

# ITOA –A CONTEMPORARY STUDY AND USAGE IN INDUSTRIES

Arvind Kumar-Senior ERP Solution Architect / ERP Manager

**Abstract:** IT operations analytics (ITOA) is the practice of monitoring systems and gathering, processing, analyzing and interpreting data from various IT operations sources to guide decisions and predict potential issues. Information is gathered from live running infrastructure as well as older logged data from application, service and infrastructure hardware logs. Other sources of data include software agents running in operating systems or hypervisors gathering data relevant to I/O, transactions and resource usage. The results of scripted tests are gathered, along with real-time analysis of running protocols in a network IT operations IT data from different sources, examining that data in a broader context, and proactively identifying problems in advance of their occurrence. With the right ITOA solution, you can detect patterns early to predict issues before they arise.

**Keywords:** ITOA, SLR, CAGR, Big data

## 1. INTRODUCTION

Enterprises need the support of efficient and reliable IT systems and infrastructure for their day-to-day operations. But IT Infrastructure and operations teams face relentless pressure to improve service and support growth initiatives while optimizing costs. Organizations need to reap the benefit of advanced ITOA methodologies to help manage Business Services and the quality of the end-user experience. The core benefit of ITOA comes not from the raw data, but from the processing and analysis of data and the insights, decisions, products, and services that are derived from the analysis. This is not a trivial task and in order to deliver smooth IT Operations, there is a need to understand the underlying challenges in the ITOA landscape.

The objective and motivation of this article is to give a systematic review of existing ITOA landscape for the commercial products. The rest of the paper is organized as follows: In Section I, we begin the paper by defining the ITOA. Section 2 focuses on key tenets of ITOA. Section 3 talks about focuses on the research method used in this study. Existing commercial products and architecture used by them are highlighted in Section 4. Section 5 is on, how ITOA works. Section 6 talks about challenges in ITOA. Section 7 is for ITOA

features. Section 8 is log analysis. Section 9 is for conclusion and future state of ITOA.

## 2. KEY ITEMS IN ITOA

In this chapter, we describe core concepts and background information. We start by presenting a brief primer on IT Operations Support.

**IT Operations Support or Production support** is the practices and disciplines of supporting the IT

Systems/applications which are currently being used by the end users. Most of the Enterprises rely on conventional methods to manage vast amount of data stored across Knowledge Database, Configuration Management Database, Ticketing Systems or Monitoring alert systems to do this support.

Usually there are 3 levels of support:

**Level 1 (L1)** handles on-call support incidents and provides solutions for simple and known problems,

**Level 2 (L2)** provides administration-level support and deeper technical support, and

**Level 3 (L3)** provides support for most advanced technical issues through their subject matter expertise.

**IT Operations Analytics (ITOA)** has been defined by ITanalyst Forrester Research [1] as “use of mathematical algorithms and other innovations to extract meaningful information from the sea of raw data collected by management and monitoring technologies.” ITOA primary use is to assist support team to make data driven decisions to optimize operations. It leads to operational intelligence during decision-making process itself.

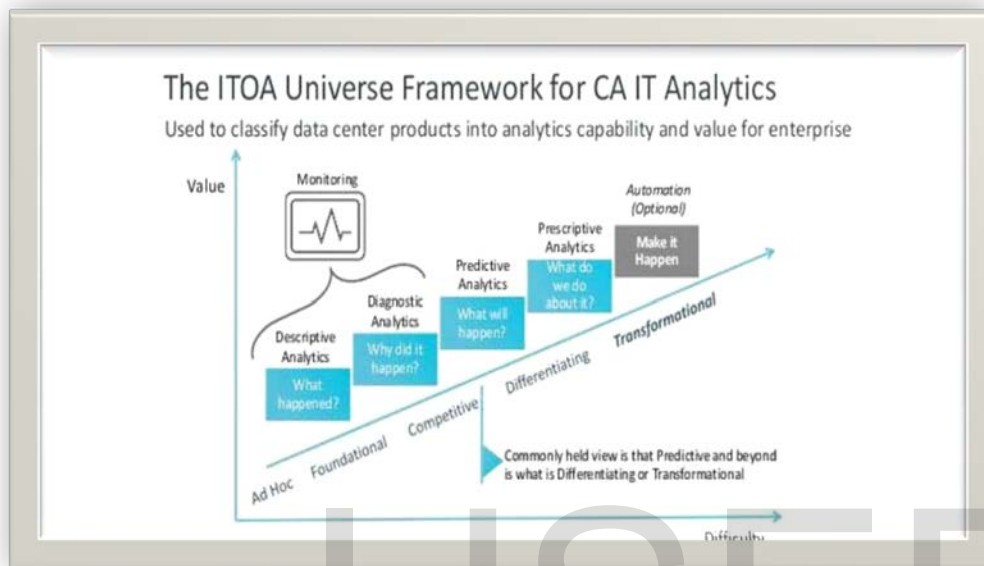


Fig 1 - Shows the ITOA frame work from CA

Gartner has outlined core applications for ITOA:

