

Artificial Intelligence Integration in IT Service Management: An ITIL Configuration Management Process Review

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Abstract:

The advent of Artificial Intelligence is documented to have emanated from machine learning inventions. Artificial intelligence (AI) is the simulation of human intelligence in machines, teaching a computer to think, learn, and perform tasks like a human. Some IT Service management vendors (ITSM) have started incorporating the added value of AI within their ITSM solutions. Even though the value of such initiatives is not well documented, there has been a lot of promising data that points to continued rollout of ITSM solutions integrated with AI. With little research currently being done on the Configuration Management Database (CMDB) process both within academia and industry, this article strives to address that existing gap in new knowledge especially with the advent of new AI adoption initiatives. The scope of this work includes a review of existing AI use within five major ITSM vendors with a CMDB process module. We provide a comprehensive discussion of the identified use cases and how any of these use cases can solve four main CMDB implementation challenges from our research study. The goal of the paper is to enhance the available knowledge on AI integrated CMDB as a core ITIL process that supports IT Service delivery. This is achieved by providing a comprehensive analysis of existing Artificial intelligence CMDB applications platforms.

Keywords

AI, AI Copilot, Configuration Management Database (CMDB) ITIL, ITSM

Introduction

The management of configurations has traditionally been viewed as an IT management best practice. Using security-focused configuration management (SecCM) to gain greater control over and ensure the integrity of IT resources facilitates asset management, improves incident response, ServiceDesk, disaster recovery, and problem-solving, aids

in software development and release management, enables greater automation of processes, and supports compliance with policies and preparation for audits (NIST SP 800-128). In an article published in Forbes magazine, Ian Scholnick notes that digital transformation has become a priority for enterprise organizations across all industries due to the urgency of marketplace competition. In many industries, Artificial intelligence (AI) is currently at the forefront of digital transformation even though there is still more work to be done in adopting AI and using it for the greater good.

Research published in the Harvard Business Review (HBR) highlights the need for doing things differently when it comes to digital transformation projects based on the revenue gap realized and the unrealized cost savings. Lamarre et al (2023) stated that out of 89% of large companies globally, with digital and AI transformation underway, they have only captured 31% of the expected revenue lift and 25% of expected cost savings from the effort. Several ITSM solutions have been incorporating the added value of Artificial intelligence within their ITSM solutions. Even though the value of such initiatives are not well documented, there has been a lot of promising data that points to the continued roll out of ESM solutions integrated with Artificial intelligence.

The purpose of the study is to determine current Artificial Intelligence integration in Enterprise Service Management specifically within the configuration management process module. Research within the domain of configuration management implementation is limited particularly in tools, processes, and frameworks to increase adoption rates and successful implementation. Per Boston Consulting Group (BCG), to successfully deploy AI at scale and capitalize on the impact of AI on business, businesses need to prioritize a 10-20-70 approach that emphasizes algorithms (10%), tech and data (20%), and people and processes (70%). The Significance of the Study is that the researcher, through personal experience within 16% of the (three out of the 18 total) Community Colleges in New Jersey, and about seven (7) private companies some being Fortune 100 companies, and the literature review elaborates the gap in ITIL success stories with CMDB Implementations across various industries. With the details on current CMDB implementation challenges, this study will provide a remarkable addition as a reference guide for Artificial Intelligence integration in Enterprise Service Management with a focus on the ITIL configuration management process.

Objectives

Our main aim is to provide Artificial Intelligence integration in Information Technology Service Management (ITSM) review with a focus on ITIL configuration management process by;

- Research the major ITSM vendors that have Artificial Intelligence capability integration.
- Review the specifics of using AI for the configuration management process.
- Identify if the AI integration can help solve any of the CMDB implementation challenges from our previous study.

2. Background

Since the beginning of the Internet era, computers have played a role in human life across all industries. The simplicity of the development of different technologies contributed to an increasing dependency on computers. These technologies from the invention of the internet to date include but are not limited to, Wi-Fi, Virtual computers, Cloud computing, Big Data, quantum computing, and Artificial intelligence.

The 'Internet Era' refers to a period characterized by the widespread use of the Internet for accessing information, communication, and services, leading to a shift in how individuals interact with technology and information sources (Fang 2013).

