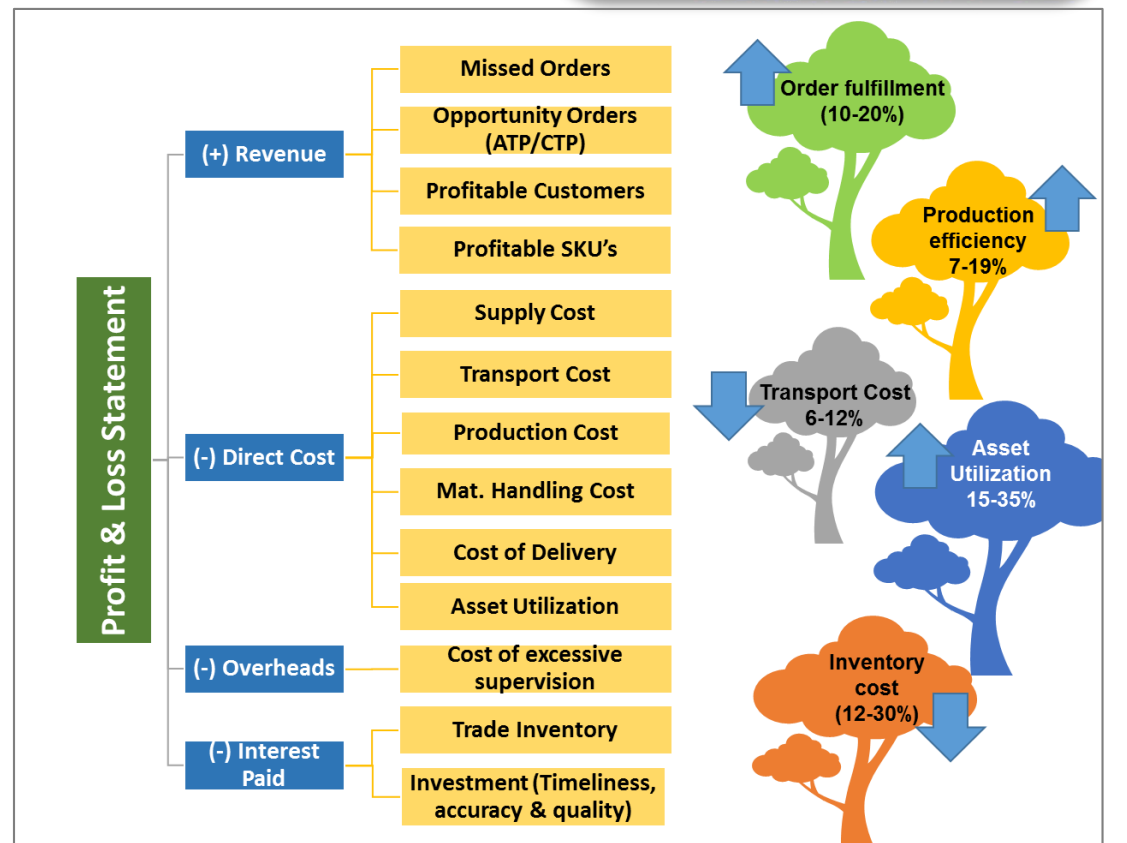# C. Network Optimization – Sales and Operations planning