- **Root Cause Analysis:** The models, structures and pattern descriptions of IT infrastructure or application stack being monitored can help users pin point fine-grained and previously unknown root causes of overall system behavior pathologies.
- **Proactive Control of Service Performance and Availability:** Predicts future system states and the impact of those states on performance.
- **Problem Assignment** Determine show problems may be resolved or, at least, direct the results of inferences to the most appropriate individuals or communities in the enterprise for problem resolution.
- **Service Impact Analysis:** When multiple root causes are known, the analytics system’s output is used to determine and rank the relative impact, so that resources can be devoted to correcting the fault in the most timely and cost-effective way possible.
- **Complement Best-of-breed Technology:** The models, structures and pattern descriptions of IT infrastructure or application stack being monitored are used to corrector extend the outputs of other discovery-oriented tools to improve the fidelity of information used in operational tasks (e.g., service dependency maps, application runtime architecture topologies, network topologies).
- **Real time application behavior learning:** Learns & correlates the behavior of application based on user pattern and

underlying Infrastructure on various application patterns, create metrics of such correlated patterns and store it for further analysis.

- **Dynamically Baselines Threshold:** Learns behavior of Infrastructure on various application user patterns and determines the optimal behavior of the Infra and technological components, benchmarks and base lines the low and high water mark for the specific environments and dynamically changes the benchmark base lines without any manual interventions.

### 3. SOURCES OF INFORMATION

These sources cover the most relevant journals, conferences and work shop proceedings.

- IEEE eXplore(ieeexplore.ieee.org)
- Science Direct(www.sciencedirect.com)
- Springer(www.springer.com)
- Market Research firm websites(Gartner, Forrester, IDC, Markets and Markets)
- ITOA commercial vendor white papers

The search criteria included the titles (IT Operations Analytics, Big Data, IT operations)

### 4. ARCHITECTURE OF ITOA

IT Operations Analytics solution implementation is based on collecting data which is relevant to business (real-time, historical & archived) from the existing IT Operations system. This data then goes through cleansing. Analytics is applied on the top of it get the right context for users problems and finally data visualization is done.

Ali Imran Jehangari have discussed the principles to build an ITOA tool in [3] .He has done some research work of on studying new technologies and permit research which is often not possible with commercial tools. In this section, we will focus on commercial ITOA analytics solutions.

ITOA solutions are marketed broadly under 5 applications

- Infrastructure management
- Data Visualization
- Network Management
- Data Visualization
- Network Management

Table 1: shows vendors and corresponding ITOA products

Vendor	Product Solution
Microsoft	Microsoft Operations Management Suite
IBM Corporation	IBM Operations Analytics -Log Analyzer -Predictive Insights
SAPSE	SAP IT Operations Analytics (SAPITOA)
BMC	True Sight Operations Management True Sight App Visibility Manager True Sight Infrastructure Management
HewlettPackard	HPE Operations Analytics (ITOA)
Splunk	Splunk IT Service Intelligence
Moogsoft	Incident. MOOG
ITRS	ITRS Insights
Zenoss	Zenoss as a Service (ZaaS), Zenoss dynamics5
Evolve	Blended Analytics
ExtraHop	Extrahop Platform
VMWare	vRealize Operations
Prelet	Prelet Behavioral Analytics
Appdynamics	Application Performance Management
Nextthink	Nextthink End-user IT Analytics platform

Figure 2:shows vendors and corresponding ITOA products

For the “data analytics, these products rely on using Machine Learning /Behavioral Analytic principles as shown in Figure 3.

