

Intelligent IT – Driving IT through A²I

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Abstract

With the data explosion, both structured and unstructured, each organization is striving towards gathering meaningful insights to either enhance the productivity of their employees (insights from organizational data) or to strengthen their competitive position in the market by providing customer centric products and services. IT services is a potent use case for such a scenario as there is a wealth of data developed in the IT lifecycle across development, quality assurance (QA) and production (live). The IT resources (people, monitoring tools) consume data at each stage in an isolated manner and generate insights which are focused on enhancing that particular phase (development, QA or production incidents) of the IT lifecycle. The paper aims at finding an integrated and collaborative AI-ML (artificial intelligence-machine learning) solution which can break these silos and provide a comprehensive and intelligent solution driven by the principle of A²I – *Automate, Augment and Invent*, aimed at improving both employee productivity and customer centricity of an IT organization.

Index Terms— Artificial Intelligence (AI), Machine Learning (ML), Automation

I. CURRENT STATE & PROBLEM STATEMENT

DATA EXPLOSION and emergence of artificial intelligence has pushed IT organizations to maximize productivity and provide best-in-class services to their customers.

A. Data has grown

The volume and velocity of enterprise data is increasing exponentially. IT organizations are able to extract large volumes of data as new-age technologies are enabling them to obtain macro as well as micro level details across monitored environments, in real-time.

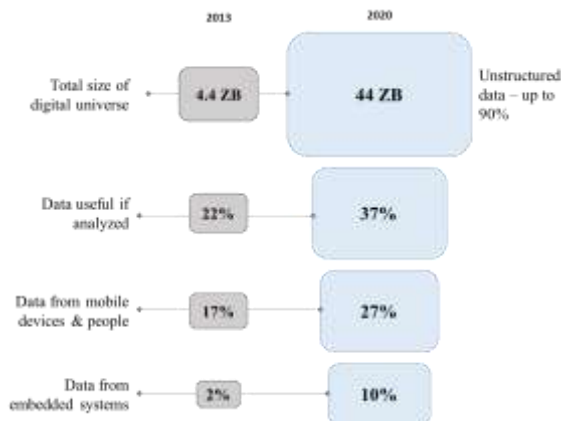


Fig. 1. Projection of data growth in the digital universe (in Zettabytes (ZB), 1 ZB = 1 Billion Terabytes) [1]

The data which is valuable for generating insights is both

structured (e.g. organized data bases) and unstructured (e.g. data from log files, social and other non-traditional sources). Unstructured data, in particular, is gaining significance with the advent of plethora of social platforms, exponential increase in connected devices (includes mobiles, RFID tags, Smart Cards, GPS devices, cards etc.) and the fact that users connected to the products through these devices round the clock.

Data also lies in the form of semi-structured log data, unstructured human language found in production tickets/incidents and structured data from application performance monitoring events.

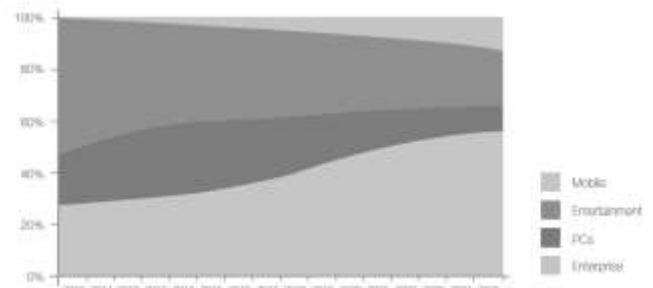


Fig.2. Distribution and trend of where data is stored. Source: IDC's Data Age 2025 study, sponsored by Seagate, April 2017 (Page 9, Figure 4) [2]

B. AI Maturity is highly fragmented

IT organizations have picked up significant pace in leveraging AI to improve their operations, however the AI maturity and metrics for a successful implementation varies widely across the application/product types.

AI is widely accepted and optimized in applications with low confidentiality or low impact data such as movie recommendations, restaurant reviews, travel blogs etc. However, leverage and widespread adoption of AI faces significant barriers in applications that involve business critical information such as credit scoring or involve

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stringent regulations such as medical treatment recommendations.

While human interface use cases such as self-driving cars are evolving, the *programmed interfaces are still not exploited to their full capacity*, and these present significant high-yield opportunities. AI's potential is not just limited to greater automation and operational efficiencies but goes beyond to *illuminate "hidden patterns", "dark" and "unstructured" data sets and to simulate scenarios for decision-making*.