**A.** **Industry:** All verticals with physical products supply chain

**B.** **Challenges:** It is commonly observed in large organization having large distribution network and several production facilities to have procurement, production, logistics and sales working in silos. Missing details in planning instructions, synchronization and alignment of goals leads to several problems. Production targets of shop floor may not be inline with inventory and sales plan leading to non-optimal inventory as well as order losses. Financially speaking, it leads to order revenue losses, higher working capital and carrying costs, underutilized facilities, frequent disruptions, higher operational costs etc.
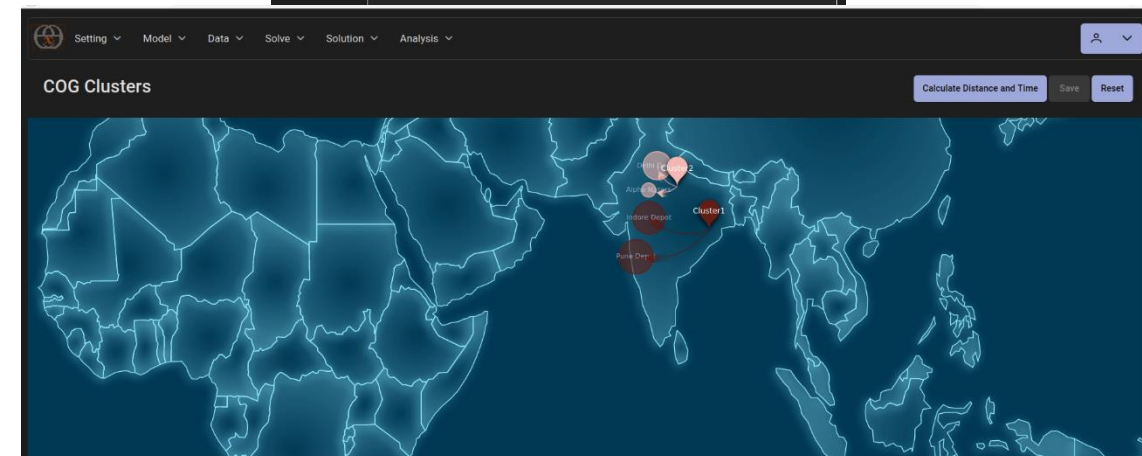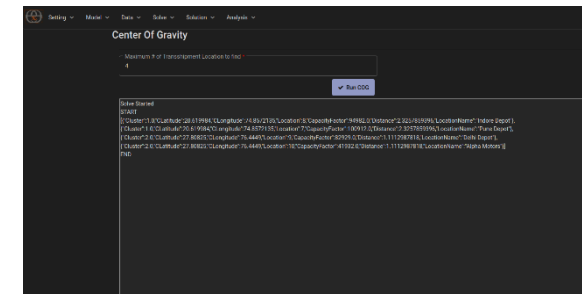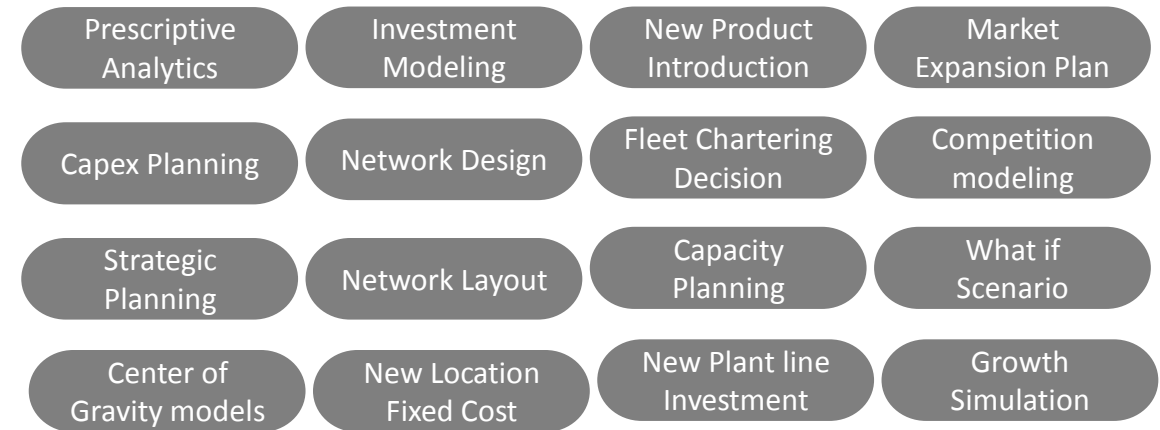
**C.** **Solution:** data and advanced analytics (optimization) driven integrated planning (sales and operations planning) can help meeting all demands by exploring all possibilities of logistics and production options available (routing, production, recipe..). Xplan handles several constraints of production, logistics, procurement, inventory, financial & commercial modelling with elegance to plan holistically and drive business results.

**D.** **Benefits:** The plan and scenario runs help achieve more profits/ or lower costs, better fulfilment and customer service, optimal inventory levels and right utilization of resources.

Prescriptive Analytics

Integrated Planning

Distribution Planning

Production Planning

Procurement Planning

Revenue Optimization

Inventory Optimization

Maintenance Planning

**Profit & Loss Statement**

**(+) Revenue**
- Missed Orders
- Opportunity Orders (ATP/CTP)
- Profitable Customers
- Profitable SKU's

**(-) Direct Cost**
- Supply Cost
- Transport Cost
- Production Cost
- Mat. Handling Cost
- Cost of Delivery
- Asset Utilization

**(-) Overheads**
- Cost of excessive supervision
- Trade Inventory

**(-) Interest Paid**
- Investment (Timeliness, accuracy & quality)

Order fulfillment (10-20%)

Production efficiency 7-19%

Transport Cost 6-12%

Asset Utilization 15-35%

Inventory cost (12-30%)

# D. Facilities Planning Investment Analysis

XPlan

**A.** **Industry:** All

**B.** **Challenges:** Across several plants, procurement centers and substantial distribution network, company had to plan for expansion keeping in mind next 5+ years demand. There are several decisions of long term nature which has far reaching impact on well being of the organization viz. new product introduction, plant capacity expansion, new warehouse location, new market entry, countering competition, price positioning, fleet chartering, outsourcing etc. Gut-feel based or simple spreadsheet calculations makes decision makers nervous, as the suggestions are not connected and grounded with realities of sales, production, logistics, operational costs. Being able to throw in all the details of sales, production, fixed cost, depreciation, price-cost-demand scenario and let an optimization model evaluate all possible combinations at a click of button is like a dream come true. Results from Xplan are verifiable for optimality and all aspects are synchronized.

**C.** **What we did:** We built an optimization model using Xplan that had the end to end supply chain modelled and additionally had facility investment options and all fixed, semi-fixed and variables costs mapped. Optimization model chose the best set of facilities to be opened /closed in time phased manner in a multi-period model.