Per the World Economic Forum, we are entering the Intelligent Age, an era far beyond technology alone. This is a societal revolution, one that has the power to elevate humanity — or indeed to fracture it. The Intelligent Age, driven by rapid advancements in artificial intelligence (AI), quantum computing, and blockchain is transforming everything and changing it right now, in real time (World Economic Forum 2024). This literature review will focus on providing a high-level review of the ITIL framework, the connection between ITIL and ITSM, an understanding of the configuration management process, and a review of ITSM platform solution vendors offerings of configuration management platform integrated with Artificial intelligence.

2.1 ITIL Explained:

ITIL is a library of best practices for managing IT services and improving IT support and service levels. One of the main goals of ITIL is to promote alignment between IT services and business objectives, even as they change (IBM 2024).

The latest version of the ITIL framework is ITIL4. This was created and released in 2019 by Axelos, a creator of professional certification. Per Axelos, ITIL 4 is an adaptable framework for managing services within the digital era. Through our best practice modules, ITIL 4 helps to optimize digital technologies to co-create value with consumers, drive business strategy, and embrace digital transformation Axelos (2024). Even though ITIL is the most adopted ITSM framework per figure 1 below, other frameworks that exist include DevOps, Control Objectives for Information and Related Technologies (COBIT), Microsoft Operations Framework (MOF), and ISO/IEC 20000.

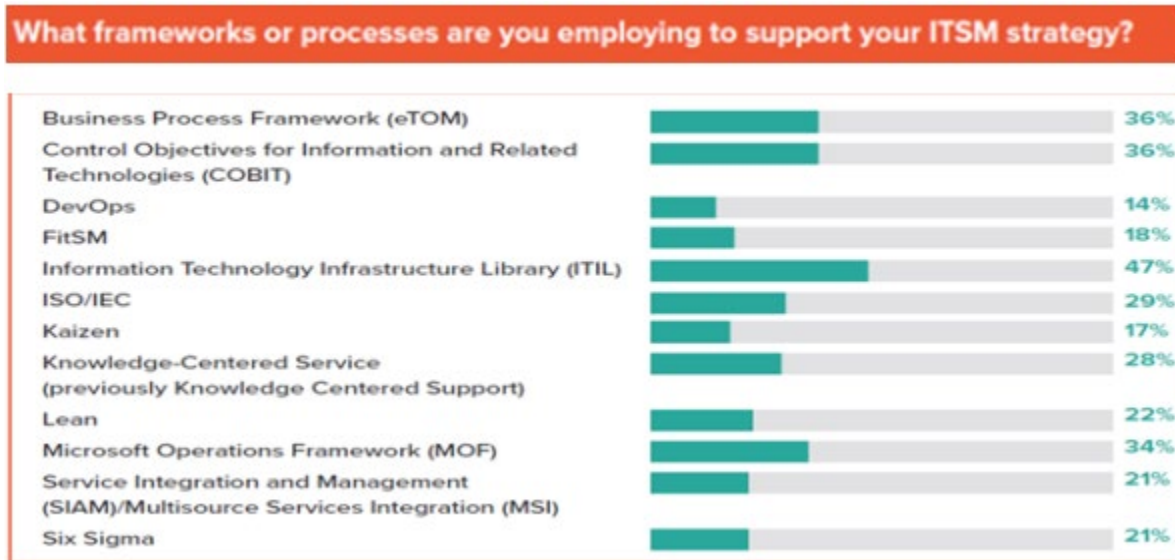


Figure 1. The most popular frameworks and processes (Forbes 2017).

The growing dependency on IT platforms across all industries and the need for record speed from customers while assessing the available IT solutions from online banking, Online shopping, and multiple streaming services to name a few demands organizations to rely on predictable frameworks like ITIL for IT service delivery. To take advantage of this framework, several IT Service Management (ITSM) have built their solution as prescribed by the ITIL framework for ITIL processes like Incident management, change management, problem management, and Configuration management which is the focus of this research.