C. Issues in the current IT Processes

- Integrating data from varied sources: Data comes from a lot of sources e.g. enterprise applications, social media streams, employee-created documents, emails etc. This poses some challenges in data integration and reconciliation, which leads to increased effort and subsequently more time in arriving at actionable insights
- Handling Dark Data: Gartner predicts that through 2021, more than 80% of organizations will fail to develop a consolidated data security policy across silos, leading to potential noncompliance, security breaches and financial liabilities. [5]
- Root Cause Analysis for Performance issues: According to Gartner, Root causes of performance problems have taken an average of 7 days to diagnose, compared to 8 days in 2005 and only 3 percent of incidents were predicted, compared to 2 percent in 2005.

II. WHERE DOES AI FIT IN?

Effectively integrating AI across the IT lifecycle through implementation of three key components of ML, NLP (Natural Language Processing) and BOTS can serve as a potential solution for the challenges and problem statement listed above. IT organizations have already rolled out initiatives to tap into this vast potential of AI, and the future of additional investments in AI seem extremely positive.

According to Gartner –

- “By 2020, 50% of IT organizations will apply advanced analytics in application development to improve application quality and speed of delivery” [3]
- “By 2020, 75% of integration platforms will leverage ML to automate integration between application APIs, thus reducing the need for skilled integration specialists” [3]

Based on the problem statement and to align with current market shift, we have developed a three-pronged approach - **A²I - Automate, Augment, Invent**.

- A. *Automation* can improve operational efficiencies e.g. lifecycle automation, operations / robotic process automation etc.
- B. *Augmentation* can improve the performance and

productivity of a company's existing resources. E.g. decision-making engines, recommendation engines, virtual agents and conversational bots

- C. *Invent* to conceptualize newer business models and opportunities to drive growth and market share

A. Automate

Traditional automation has always focused on individual elements of the lifecycle e.g. Regression Test Automation to focus on automation GUI, web service related test cases, automation for application maintenance etc. With the proliferation of AI, there is a need to expand automation boundaries not just to bring in operational efficiencies across the lifecycle, but also to bring in intelligence. The process flow for 'Automate' is depicted below:

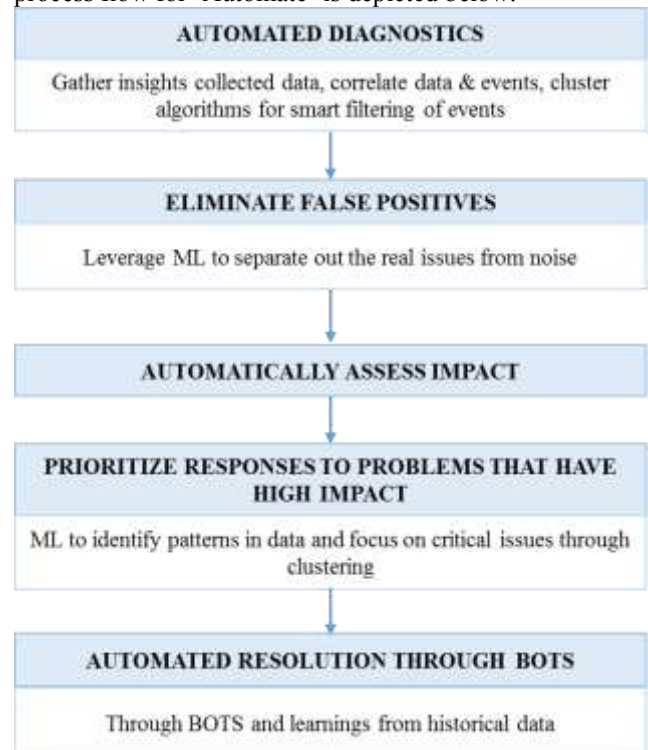


Fig. 3. 'Automate' process

Some of the key considerations for our solution include:

- 1) **Maximize Uptime with Machine Learning** for IT Operations - Improve availability and performance process effectiveness with RCA & incident prediction - IT Operations Analytics solutions
- 2) **Eliminate False positives** – Especially for anomaly detection & security
 - a. Anomaly Detection: As data collected by organizations increase in size and complexity, it becomes impractical to manually spot infrastructure problems, intruders, or business issues. ML can thus enable identification of unusual behaviors and anomalies
 - b. Analytics & predictive intelligence for security: ML technology can analyze data and connect thousands of seemingly unconnected clues left

behind by fraudsters to predict fraudulent behavior

- 3) **Ability to deliver faster response & resolution time to users & customers:** Automating the remediation/resolution for troubleshooting problems from end users can bring in the required agility to cater to the current data explosion.