**D.** **Benefits:** Capex postponement with leasing and extra shift working option suggested. Very detailed planning with all constraints satisfied gave confidence. Several scenarios could be run in short time and compared.

| Prescriptive Analytics | Investment Modeling | New Product Introduction | Market Expansion Plan |
| Capex Planning | Network Design | Fleet Chartering Decision | Competition modeling |
| Strategic Planning | Network Layout | Capacity Planning | What if Scenario |
| Center of Gravity models | New Location Fixed Cost | New Plant line Investment | Growth Simulation |

# E. Staff Allocation & Roster Scheduling

X Plan

**A.** **Industry:** Healthcare, Hospitality, Technician Service, Call centers, Factory, Airlines

**B.** **Challenges:** With Multiple departments requirements of different staff types over coming several days, staff planning can be quite a task if you have to consider time windows of availability and requirements, skill requirement matching, experience, certifications, compatibilities, compliances and costs. Trial and error assignments can be tedious and may have issues with any of the factors like compliance, cost or staff satisfaction. Usual template driven assignment face huge issues when there is a disruption and service levels fall.

**C.** **Solution:** an Optimization based solution, which simultaneously follows all the constraints while doing assignments and optimizes cost, balancing contract and payroll staff, fairness (under/over assignment).

**D.** **Benefits:** Cost saving, Better service levels at same staffing level and skill matching, process free from personal biases, better compliant to labor laws, more equitable assignments.

- Staff Availability
- Department Requirements
- Staff Skills
- Shift Time windows
- Staff Type & Sharing

- Labour Laws constraints
- Staff Compatibility
- Staff Skills
- Staff Cost
- Contract-Payroll Priority
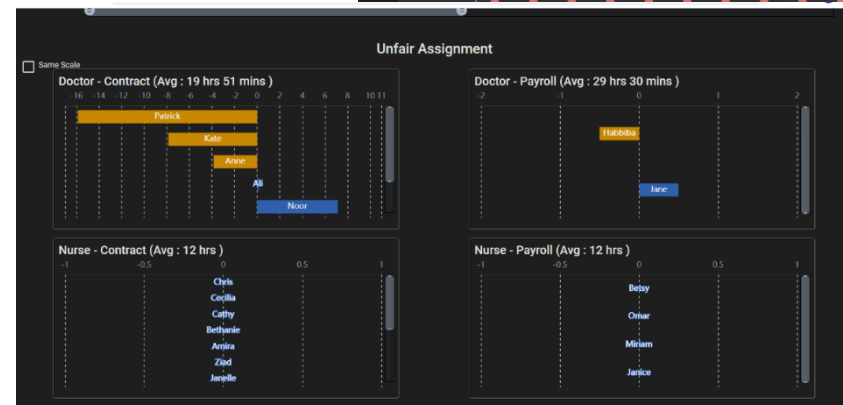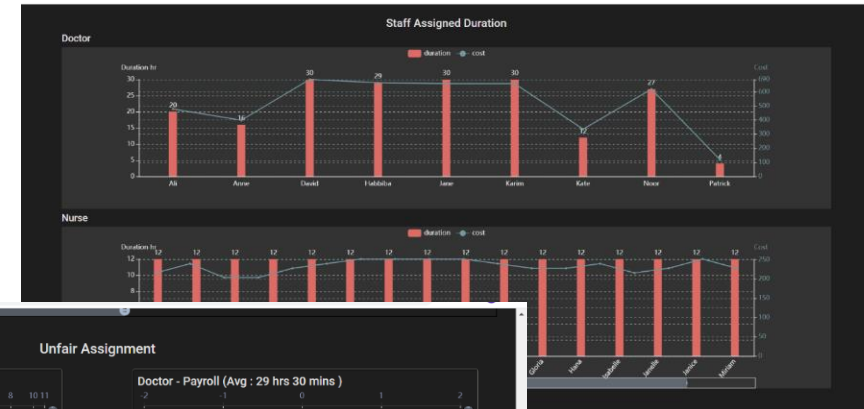
# F. Cutting Stock Optimization: Waste Reduction

**C U S T O M**

**P R E S C R I P T I V E**

**A.** **Industry:** Films, Metals, Paper, Textile, Furniture, Cables, Electrical, Warehouse Operations

**B.** **Challenges:** With every cut in paper roll, wire, metal sheet, film there is likely to be some waste. Different cut sizes, different raw sheet sizes, with our without rotation combinations can run into very large number of options quickly.
Value proposition here is the evaluation of cut combination across different order types from base sheets could easily sale 5-20% of waste which will be sold at a discount as scrap instead of going as good finished product. This adds up to a significant amount for all size of business operation. It is a direct loss to bottom-line

**C.** **Solution:** using advanced Optimization algorithms to suggest best combination of orders and cut pattern from several base sheets.

**D.** **Benefits:** Waste reduction, higher profitability.

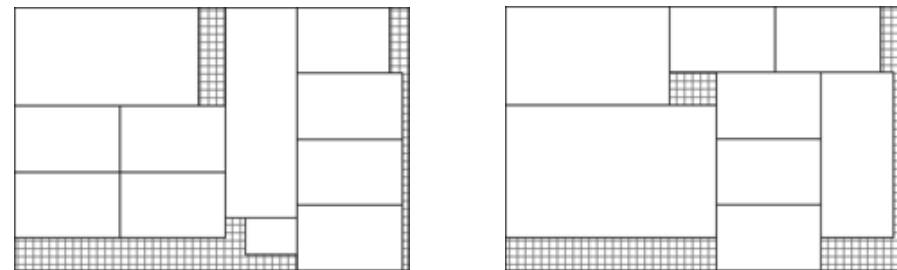| 1D Cutting-Wires | 2D Cutting-Sheets | Prescriptive Analytics | Improved bottom line |
|---|---|---|---|
| 3D Stacking - warehouse | Waste Reduction | Optimization | API-Subscription |