IT Service Management (ITSM):

IT service management (ITSM) is the practice of planning, implementing, managing, and optimizing information technology services to meet the needs of users and help organizations achieve their business goals (IBM 2024). For ITSM to be effective, there are three parts that define that success which are People (IT teams), technology, and practices. In this article we will focus on the technology pieces. However, it is important to note that the most critical part in IT service delivery is people as IT teams configure, implement, and maintain different IT technologies while also authoring practices (Processes, and procedures) go to be followed while requesting, consuming, and asking for support for the same technologies across various organizations. Gartner defines IT service management (ITSM) platforms as software that offers workflow management that enables organizations to design, automate, plan, manage, report on and deliver integrated IT services and related digital experiences. Supported practices include request, incident, problem, change, knowledge and configuration management, and case management (Gartner Research 2024)

2.2 Configuration Management.

Configuration management has been part of the ITIL framework since the introduction of ITIL version 1 in 1980s by the Central Computing and Telecommunications Agency (CCTA), a government agency in Great Britain (Kempter 2023). Within the configuration management process module in any ITSM platform, a configuration management database (CMDB) exists as the central repository that stores all the Physical and logical data about the several IT configuration Items like laptops, desktops, network equipment, servers and logical data like business process.

The value of the CMDB from a risk perspective is also well documented. Per Ram, the ability to track and monitor security attributes of assets within the CMDB enhances an organization’s ability to proactively address potential threats and vulnerabilities (Ram 2023). With the CMDB, other ITSM software modules like change management, Incident management, problem management, release management can all benefit by enhancing IT service delivery utilizing the single source of truth the CMDB offers. For this research we will do a comprehensive review of AI application within CMDB and the value they add in addressing CMDB implementation challenges identified by our research.

In his book, Principles of Network and Systems Administration, Burgess lists several guiding principles, one of them being the system configuration policy. Principle 39 (Policy) States that a clear expression of goals and responses prepares a site for future trouble and documents intent and procedure. Policy should be a protocol for achieving system predictability (Burgess 2003).ServiceNow in their effort to improve the CMDB, they developed a framework for CMDB rollout. A Common Service Data Model (CSDM) is a standardized framework that defines service-related terms and relationships for all ServiceNow products. It links IT assets to services, users, costs, and more, facilitating accurate reporting and aligning business strategies with technical implementations (ServiceNow 2023).

2.3 Artificial Intelligence

There has been a remarkable buzz about AI across many industries with IT and finance leading the way. For about 5 years now, a lot of Lab research has been done to try and determine the value of AI with its application on different fronts with ITSM platform being one of them. Gartner has tracked artificial intelligence (AI) on its Hype Cycle since 2020. Some of the highlights of AI on the Hype Cycle are included in the table below highlighting the AI innovations that have taken place the last 5 years from 2020 to 2024 as shown in table 1 below.

Table 1. A summary of Gartner AI research since 2020.

Year	Event
2020	Gartner predicted that the impact of AI on code generation, innovation, and design would be 5–10 years away.
2021	Generative AI became a top strategic technology trend for Gartner.
2022	Gartner placed generative AI on the peak of inflated expectations on the Hype Cycle for Emerging Technologies.
2023	Gartner's Hype Cycle for Artificial Intelligence shows that cloud AI services have reached the trough of disillusionment.
2024	Gartner's Hype Cycle for Artificial Intelligence shows that cloud AI services have reached the trough of disillusionment.

However, it is good to note that AI as a technology, and a research area has been there since the early 1980s. As observed by Khalil, the decision to build core expertise in the strategic technical areas of artificial intelligence was made before most of their commercial application were well understood (Khalil, T. 2000). Some of the earlier research topics noted included databases, machine learning, knowledge representation, expert systems, and distributed AI. A further look at the details of Gartner's research revealed that the AI focus is on generative AI per Figure 2 below. Generative artificial intelligence (generative AI) is a type of AI that can create new content and ideas, including conversations, stories, images, videos, and music. AI technologies attempt to mimic human intelligence in nontraditional computing tasks like image recognition, natural language processing (NLP), and translation. Generative AI is the next step in artificial intelligence (Amazon 2024).