B. Augment

IT organizations can leverage AI-ML based techniques for enhancing operational efficiencies of the organization internally, as well as strengthening their competitive position in the market by providing superior customer experience.

- *Operational Efficiency & effectiveness by improving employee productivity* and supplying additional intelligence – BOTS or utilities can be leveraged to assist employees in gaining quick information for queries ranging from basic needs such as procurement of new office equipment to complex requests which need search intensive information to be presented in a context-sensitive manner
- *Strengthen competitive position by improving customer Service Effectiveness & Net Promoter Score*
 - Maximizing leverage of self-learning Chatbots
 - Actionable insights through analytics on call data
 - Leveraging NLP and ML to estimate and manage customer's intent;
 - Leverage NLP and ML for Social listening & ticketing
 - Leverage Bots to provide Customer service response suggestions based on customers asks

C. Invent

AI can pave the way for conceptualizing and bringing in disruptive business models for the IT organization which may focus on either increasing efficiency, effectiveness or bring in innovation. Some of the areas include:

- Enhance product & pricing strategies
- Enhance cross-selling & up-selling strategies
- Building personalized experiences for customer
- Enhance retention strategies

III. BREAKING THE SILOS & CONNECTING THE DOTS

To maximize the potential of ML, IT organizations need to integrate all the data silos under one platform to enable analysis and arrive at actionable insights. This approach will help in eliminating gaps across the lifecycle and serves as a single source of truth for all applications environments.

What do the leading analysts say?

- “By 2020, 70% of new integration technology deployed will have unified application and data integration capabilities within a single platform” [3]
- “By 2020, 30% of all B2B companies will employ AI

to augment at least one of their primary sales processes. (sales organizations will be using data and analytics to become smarter and better — much faster)” [3]

The figure below depicts a unified and integrated AI hub solution:

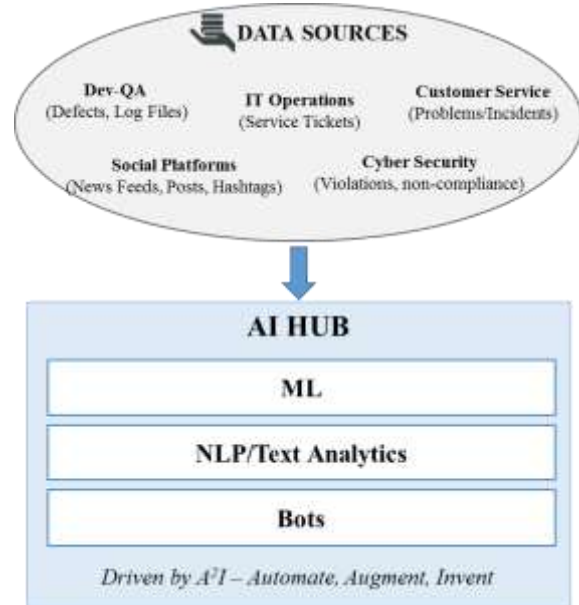


Fig. 4. Integrated AI Hub

IV. CASE IN POINT

A. Machine Learning Approach

Objective:

Provide Best-in-Class learning experience - Improve quality & user experience of learning management solution

- Identify hot spots and reduce number of tickets
- Predict anomalies for future quarters
- Improve automation coverage and overall application quality

Hypothesis:

- Learning completion in sub systems not reflecting in LMS
- Trends as per Departments and Regions
- Top certificates have most issues

Approach:

Leverage ML and NLP/Text Analytics for insights on:

- Volume distribution of tickets across categories/apps
- Historic trend of issues between 2017 and 2018
- Identify areas for automation

Leverage ML/Text Analytics for diagnosis:

- Trend as per department and regions
- Identify root cause on arrival on a new ticket
- Identify areas that can be automated in business process

Leverage ML/Text Analytics to predict:

- The number of tickets expected based on a specific campaign drive for specific departments/courses

Leverage Bots for resolution:

- On arrival of a new tickets, BOTS (trained based on RCA) *recommend* and take actions automatically based on repeated trends leading to resolution

Solution:

Various Machine Learning Approaches

- Create a word cloud – Role Development Modules are identified as having large number of issues. Out of 9 million incident metrics, the Summary column with 55K records is chosen for text analytics and below inference was drawn:



Fig. 5. Word Cloud

- Next step is to plot information against the problem patterns and against the time series to project the frequency of occurrence for repeated issues
- Clustering – If one group or designation demonstrates more issues then identify if that group is co-located. Check if there is a common course that contains most issues.
- Based on the current findings to apply predictive analytics and identify the areas that need focus and close the feedback loop
 - Improve stickiness to content
 - Enable a recommendation engine

A preliminary Pareto analysis has given the below findings

- Top 3 regions that visibly have the most tickets
- Top 3 departments with most tickets

End to end lifecycle from Requirements to Production is observed and action is taken on KPIs/Patterns to improve application quality.