1D -combinations

| | Wires |
| | Metal Bars |
| | Paper Rolls |
| | Logs |
| | Cables |
| | Pipes |



2D -combinations

| Films | Metal Sheets | Ply boards | Textile |
| Glass | Leather | Warehouse Ground Space | |

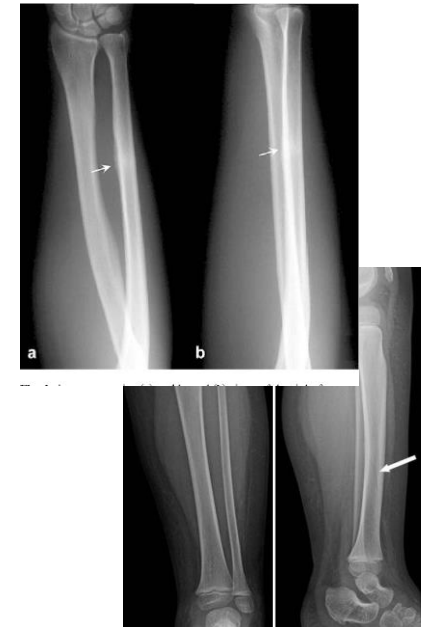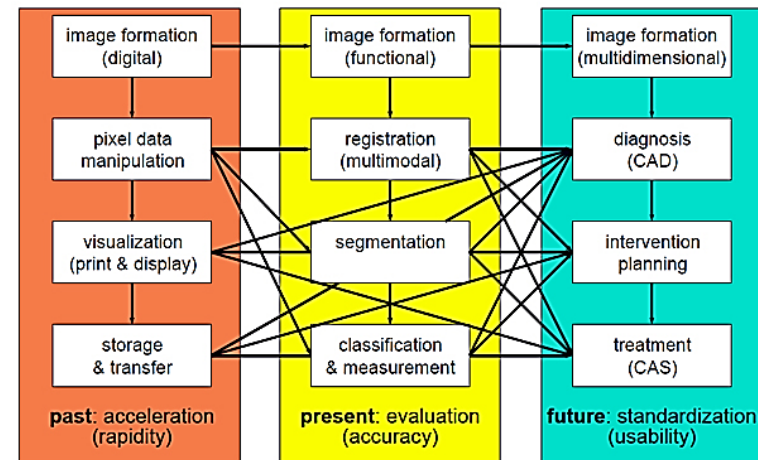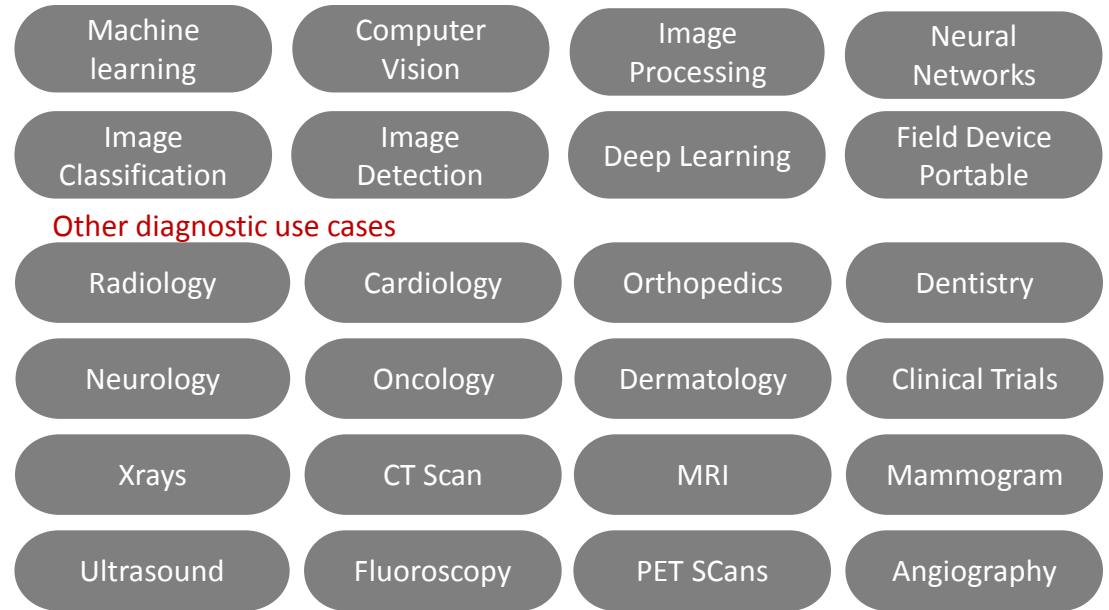# G. Computer Vision [Machine learning]- Medical diagnostics

**CUSTOM**

**DIAGNOSTIC**

A. **Industry:** Healthcare

B. **Challenges:** There is a large geographical area and large population where healthcare delivery suffers from lack of doctors & diagnostic availability. The diagnostics field is currently relying on high end equipment's which government as well as private players have found it hard to reach these areas. Both Non-critical & Critical health conditions can benefit from computer vision and machine learning based cognitive technologies with great accuracy in diagnostics. It can definitely augment the capability of medical practitioner.