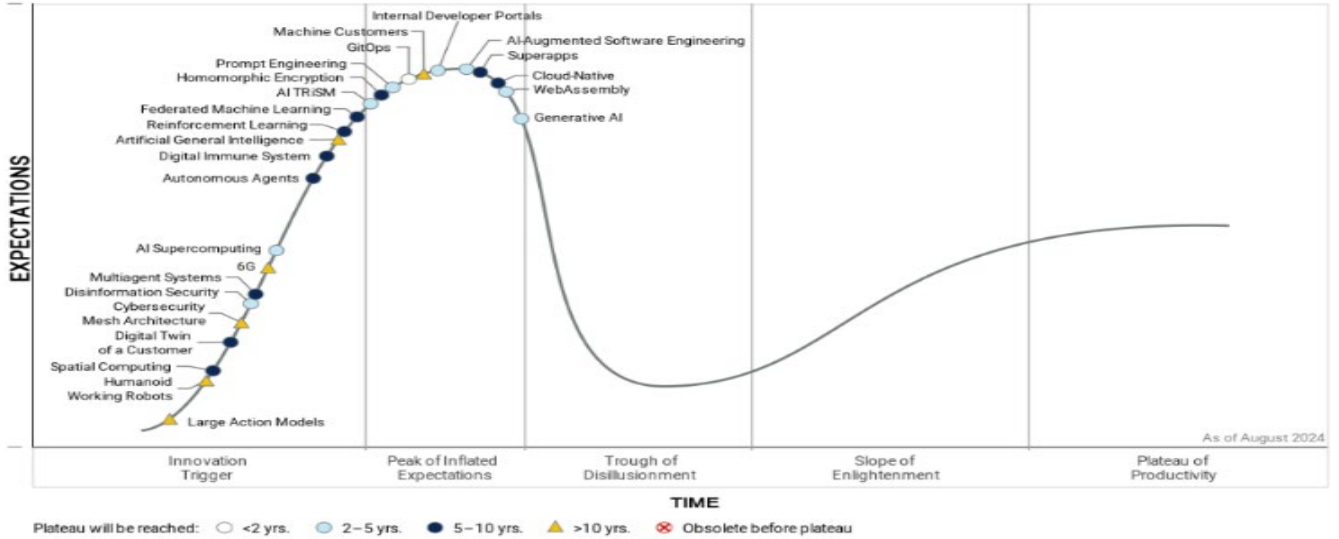
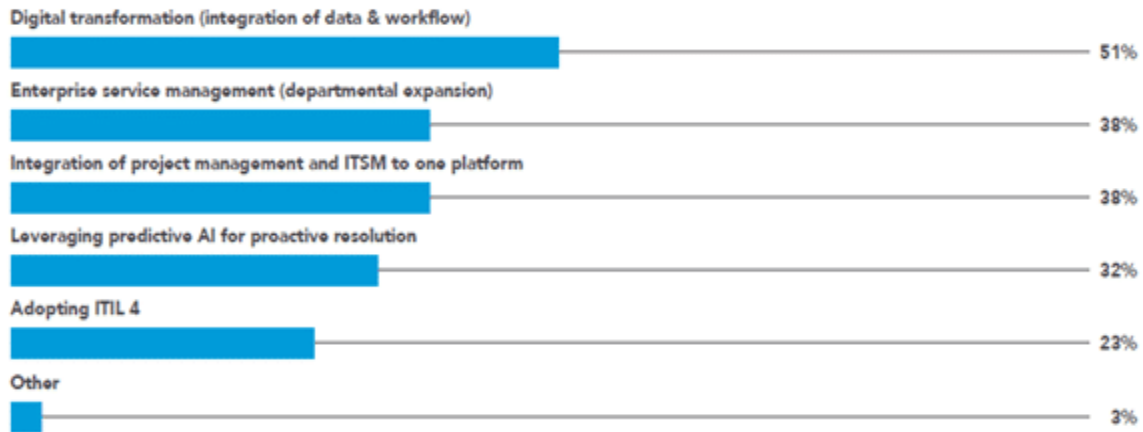


Figure 2. Hype Cycle for Emerging Technologies, 2024 (Gartner)

In a research study done by Informa tech survey back in 2022 to determine the top ITSM trends ServiceDesk IT professionals found critical in the next 1 to 2 years, the top issue was digital transformation with 51% of respondents and on AI, leveraging predictive AI for proactive resolution was selected by 32% of the respondents. Bearing in mind that AI is currently one of the drivers of digital transformation, this gives more reason why there needs to be more research on using AI to solve business challenges like digital transformation.

Which of the following ITSM top trends do you see as the most critical in the next 12 to 24 months?