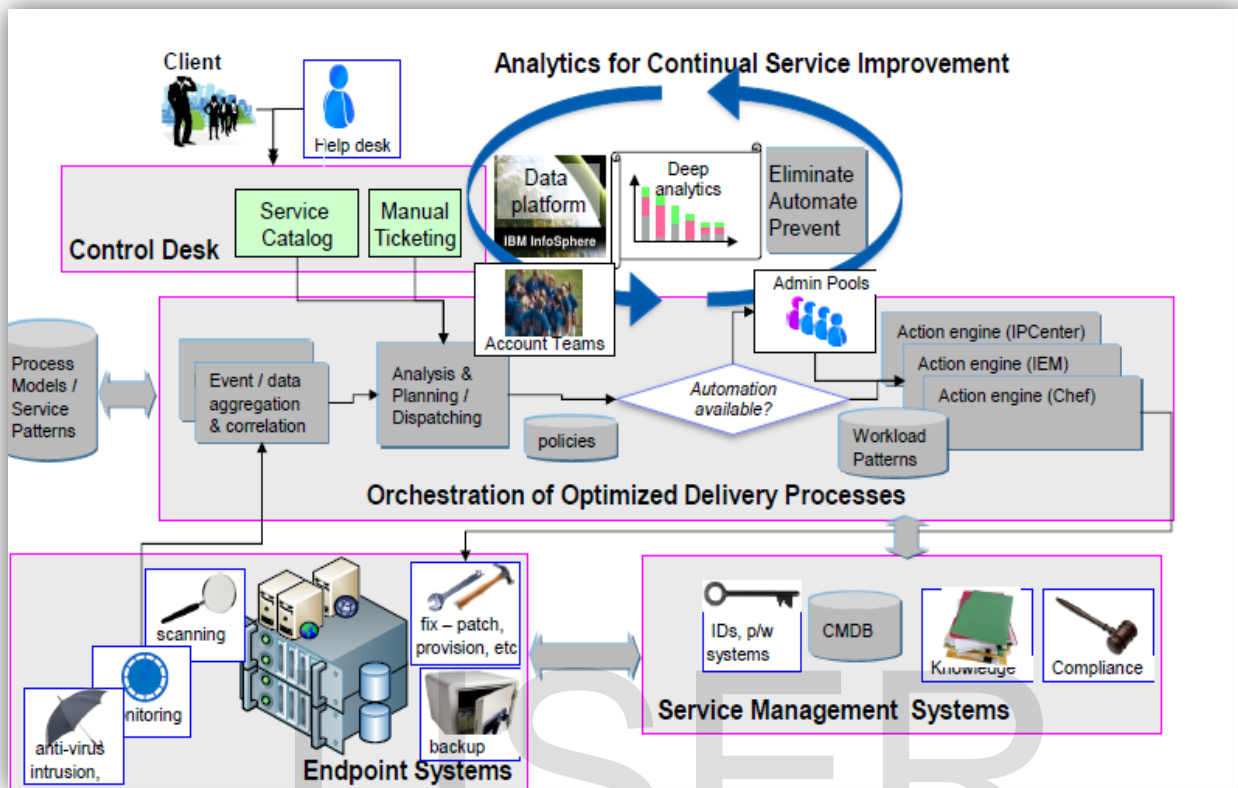


Fig 3: ITOA value Chain Analysis

## 5. HOW ITOA WORKS

ITOA software can either be administered on-site, or accessed via a cloud provider. The software gathers data from running (live) systems, including operating systems, hypervisors, network devices and sensors, as well as data from various types of logs, such as applications, databases, devices and web. The data is warehoused and indexed in a data store. From there, ITOA normalizes and transforms structured

From there, ITOA normalizes and transforms structured and unstructured data, turning it into usable information. The data may include

different kinds of KPIs as there are active network connections and server CPU

utilization, application usage patterns and user responsiveness metrics among them.

Many ITOA tools “learn” what’s normal for a system, network or environment, creating baselines and then identifying patterns in the data to detect anomalies and then identifying patterns in the data to detect anomalies, especially in log data and network captures.

Finally, IT operations analytics software sends alerts to a management console that recommends actions for administrators to take

to resolve issues. A real-time alert might be issued when a KPI exceeds a threshold or strays from an expected norm. Most ITOA products prioritize issues as well, allowing network administrators to focus on critical problems and return to lower-risk problems as time allows.