C. **What we did:** We ran several cases of x-ray bone fractures etc. for identification, classification and labeling of problems suspected. Accuracy of results are comparable to what human detection rates are. With state of the art technology training and wider training image base available, computer vision technology has proven to exceed the accuracy of human eye balls. One key reason behind this is an individual doctor is limited by his years of experience and types of cases. The training models image cases is not impeded by such restrictions. These proof of concepts sets us up for numerous possibilities of such technologies are numerous.

D. **Benefits:** A socially responsible, economic and novel method of healthcare is possible to fill the gap where the kind of conventional healthcare attention is not available 24x7 to start with and awaits wider acceptability.
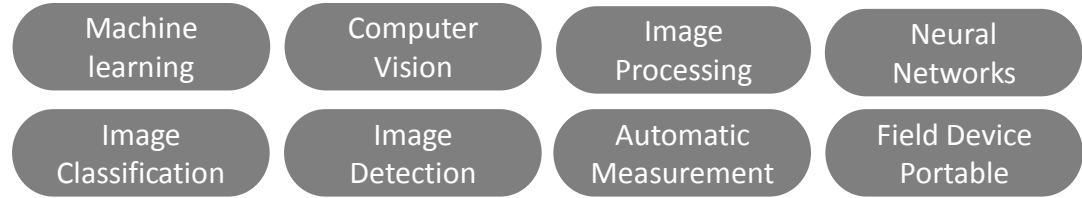
| Machine learning | Computer Vision | Image Processing | Neural Networks |
| Image Classification | Image Detection | Deep Learning | Field Device Portable |

Other diagnostic use cases

| Radiology | Cardiology | Orthopedics | Dentistry |
| Neurology | Oncology | Dermatology | Clinical Trials |
| Xrays | CT Scan | MRI | Mammogram |
| Ultrasound | Fluoroscopy | PET SCans | Angiography |



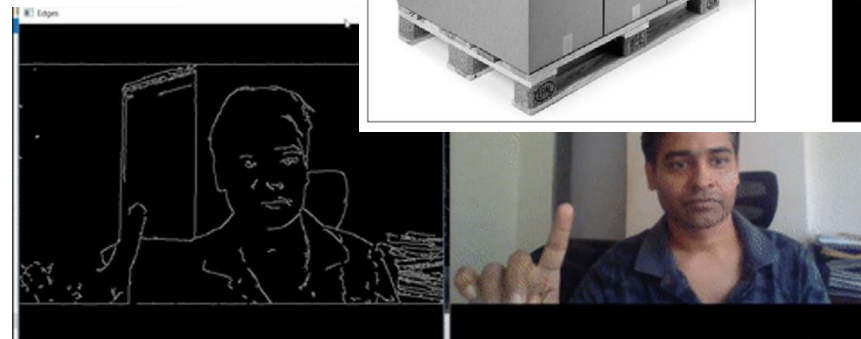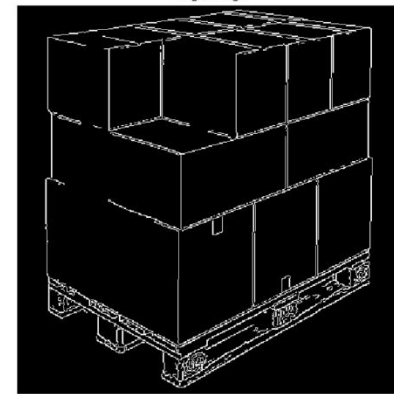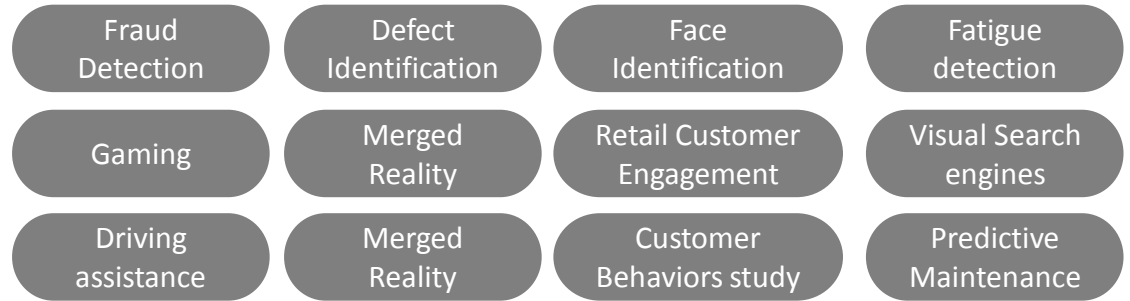Source: The international Society of Optics & photonics

# H. Computer Vision-Image Processing

**A.** **Industry:** Logistics, Manufacturing, Warehouse Operations

**B.** **Challenges:** Manual operations of incoming boxes in warehouse takes long time to identify, sort and move to storage location and sometimes human mistakes will cause problem in inventory reconciliation. There is significant scope in Operations efficiency and it hurts during the peak load time.

**C.** **Solution:** Warehouse incoming box can be identified using camera in staging area or conveyor. Using edge detection and advanced algorithms of ML based image processing Object detection (type of box) and count is possible. matching of boxes with reference box dimension helps in classification and enable workflows and automation for further movement.

