iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** IV **Month of publication:** April 2018

DOI: http://doi.org/10.22214/ijraset.2018.4505

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue IV, April 2018- Available at www.ijraset.com

Big Data Strategies for Management in Tertiary Sector

D. Rajendra Dev[1], Rita Roy[2]
[1,2]*Department of Computer Science and Engineering, Sanketika Institute of Technology and Management, Visakhapatnam, Andhra Pradesh, India*

Abstract: The popularity of Big Data and Analytics, its availability on the Cloud, and the ensuing value to individuals and businesses requires that Big Data be considered as a service. (Analytics as a Service (AaaS). The establishment, management, and development of Big Data and its services requires the embedding of analytics within integrated business processes coupled with established methodologies and applied end-to-end across the delivery cycle. Big Data services are set to become more complex as they ingest wide ranging data sources and varying data types (including unstructured); with delivery across jurisdictions; adopting extended supply chains; considerations of quality of data; and lengthened consumption chains as offerings are aggregated and repurposed. Additional impacts to services include audit, compliance, regulatory, and security issues. Based on business experimentation and industry examples, this paper explores Big Data services from a business perspective with a focus on the integrated end-to-end offering to realize customer focused business outcomes for customers of the service.

Keywords: bigdata, business, Agile methodology, ITIL framework, Analytics as a Service, cloud service

I. INTRODUCTION

Big Data and the related Analytics as a Service (AaaS) can be used for research purposes, or offered on a cost recovery basis within a large organization, or provided as a cloud service to small businesses on a pay per use model. Big Data is impacted by the laws of supply and demand. Big Data has regulatory and compliance obligations. Big Data is established using proven frameworks for project management and business analysis. Big Data is developed using methodologies like Agile. Big Data is managed using service frameworks such as ITIL. The development, establishment, management, operation, growth, and maturity of Big Data is the end-to-end ifecycle management of a service. To assure service delivery, proven business processes, management principles, and frameworks are applied end-to end to meet the needs of customers.

A. Big Data Service

1) *Service Support :* The day to day management of the service. This includes project management, operations (ITIL - reference),financial management, data source management, and vendor management
2) *Application Support :* The day to day development and management of Big Data applications (Agile – Unhelkar, B., 2013),including data source integration
3) *Service Improvement :* ongoing revision and improvement of the service. Includes process management, continuous improvement, training, change management (ADKAR), and business integration.
4) *Service Development :* The development of the service and new products, growth of markets, strategy, emergent technologies.

Figure 1. Elements of a Big Data Service.

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B. Why Big Data And The Service

A recurring theme within Big Data should be why Big Data and what is the service? Whilst there will always be an aspect of "build it and they will come", successful Big Data based business processes exist to meet specific needs. A carefully construed strategic approach to Big data adoption is a must for its success and for risk reduction in businesses.

The range of principal business functions and methodologies required for Big Data services. Example standards that may apply within areas of Big Data include:

1) Technology Management - COBIT v5
2) Operations / Service Management – ITIL Architecture – TOGAF or Zachman\
3) IT Governance – ISO 38500
4) ITG Governance Framework – ITG
5) Security – ISO 2700
6) Risk Management – ISO 3100

Figure 2. Methodologies within Big Data service.

C. Project Management

Many of the activities in establishing and managing Big Data services are a series of projects (programs) managed to existing project (program) management methodologies.

D. Vendor Management

The aggregation of information from different systems requires data feeds from different systems that may be managed by different vendors. New service contracts implemented or revisions to existing service contracts.

E. Development Using Composite Agile Method And Strategy

Application development can be managed using agile based methodologies. For other aspects of the service, development follows a range of methodologies according to what is being developed. Examples for development include:

1) *Networks* – Standard change control for changes to production and other networks, e.g. firewall rule changes
2) *Servers* – Implemented with methodology for automation and Dev/Ops model (Dev/Ops is the model where by virtual machines with operating system, database, applications, load balancers and virtual firewalls are automatically created and destroyed) or the traditional change control of physical infrastructure. Applies for production, development, testing, training, and recovery environments.
3) *Operating Systems* – The installation of the operating system onto the server for respective environments. Alignment with organizational standard Operating Environments (SOE).
4) *Compute* – The installation of supporting applications within the SOE, e.g. alert and monitoring tools. These tools were integrated into existing services and support.
5) *Databases* – The installation of the required databases for data aggregation, matching, and calculation.