Note: Multiple responses allowed
Data: Informa Tech survey of 146 help desk, ITSM, or ESM professionals, January 2022

Figure 3. ITSM top trends research Informa Tech 2022

This synergy between AI and business processes has fueled a change in thinking, allowing businesses to redefine their operational strategies, customer interactions, and value propositions, heralding a new era in digital transformation (Daly 2023).

3. Methodology

The reference research was designed as quantitative research that used data collection via an online survey based on Qualtrics software as a service (SaaS) solution giving it the flexibility to be entirely online. Research questions were in a questionnaire that was used to get feedback about the current state of CMDB adoption in ITIL implementations in New Jersey community colleges. The researcher's purpose was to determine factors that influence IT professionals in Community Colleges in the adoption of CMDB during their ITSM implementations. The basis of this paper is research question 2; What are the challenges faced by IT employees in NJ community colleges with their current ITSM infrastructure that CMDB adoption would resolve? (Dande & Lee 2020).

From the study, many respondents listed Achieving and demonstrating Return on Investment (ROI) at 34.81% as the main challenge in implementing the CMDB as part of the Configuration Management ITIL process amongst other challenges as shown below. The top four challenges that were identified included the following:

- a. Achieving and demonstrating a Return on Investment (ROI) of 34.81%
- b. Implementing continuous service Improvements 29%
- c. Integrating and aligning IT and business goals 26%
- d. Cloud migration 20%

4. Findings & Discussions

CMDB Generative AI Dependency

The promise of Generative AI application in everyday business challenges has resulted to increased automations effort, reduction of repetitive task that are done by IT professionals, and easier knowledge management practices by utilizing AI. Such benefits help address the main challenges identified in the research study as some of the benefits of AI translate to business processes effectiveness and efficiency.

AI can automate the discovery of IT assets and their configurations to keep the configuration management database (CMDB) up to date. It can also detect configuration anomalies related to security risks or operational inefficiencies. (Moshe 2024).

In investigating some of the available ITSM vendors with CMDB modules, the researchers picked a list of 5 vendors to include ServiceNow, Fresh service, and Ivanti based on a precious work by Dande, F., & Li, X. 2023, where a CMDB Selection Matrix Model (CSMM) to identify a suitable provider/vendor for the CMDB implementation was developed. Two additional vendors SolarWinds, and Device42 were picked based on researchers' own industry experience. The ITSM platforms of these five selected vendors were investigated to determine AI integration on the tool and how it addresses the challenges identified above from the research study.

ServiceNow: -

This ITSM vendor solution has the ability to provide Powerful visualization and reporting of data and ensure data consistency and integrity which both address the challenge of ROI that was observed by 34.81% of survey respondents. With the CMDB being a single source of truth, the ability to have vibrant reporting and visualization offered by ServiceNow befits the organization by delivering on a key investment goal. ServiceNow also can ingest third-party data confidently, which addresses the challenge of Integrating and aligning IT and business goals as observed by 26% of the survey respondents.

The common service data model (CSDM) is all about doing CMDB the right way. A CSDM is a centralized repository of standard and consistent sets of terms and their definitions (ServiceNow 2023). In their latest CSDM release, ServiceNow added AI as a core component as shown below.

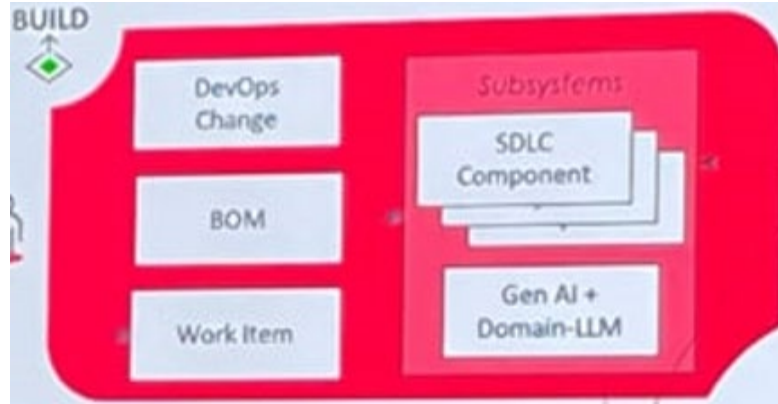


Figure 4. ServiceNow CSDM build domain: Generative AI (gen AI) and large language models (LLMs)

Fresh service: -

According to FreshService State of Workplace Technology 2023, 95% of IT professionals see the benefits of using generative AI to help complete work. Figure 5 below shows the Device screen of their AI tool capability. Even though just two features are highlighted for the sake of this publication, the configuration had 11 different options which included the Post Incident Report Generator that aligns with CMDB.