**D.** **Benefits:** Operations efficiency improvement. Visibility and real time monitoring control. Identification and storage area indication becomes an automated process which is fast and reliable. Cost reduction from automation.
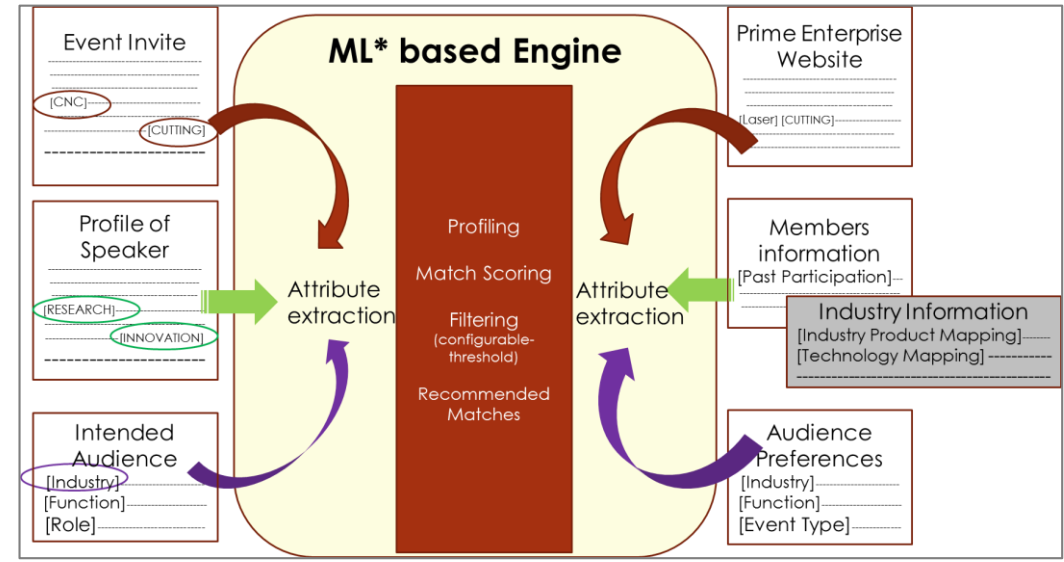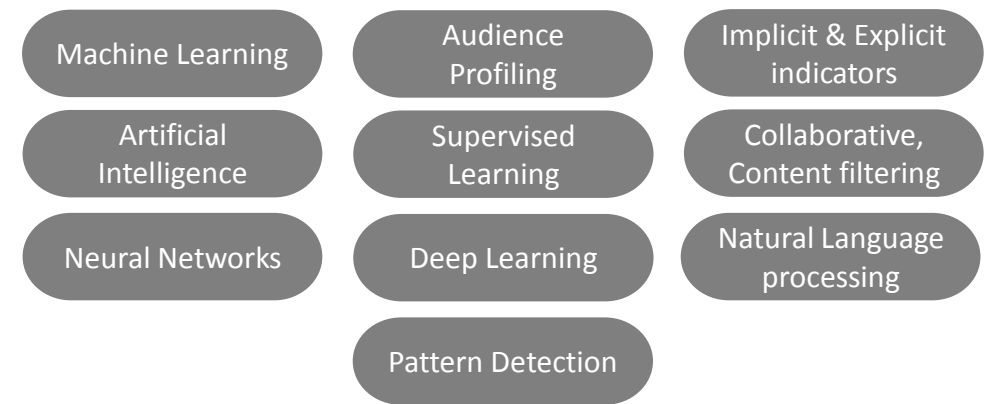
CUSTOM

DIAGNOSTIC

| Machine learning | Computer Vision | Image Processing | Neural Networks |
| Image Classification | Image Detection | Automatic Measurement | Field Device Portable |

Other use cases

| Fraud Detection | Defect Identification | Face Identification | Fatigue detection |
| Gaming | Merged Reality | Retail Customer Engagement | Visual Search engines |
| Driving assistance | Merged Reality | Customer Behaviors study | Predictive Maintenance |


Original Image


Edge Image

# I. Recommendation Engine

**A.** **Industry:** Online retailers, Ecommerce, B2C, B2B, Government Enterprise, Media, Publishing house, All Sales & Marketing Companies, Banking, Finance, Public Relations

**B.** **Challenge:** Each organization wants to reach out to a wide audience and communicate without missing an opportunity. Today, audience is overwhelmed with emails, sms, calls to the extent that missing out on important communication is very common. Unless each sender becomes aware of the fact that more is not good. What you need, when you need is the key to success. Challenge becomes multi-fold when we take into account that each audiences' preference is different and it is not specified. No standardization meta data could have achieved appropriate filtering of communication.

**C.** **Solution:** We created an NLP based recommendation engine to channelize the communication to right audience. Using advanced machine learning algorithms using Natural language processing, text mining, implicit and explicit indicators, engine will score the message preference likelihood. Multiple categories of communication senders and multiple categories of audience can now be managed in channeling the right communication through this system.

**D.** **Benefits:** Audience was getting 65% less emails from sender organization and since they were relevant the participation and response improved significantly.