F. Development May also be Required For

1) *Request Management* – Processes for request management.
2) *Testing*– Processes for testing all aspects of the solution (application, infrastructure, or operational support for a new service).

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3) *Incident Management* – Integration of new service and infrastructure into existing Incident Management processes.
4) *Service Desk* – Changes to service desk processes and tools to support new customers and new applications.
5) *Operational Support* – Changes to operational support models to support a new application and service.
6) *Business Change* – Development of the business change to support the service.

II. CONTINUOUS TESTING

In the implementation of a Big Data service within a financial services organization, an extensive User Acceptance Testing regime, with extensive documentation for regulators was required. In addition, the testing of service and support processes, end-to-end integrated testing with vendors was required for audit and compliance purposes as well as for routine business operations

A. *Testing can be extensive. As with the Standing up of any new*

service, testing requires:

1) *Test Strategy* – An integrated end-to-end test strategy. This may include:
2) Functional Testing
3) Load Testing.
4) Performance Testing.
5) Penetration Testing.
6) Data matching and calculation testing.
7) Accessibility Testing.
8) Usability Testing.
9) Business Continuity Testing.
10) Security Testing.
11) Privacy Testing.
12) Process Testing.
13) Financial Testing.
14) User Acceptance Testing.
15) Operational Acceptance Testing

III. SERVICE SUPPORT USING ITIL

The ITIL framework is part of ICT service delivery in many organizations, Figure 3. Related to the areas of ITIL are the organization and service specific policies, standards, and procedures required, and then the specific work instructions or request. Even with the use of virtual machines, virtual load balancers, automation and the use of Dev/Ops models, ITIL is a cornerstone of Big Data service management.

Figure 3. ITIL Framework.

A. *Service Desk*

Any Big Data services will require the skilling and use of a service desk. From technical support, to account queries, to billing queries, to incident management, to feedback, and general point of escalation around the service; a service desk function is required. The processes around the services need to be implemented and/or revised, staff skilled, knowledge bases updated, and Service Level Agreements (SLA) or Operational Level Agreements (OLA) applied. Where service desks are outsourced, vendor management comes is also required.

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B. Configuration Management

The following need to be tracked and utilized in the service provision: network assets, servers, software, databases, licensing, location details, operating systems, and other core configuration management. Both traditional infrastructure management and Dev/Ops based operations require some level of Configuration Management.

C. Incident Management

The provision of news products and services often sees changes to be made to incident ticketing systems. Existing Incident Management processes are revised to support the service or new Incident Management processes are established. The compliance and regulatory issues from incidents can be complex for Big Data because of the different data supply chains and the business impacts as businesses become more reliant on Big Data

D. Problem Management

Similar to Incident Management, is Problem Management . All aspects of the problem management process are revised or implemented to support the Big Data service.

E. Change Management

Change Management is still required. Application integration, data feed management, and supplying data to supporting operations all required some level of Change Management. variations to existing Change Management processes are to be applied to support a new service. Again, the similar themes of training, refresher training, process review, vendor management, knowledge
bases, updated, and SLA and OLA applied.

F. Release Management

Managing the releases of upgrades and version control, apply to the applications, supporting software, servers, operating systems, databases, and the data sources.

G. Availability Management

Managing the availability of the service is part of the service offering. These OLAs and SLAs may be required for the supporting network and related infrastructure provision, as well as for data
provisioning and other dependencies for the management of the service.

H. Capacity Management

This covers the supporting infrastructure and networks, the related servers, and the capacity of data sources to support the expected demands. The complexity of Capacity Management depends upon factors including the nature of the service offered, public cloud vs. private cloud, in-house vs. vendor management.

I. Service Continuity Management

Disaster Recovery and Business Continuity are part of the service to assure delivery. This part of an overall resilience approach to service delivery. With more Big Data being delivered by Dev/Ops and with greater automation. Assurance of service continuity from suppliers of data in the
Big Data supply chain is also required.

J. Service Level Management

The overall governance and management of the service is a key function that is often overlooked or is just assumed to occur.