Figure 5. Fresh service configuration window showing the 11 different AI features.

SolarWinds: - Generative AI capability was limited and does not extend to the CMDB. As GenAI technology has been rapidly developing within the last 5 years. It is not surprising that SolarWinds AI capability only has two features as shown in the figure 6 below.

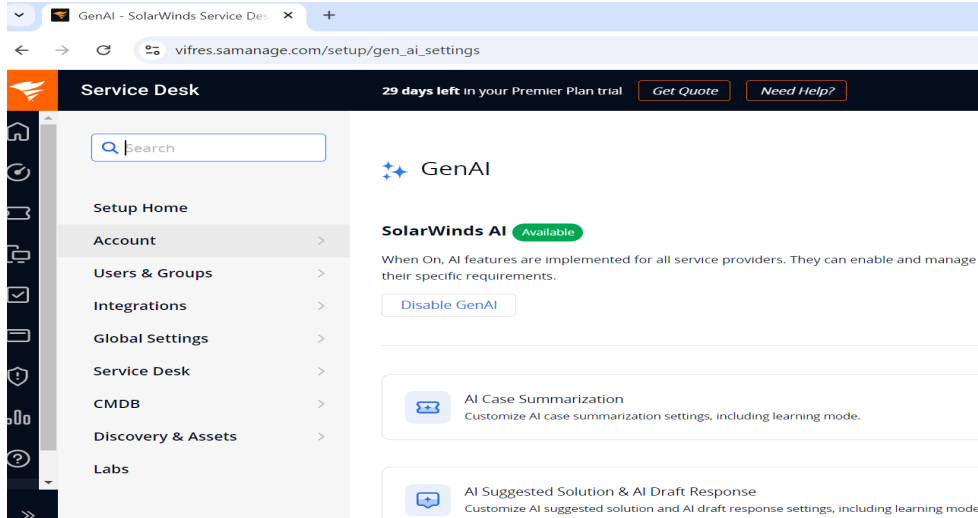


Figure 6. SolarWinds configuration screen shows the only 2 available ai features.

Ivanti: - Ivanti Neurons for Discovery delivers accurate and actionable asset information in minutes. Other features that address the CMDB challenges that are also AI-aligned include automated agent deployment, data cleansing for CMDB, and reconciliation insights. The Ivanti AI features are referred to as AL-guided ITSM as shown in Figure 7 below.



Figure 7. Ivanti's ITSM enterprise plan with AL.



Figure 8. The picture shows robust cloud CI discovery and a Pre-configured CMDB

Device 42: -

Device42’s CMDB provides a single source of truth within your organization. This gives you a clear view into your IT ecosystem to identify, manage, and verify all configuration items (CI) in your environment (Device42). One unique offering is that they have a robust cloud CI discovery and a Pre-configured CMDB as shown in Figure 8.

Additionally, Device42 Enrich AI uses artificial intelligence (AI) to consolidate, standardize, and enhance discovered configuration item (CI) data. By tackling the challenges of inconsistent and incomplete CI data, Enrich AI offers actionable insights that empower you to improve IT operations management (Device42). While researching the Artificial Intelligence integration in IT Service Management across five selected ITSM vendors based on a previous study that relied on Gartner’s magic quadrant research and Forrester wave research to identify ITSM vendors, ServiceNow, Fresh Service, SolarWinds, Ivanti, and Device42 were selected. An investigation was done to find out their CMDB solution offerings. Out of the 5 vendors, we were able to request Sandbox environments to log and review the details of the CMDB configuration on a live functional instance for ServiceNow, Fresh Service and SolarWinds. The table below shows the vendor list and Sandbox URL that we created for this research.

Table 2. Test Sandbox vendor names and URLs.