Machine Learning

Audience Profiling

Implicit & Explicit indicators

Artificial Intelligence

Supervised Learning

Collaborative, Content filtering

Neural Networks

Deep Learning

Natural Language processing

Pattern Detection

# J. Enterprise Integration

CUSTOM

DIGITAL

**A.** **Industry:** All

**B.** **Challenges:** There will always be disparate sources of data and point solutions. Need for integration to enable workflows, process automation, reporting, business intelligence is on the rise. Quick and dirty interfaces are written all the time even for mission critical processes. Interface code is also a software which falls in no-mans land or with a poor cousin, when it comes to maintenance. Often maintenance lacks traceability, parameterization, scalability, change in transformation rules, flexibility to trigger them on time, event or manually or push-pull.

**C.** **Solution:** Use middleware solutions for building data pipelines (ETL) wherever possible. Ability to build the ETL /ELT pipeline as blocks of functional elements allows the system administrator to write logs, keep the code maintenance, detect where things have gone wrong, change mapping transformation whenever there is change in source or sink system. Buffering messages and being fault tolerant are built in functionalities as against custom coded interfaces.

**D.** **Benefits:** Visible & manageable interfaces, improved error traceability, maintainable & scalable, lower failures and process interruptions

Fault Tolerant

Integration

Streaming Data

ETL / ELT

Cloud & On-Premise

Middleware

Different data sources

Guaranteed Delivery

**Tools used:**
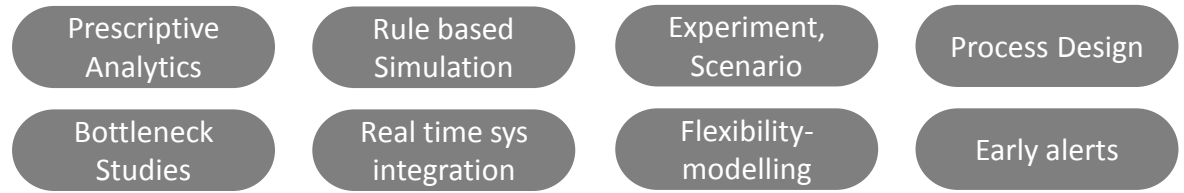
Apache Nifi
Kafka,
Talend,
Redis, Celery
Python
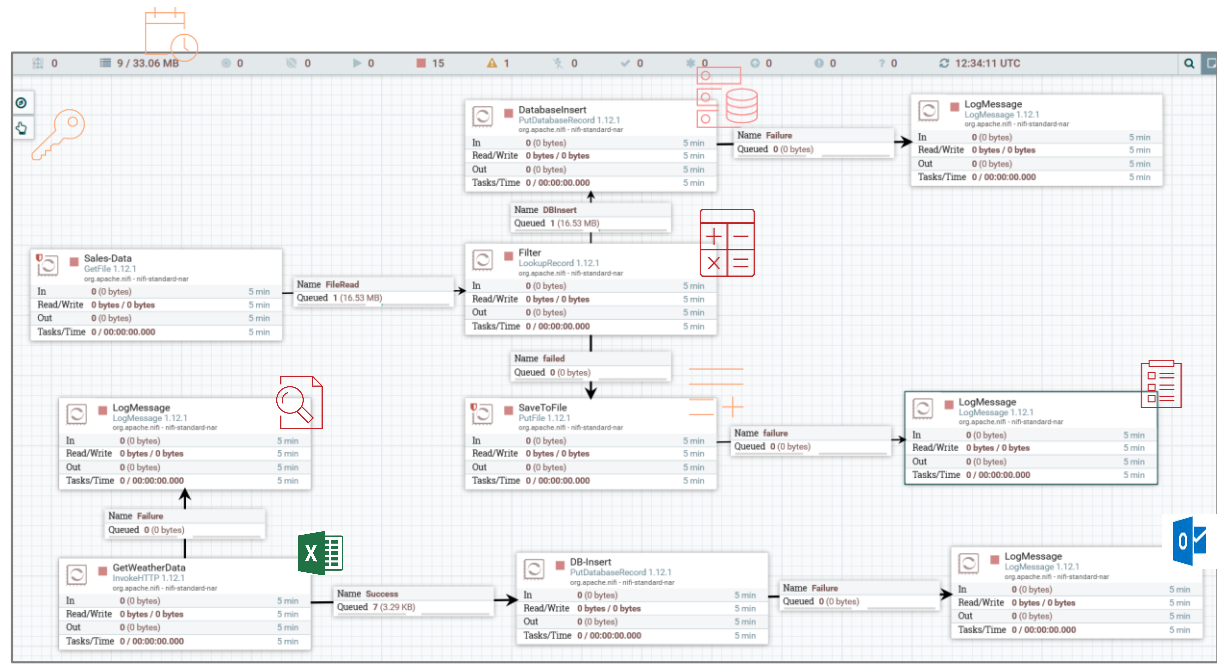
# K. Simulation: Digital Twin Scenario Studies

**A.** **Industry:** Discrete Manufacturing & Warehouse operations, Traffic, Port Operations,

**B.** **Challenges:** Digital twins allow you to understand your complex system from several angles. You can afford to experiment with the model without any cost or real risks. Studies of de-bottlenecking, plant commissioning, ergonomics, lean studies, Peak time operation preparedness are just a handful of use cases. In the warehouse operation use case, several KPI like warehouse throughput, utilization of manpower, equipment, waiting time etc. are the focus areas.