Fig 4 - Best Practices of ITOA

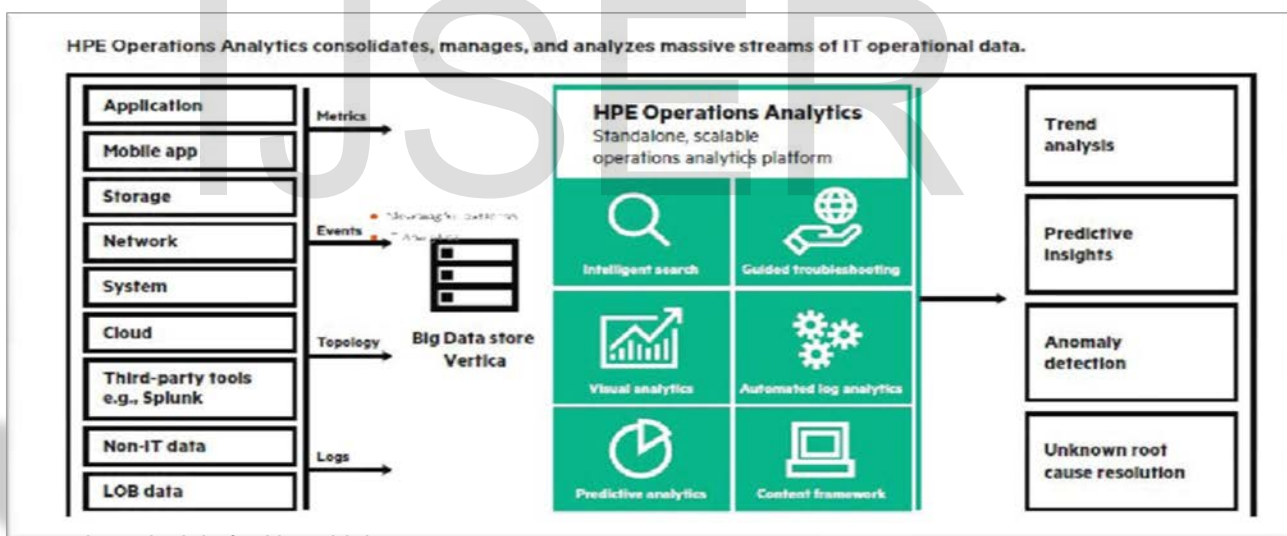


Fig 5: Implementation principle for Next think

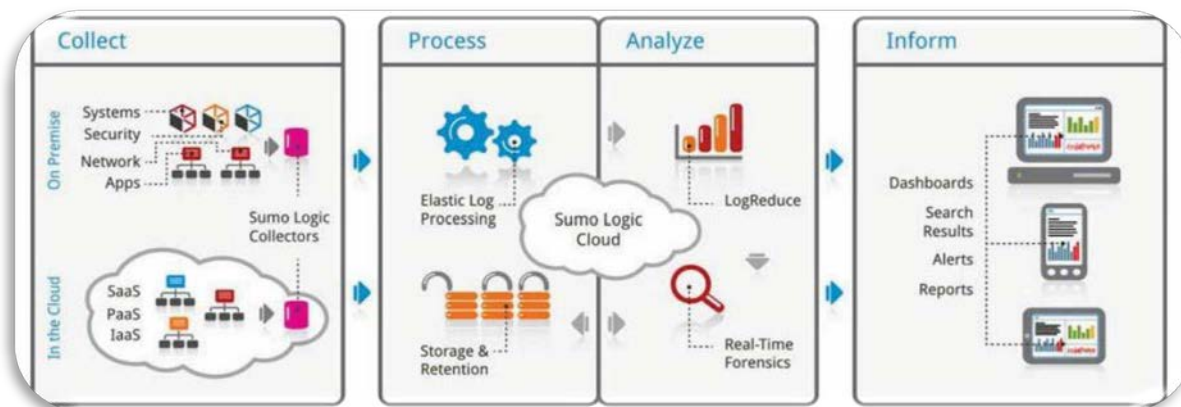




Fig 6: Implementation principle for HP.