Vendor NAME	Test Sandbox URL
Fresh Service	https://njit.freshservice.com/a/admin/freddy-features
SolarWinds	https://vifres.samanage.com/setup/gen_ai_settings
ServiceNow	https://dev208004.service-now.com/

5. Conclusions

Gartner Research publication found out that more than half of CMDB efforts become unmanageable, due to a lack of business alignment, inappropriate scope, or inadequate process rigor Williams, R. & Gonzalez, K. (January 2017). These findings in summary are closely relevant to the 4 major CMDB implementation challenges from the results of our study which included, Achieving and demonstrating Return on Investment (ROI) 34.81%, Implementing continuous service Improvements 29%, Integrating and aligning IT and business goals 26%, and Cloud migration 20%.

In reviewing AI use across the 5 vendors listed above, we discovered that even though all the vendors have some IA integration in their ITSM solution, the AI solution in some most does not extend to the CMDB. We were not able to review live instance setting for Device42 and Ivanti and we relied on their documentation only to come up with the details.

Of the 5 vendors selected, only 40% have a strong CMDB AI integration as reviewed by ServiceNow instance and Device 42 documentation. Fresh Service solution had no mention of the CMDB even within they systems and their 11 AI functionalities were focused on other ITIL processes like change and Incident management. Ivanti’s offering was not conclusive as their documentation was also not comprehensive.

To realize the full potential of AI for CMDB process, more work still needs to be done. With AI being a new commercial technology it is fair to say that more integration of AL across all ITSM processes like change, incident and problem management are expected to happen. This will also drive AI integration within Configuration management process and the CMDB.

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Biographies

Fredrick Dande is an IT manager for a financial services company with vast ITSM experience. He has over 10 years' experience in IT within the financial services industry and is an expert in ITIL Service Delivery. Fredrick is certified Project Management Professional (PMP), ITIL V3 certified. He is a member of the Project Management Institute, and iTSMF USA (IT Service Management professional group). Fredrick earned a BSc in Engineering Technology, a MS in Management of Technology both from NJIT & an MBA from University of Massachusetts's Isenberg School of Management. He is currently pursuing a PhD in Management of Technology at Indiana State University with a research interest in Cloud computing, ITSM, Generative AI applications in ITSM and CMDB.

Dr. Xiaolong Li holds a Bachelor of Science Degree in Electronics and Master of Science Degree in Computer Engineering from Huazhong University of Science and Technology. He earned his doctorate in Computer Engineering from the University of Cincinnati.

Dr. Li began his teaching and research at the Morehead State University in 2006. He taught various courses in electronics and wireless communications. In 2008, Dr. Li joined the Indiana State University where he taught different electronics courses, such as C programming, digital electronics, computer networking, networking security, etc. Dr. Li's primary areas of research including modeling and performance analysis of MAC protocol, Internet of Things, Wireless Ad Hoc networks and sensor networks.

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Professor Shofoluwe has published in several academic refereed journals both nationally and at international level. He is an OSHA-authorized construction safety trainer, a BPI-Certified Building Analyst and a North Carolina State licensed general contractor. Professor Shofoluwe's teaching, and research interests include construction contracts administration, risk management, sustainable development and construction, construction safety, and construction management practices. Professor Shofoluwe can be reached at musibaus@ncat.edu.

Dr. Alister McLeod is a Professor and Chair of the Electronics and Computer Engineering Technology department, at Indiana State University. Dr. McLeod obtained his doctorate degree in Industrial Engineering Technology and his Master of Science degree in Electronics Engineering Technology from Purdue University. He is the Vice President of the Indiana Surface Mount Technology Association, a professional organization concerned with best practices during the population of printed circuit boards.

As a Fulbright Specialist, Dr. McLeod has worked on curriculum development in the domains of industrial automation and smart manufacturing around the world. In Uganda, Dr. McLeod created an Industrial Automation curriculum and explored how it could be sustained at Bugema University, given limited resources. Partnering with the International University of Bad Honnef, Germany he has worked on developing curriculum and content surrounding Industry 4.0.

His research interest surrounds the adoption of productivity improvement tools and techniques in small to medium size manufacturers. Of particular interest is the impact technology has on the social fabric of work environments and communities. Utilizing a sociotechnical framework, Dr. McLeod's research seeks answers as to how easily, state-of-the-art and novel, technologies can be adopted in production environments.