**C.** **Solution:** modelling of warehouse operation and simulate the inbound and outbound flow and its variation over hour-of-day, day-of-week, day-of month for peak performance, study of bottleneck in warehouse material movement, storage and production material issuing or logistics dispatches. Unique insights into hidden bottleneck & capabilities helps improve the layout and processes. Equipped with best in class modelling, experimentation, ability to vary data, plugin with real systems and getting early alerts make these system extremely valuable.

**D.** **Benefits:** Identifying bottlenecks, Layout or process design, insights, early alerts from simulation of real data feed

Prescriptive Analytics

Rule based Simulation

Experiment, Scenario

Process Design

Bottleneck Studies

Real time sys integration

Flexibility-modelling

Early alerts

# Other Capabilities

L.    Business & Digital Transformation Consulting
1.    Process Maturity study & Improvement Recommendations
2.    Digital Transformation
3.    Digital Solutions Specification guidance
4.    Lean & Six Sigma Studies and Institutionalization through IT solutions
5.    Network Layout re-design (Fleet Size, Capacity expansion, Warehouse Layout)
6.    Data Modelling for enterprise warehouse /Data lake

M.    Production Scheduling & Simulation
1.    Metallurgy Plant Scheduling- Al Smelter etc.
2.    Polymer Plant Scheduling
3.    Job Shop, Flow shop Scheduling
4.    Blend Scheduling

N.    Logistics Scheduling & Simulation
1.    Vessel /Ship Scheduling
2.    Vehicle Route & Inventory Replenishment Scheduling

O.    Predictive Analytics Services
1.    Demand Forecast accuracy consulting & process setup (Existing platforms)
2.    Causal factor modelling
3.    Price Forecasting

P.    Training Services
1.    Technology training
2.    Six Sigma
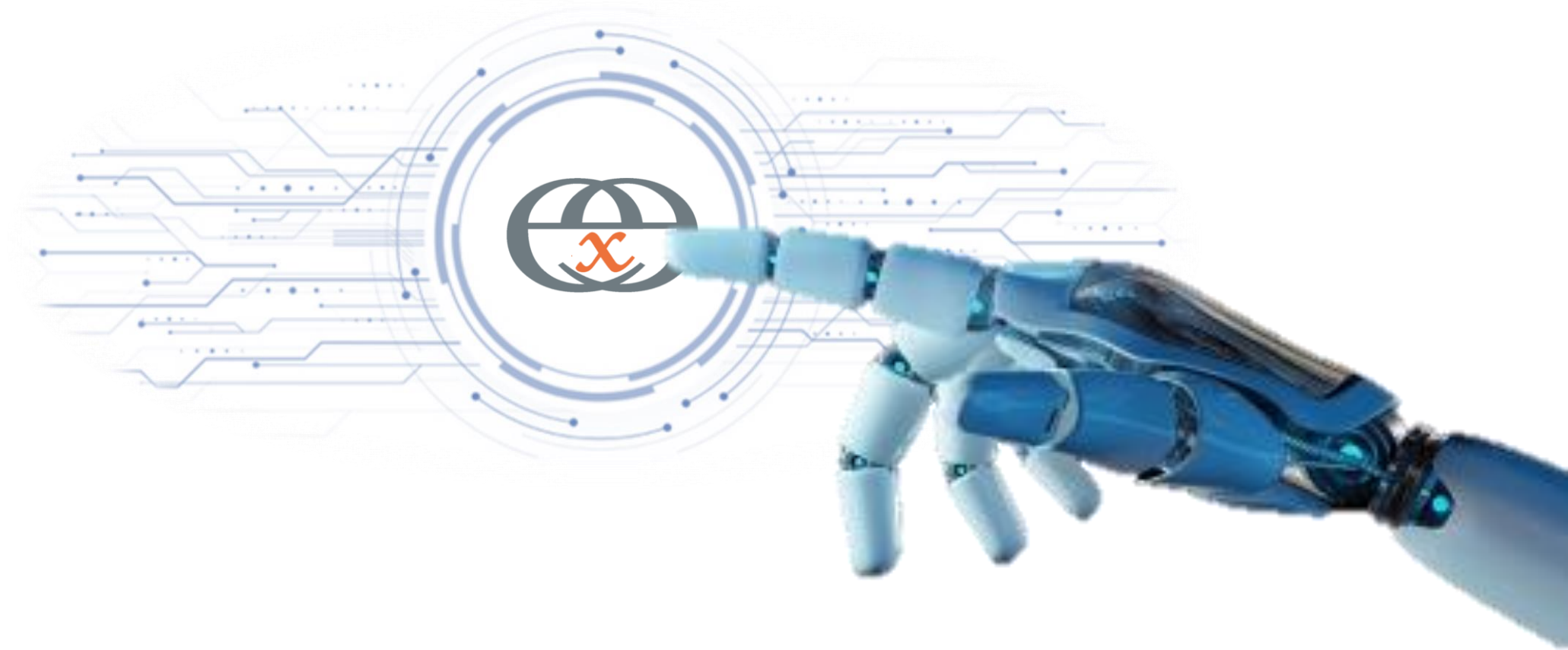
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