Key elements include:

1) *Service Definition* – A clear and easily measurable definition of the service. This includes the overall offering, the components of the services, and addresses support, operations, and technical solution

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2) *Governance* – Steering Committee to implement programs of work, a Service Review Committee is tasked with the assurance and maturity of service offerings requires a similar function. Responsible for the overall provision of the service, a requirement to cut across impacted areas to ensure delivery exists
3) *Service Performance* - This includes SLAs, OLAs, and vendor agreements.
4) Service Lifecycle -
5) Service changes.
6) Operational improvement (Continuous Service Improvement).
7) Identification of value-adding services for establishment.
8) *Service Team* – The Service Team is responsible for ensuring delivery from dependencies and other parties for service assurance.

K. Financial Management

The financial component of a Big Data service can have several areas to address:

1) *Pay per Use* – The charging for the consumption of Big Data services on a pay per use model. Whether this is external charges or internal recoveries, this pay per use model encompasses the full cost of service provision and management
2) *Service Costing* – This enables effective inventory management which can be used for resource management, capacity management, and identification of efficiencies
3) *Consumption Tracking* – Solutions for Consumption Tracking linked to billing often need to be established. The processes and operations around Consumption Tracking with the required OLAs

and SLAs, vendor agreements, knowledge bases, training, and retraining are required.

Security, Compliance, Audit, Risk

There are risks in the provision of Big Data services, especially from the extended supply chains and in provision to the lengthened consumption chains. Risk is also prevalent in aggregated services and the re-provisioning of Big Data in derived products. Security considerations, from cyber-attack to user permissions, to encrypted transfer and role based access, is an extensive topic within Big Data. Security, Compliance, Audit, and Risk are significant requirement of Big Data services.

IV. SERVICE MANAGEMENT

A. Request Management

Managing a Big Data service requires the management of Requests. The existing Request Management processes to be revised to support a new service or processes and operations are established.

1) *Accounts and Permissions* – Request for new accounts, closed accounts, and permission changes
2) *Projects* – Development that requires complex management, multiple stakeholder engagement,

and taking typically more than 5-business days of work.

Enhancements – Enhancements are mainly released as part of a planned cycle but may be released out of cycle.

Defects – Defects are mainly released as part of a planned cycle but may be released out of cycle. Defects are mainly managed as Incidents.

Use of proven ticket management life cycles with roles and responsibilities, validation, response times, statements of work, minimum information sets, and related financial management; is all

Part of a Big Data service.

B. Application Management

1) *SSL Certificate Management* – Processes for tracking SSL certificate details and review an
2) *Log Files* – Capturing, storage, management, and analysis of the required log files for service assurance.
3) *Database Management* – This includes the account management, permissions management, database indexing, and log file management.
4) *Testing* – The importance of an integrated test strategy and overall approach, with the required Functional Testing, User Acceptance Testing (UAT), Penetration Testing, Accessibility Testing, Load Testing, and Operational Acceptance Testing (OAT).

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C. Customer Management

The growth and development of a Big Data service is about servicing the needs of customers. Established business practices around sales, solution selling, marketing, branding, customer relationship management, account management, service support, and customer retention apply.

V. SERVICE DEVELOPMENT AND AGILE

The rapid changes in Big Data technology and the resulting impacts on services and products places a premium on the service being agile and the delivery of minimal viable products.

A. Self Service vs Managed Service

The type of service offered impacts upon the support and costs. The type of service may vary over time and a mixed approach may be required. The two main types are:

1) *Self Service* – Self Service is often popular with more technologically experienced and those who consume the service as a major part of their job.
2) *Managed Service* – Managed Service is often popular with those who just want a valued added product for decision making and do not have the time for Self Service.

As Big Data grows in maturity and the data analytics capacities and capabilities increase, more of the value-added analysis will be automated. This is especially the case where data are automatically analyzed as part of artificial intelligence, i.e. many Big Data services provided will be used by computers rather than people directly.

B. Capacity and Capability Building

1) *Capability* – The skilling, training, and communication of Big Data to those managing the service and those consuming the service.
2) *Capacity* – This applies to those managing the service as well as those consuming the Big Data services.

C. Business Integration

The success and uptake of Big Data services depends upon the business integration. The business integration is for both the managers of the service so that an assured service is provided as well as the consumers of Big Data so that they can realize the benefits and consume an assure service.

D. Market Development

The market development for Big Data services is seen in two main areas:

Assurance delivery of service for existing products and the emergence of new products with supporting services.

The existing business practices and principles for market development are part of a Big Data service.