## 6: CHALLENGES IN ITOA IMPLEMENTATION

ITOA solutions suffer from some limitations like:

- Issues are not always evident from logs. Useful information is scattered over diverse location like logs, metrics, events, transaction traces, stack traces, heap dumps, tickets etc. All the data needs to be correlated for accurate analysis.
- Different ITOA solutions work of different data set like Splunk (logs), ExtraHop (network data), Appdynamics (data collected by application) and the extraction layer is domain/application specific.
- Enterprises use separate tools for infrastructure and Business application monitoring resulting in Analytics silos
- Alerts are based on threshold configuration and is not free from configuration issues.
- Supervised training of the system is non-trivial
- Error messages are thrown even during healthy system state. Depending on the IT environment, machine learning can typically reduce operational noise to some extent

## 7. ITOA FEATURES TO LOOK FOR

ITOA is still evolving, and there is no standard model against which to evaluate vendor offerings. However, many vendors have entered the ITOA market, catering mainly to enterprise organizations as well as

some midsize entities. When evaluating ITOA vendors, look for the following features:

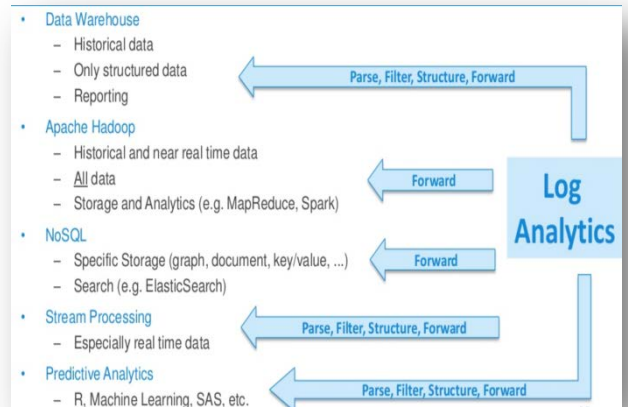
**Cross-domain collection and reporting.** A comprehensive IT operations analytics tool should be able to search for and gather logged and real-time data across organizational infrastructure—physical, virtual and cloud. That information should be automatically correlated with events, application groups (groups of users and computers) and so on, and should then provide alerts and actionable reports to remedy performance and availability issues.

**Baseline establishment.** The tool should have the capability to establish system, network or environment baselines from historical trend data.

**Automated log analysis and predictive analytics.** This includes automated anomaly detection and behavioral analytics based on machine learning. Predictive analytics uses self-learning behavior derived from past events to predict when problems may occur in the future or to predict future trends for use in capacity planning and resource allocation.

**Scalability.** If the volume of your data increases, your ITOA software must be able to handle the new load without any downtime or major upgrades.

**Ease of installation and use.** Look for ITOA software that can be up and running in minutes or hours rather than days or weeks. Dashboards should be clear, concise and customizable, enabling efficient troubleshooting and root cause analysis.



### 8. LOG ANALYSIS OF ITOA

Log Management of ITOA helps, focus on complex correlations, real time processing, predictive analysis and predictive monitoring.

Analysis of Log Management of ITOA and comparison with other big data tools are depicted below.

Fig8-IOTA relation to other big data components

### 9. CONCLUSION

#### 9.1 WIP

Dynapps. A leading vendor for IT operation analytics has outlined the future of ITOA as shown in diagram below:

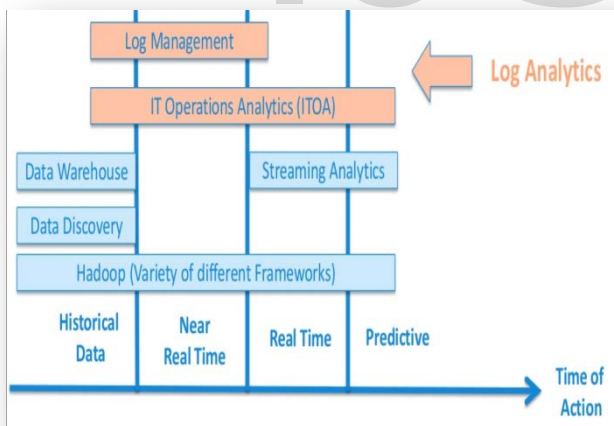


Fig7-Log Management through ITOA

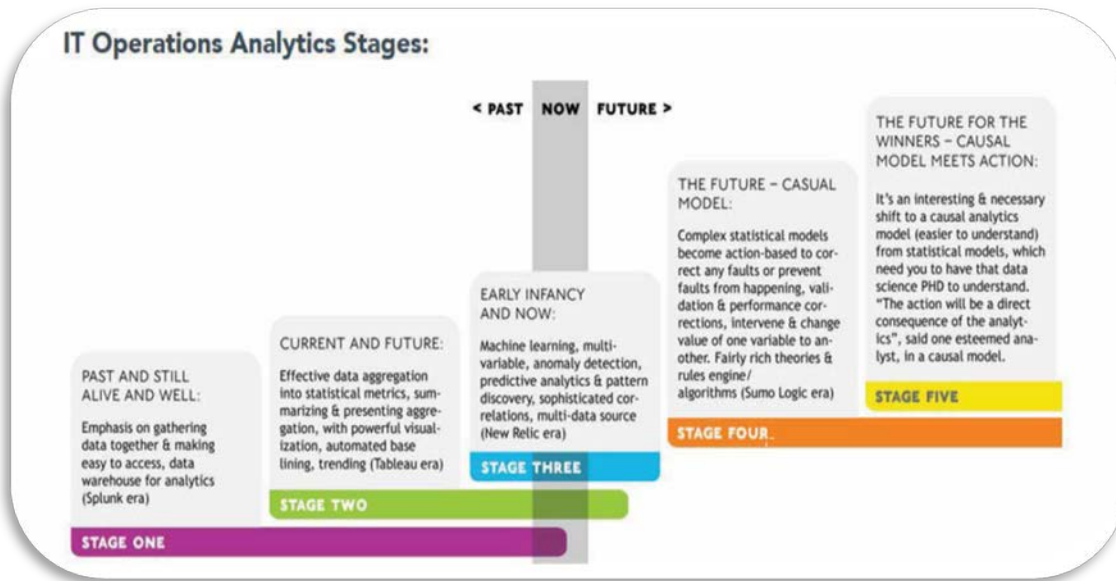


Fig9- Future State of ITOA

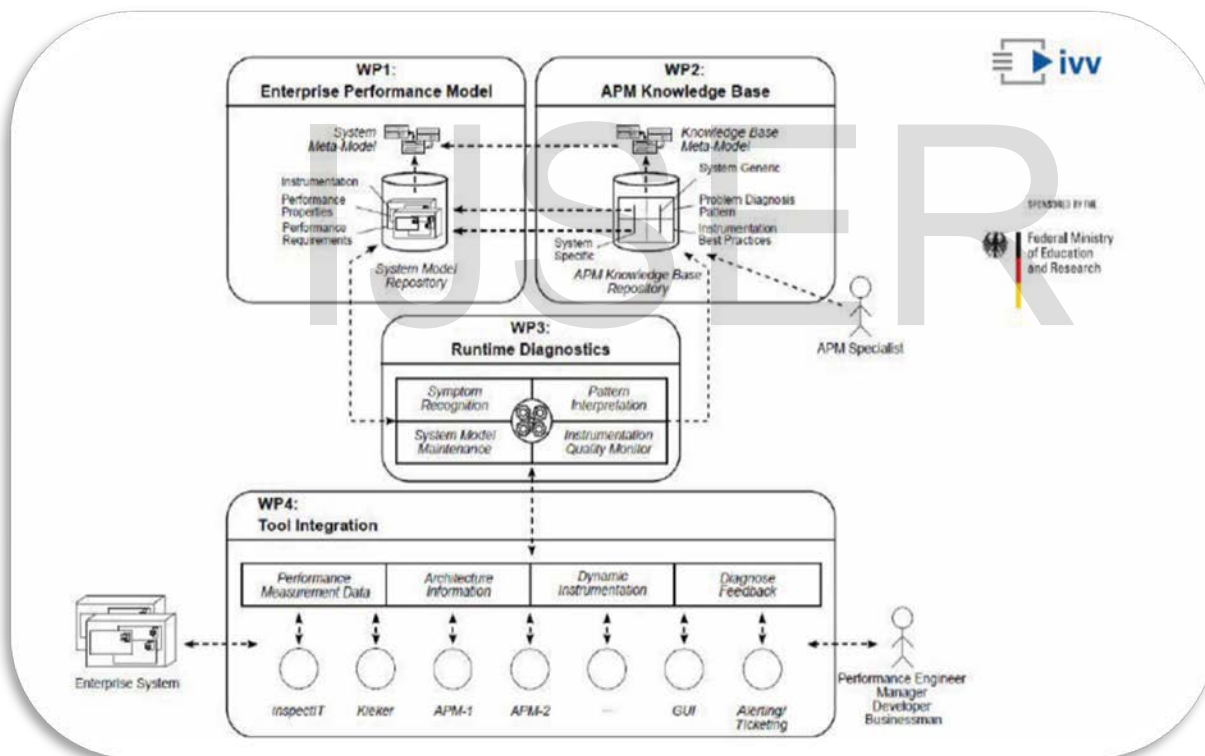


Fig10- Future State of ITOA

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