B. AI Driven Automated Failure Analysis & Resolution for Zero Touch Automation

Problem Statement:

- Manual Process of Failure Analysis & resolution results in higher effort
- Learnings from Dev-QA cycle are not leveraged for analysis and resolution in production

Solution:

Integration of AI driven system to the QA cycle (with test automation tool) and to production cycle (through ticket management system e.g. ServiceNow) to achieve:

- AI Driven Automated Test Automation failure analysis & semi self-healing - Zero touch automation
- Automated failure diagnostics for Production tickets – Reuse of learning from development lifecycle

Steps of Execution:

- Automated Testing initiated for application under test
- In case of a script error the failure analysis is manually done and the issue is resolved (e.g. for a service error, the service is restarted and the automation script is triggered)
- This is fed to the AI driven system as a learning, which enables the system to restart the service and trigger scripts for any future occurrence, hence enabling semi self-healing
- Similar learnings can be applied to the production environment with the inputs from ticket management system, e.g. ServiceNow

The figure depicts the workflow:

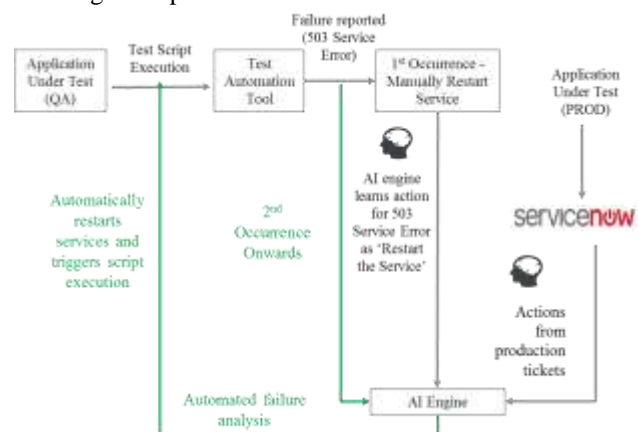


Fig. 6. Process flow for AI driven failure analysis and resolution

Benefits:

- Fully automated failure analysis; Self-healing; 20% - 50% reduction in failure analysis effort
- Learnings from Test Execution leveraged for Production analysis & recommendations; 20% - 30% Reduction in Production ticket analysis, tracking & management
- Semi self-healing and automated resolutions - 10% - 15% reduction in maintenance effort
- Integration of 2 platforms across QA and production (live)

V. CONCLUSION

A. Going Beyond the Data Hype

Considering the unprecedented proliferation of data coupled with exponential growth in connected devices ("by 2025, approximately 80 billion devices will be connected to the

Internet “- Vernon Turner, senior vice president of enterprise systems at IDC [4]), a unified AI solution is the need of the hour. Leveraging a unified AI solution driven by A²I (Automate, Augment and Invent) will ensure that the data is put to the ‘right’ use, providing the ‘right’ actionable insights targeted to both employees and end users. This will help organizations achieve dual benefits of increased operational efficiencies and increased market share.

B. Outcome Driven AI

The implementation of the given AI solution entailing integration of toolsets and platforms across the IT lifecycle requires a considerable effort upfront. Once established, such an AI solution will provide significant effort savings through improved productivity. The ROI of the solution can be measured through the following parameters:

- 1) Successful business outcomes
- 2) Performance metrics
- 3) Resolution time
- 4) Employee productivity

C. What to watch out for?

Data ageing is one of the key factors to be considered while utilizing and maintaining an AI solution. Data decays as older data becomes less reliable due to changing scenarios, customer preferences, business process flows or a disruption in the product value chain.

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Vinod Sundararaju Antony - Vinod has 17 years of IT industry experience. Over the years he has taken up a variety of roles such as Global Delivery Manager, Transformation Consultant and Transformation Consultant. Vinod has extensive experience in establishing Centers of Excellence, defining and delivering Transformation programs and enabling enterprises to improve quality, optimize cost and time to market. Vinod has developed Quality strategy for large Business Transformation programs and has set up Enterprise wide Quality Strategy and processes. Vinod holds a Bachelor of Engineering degree and is PMP & ACP certified.

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