VI. CONCLUSION

Big Data services are set to become more complex with more data sources and more data types (including unstructured) being used; with delivery across jurisdictions; adopting extended supply chains; and lengthened consumption chains as offerings are aggregated and repurposed. The proven business practices to grow and leverage Big Data can be applied to move Big Data from

routine application of datasets to existing operational areas to real time decision making and artificial intelligence consumption of Big Data services.

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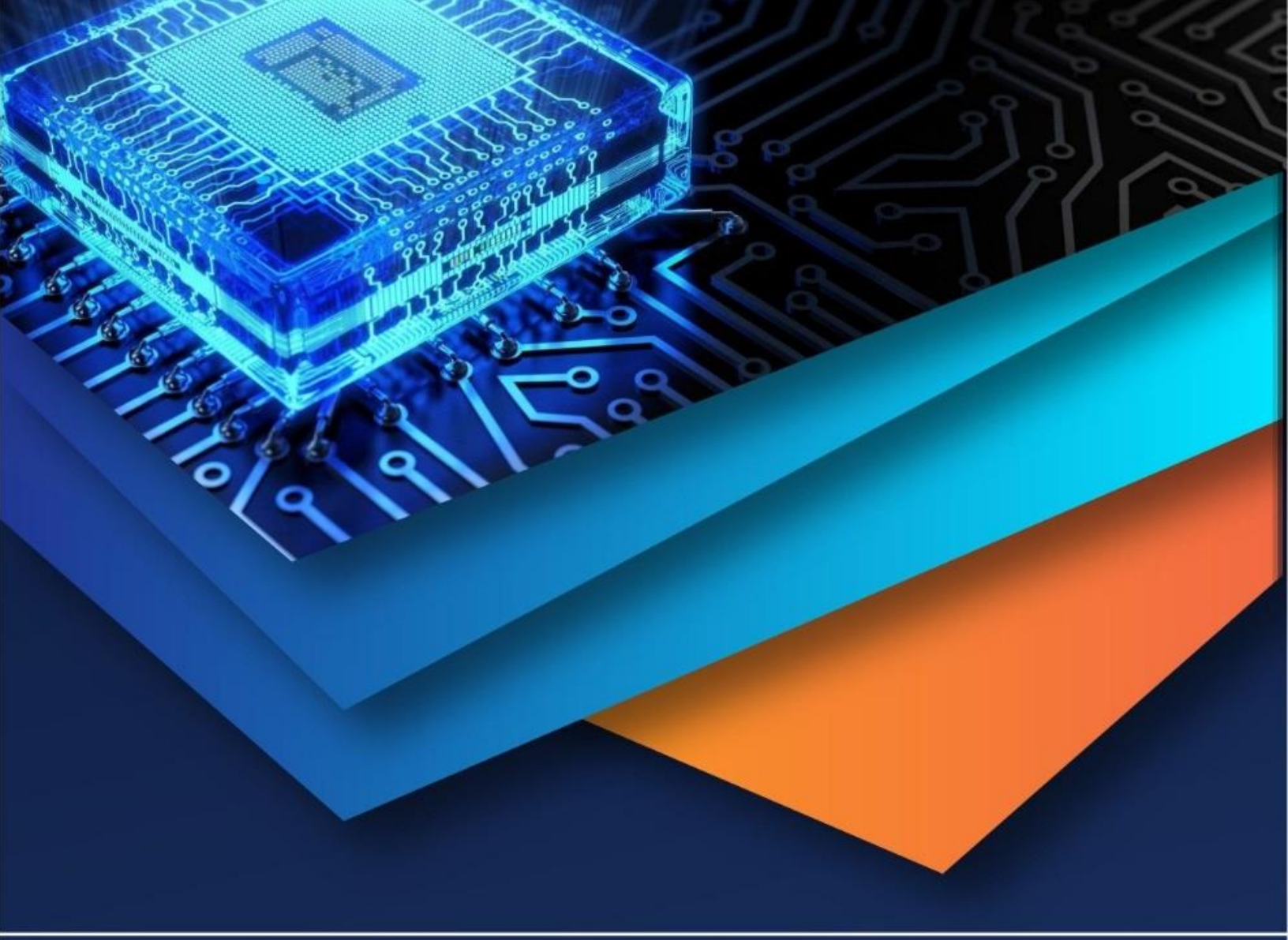

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