KSR INSTITUTE FOR ENGINEERING AND TECHNOLOGY

TIRUCHENGODE -637 215.

DEPARTMENT OF INFORMATION TECHNOLOGY

VOLUME 3
ISSUE 1

August 2015

DIGITIMES

Cloud Computing and Big data

KSR INSTITUTE FOR ENGINEERING AND TECHNOLOGY

Vision

To become a globally recognized Institution in Engineering Education, Research and Entrepreneurship.

Mission

M1	Accomplish quality education through improved teaching learning process
M2	Enrich technical skills with state of the art laboratories and facilities
M3	Enhance research and entrepreneurship activities to meet the industrial and societal needs

DEPARTMENT OF INFORMATION TECHNOLOGY

Vision

To produce competent Information Technology Professionals and Entrepreneurs with ethical values to meet the global challenges.

Mission

MD1	Impart quality education with ethical values in Information Technology through improved teaching learning process
MD2	Provide an ambient learning environment using state of the art laboratories and facilities
MD3	Encourage research and entrepreneurship activities to meet the dynamic needs of Information Technology industry and society

Program Educational Objectives (PEOs)

PEO	Key Words	Description
PEO 1	**Core Competency**	Graduates will be successful professionals in career by applying the knowledge of mathematics, science and engineering with appropriate techniques and modern tools.
PEO 2	**Professionalism**	Graduate will exhibit soft skills, professional and ethical values and thrust for continuous learning to maintain professionalism in the IT industries.
PEO 3	**Higher Studies and Entrepreneurship**	Graduates will engage in higher studies and outshine as entrepreneurs through life-long learning which leads to societal benefits.

DIGITIMES

Editorial

We would like to wholeheartedly thank our honorable Chairman, **Lion.Dr.K.S.Rangasamy** and vice chairman **Mr.R.Srinivasan**, and Principal **Dr.M.Venkatesan** for their continuous encouragement and constant support for bringing out the magazine. We profoundly thank our Head of the Department **Dr.P.Meenakshi Devi** for encouraging and motivating us to lead the magazine a successful one right from the beginning. DIGITIMES serves as a platform for updating and enhancing upcoming technologies in Information Technology. We are also grateful to all the contributors and faculty coordinator to bring this magazine.

By,

Editorial Board

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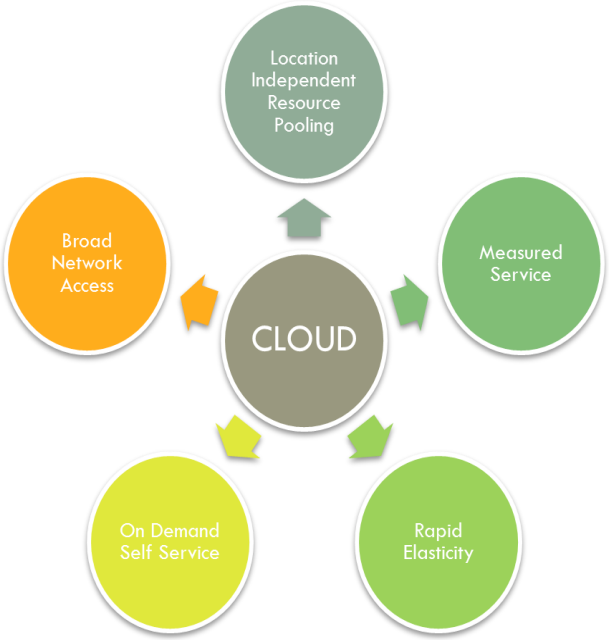
INTRODUCTION TO CLOUD COMPUTING

- **Cloud computing** means storing and accessing data and programs over the Internet instead of our computer's hard drive. The **cloud** is just a metaphor for the Internet.
- The cloud is also not about having a dedicated network attached storage (NAS) hardware or server in residence.
- For it to be considered "cloud computing," you need to access your data or your programs over the Internet, or at the very least, have that data synced with other information over the Web.

CLOUD CHARACTERISTICS



- **On-demand self-service**: Cloud services provide computer resources such as storage and processing as needed and without any human intervention.

- **Broad network access**: Cloud computing resources are accessible over the network , mobile and smart devices even sensors can access computing resources on the cloud.

- **Resource Pooling**: Cloud platform users share a vast array of computing resources; users can determine the nature of resources and the geographic location they prefer but cannot determine the exact physical location of these resources.

- **Rapid Elasticity**: Resources from storage media, network, processing units and applications are always available and can be increased or decreased in an almost instantaneous fashion, allowing for high scalability to ensure optimal use of resources.

BY
DHARANI PREETHI R IV Year/IT

CLOUD TYPES

Based a cloud location, we can classify cloud as:

Public Cloud

When we talk about public cloud, we mean that the whole computing infrastructure is located on the premises of a cloud computing company that offers the cloud service. The location remains, thus, separate from the customer and he has no physical control over the infrastructure.

Private cloud

It means using a cloud infrastructure (network) solely by one customer/organization. It is not shared with others, yet it is remotely located. If the cloud is externally hosted. The companies have an option of choosing an on-premise private cloud as well, which is more expensive, but they do have a physical control over the infrastructure.

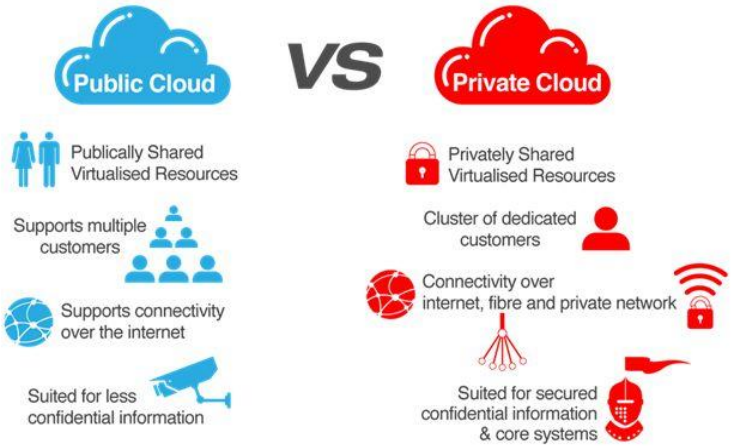
Hybrid cloud

It means, using both private and public clouds, depending on their purpose.

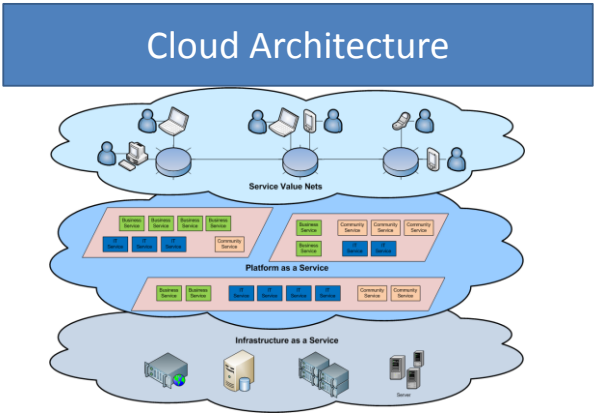
Community cloud

It implies an infrastructure that is shared between organizations, usually with the shared data and data management concerns. For

example, a community cloud can belong to a government of a single country. Community clouds can be located both on and off the premises.



BY
SANGAVI R IV Year/IT



CLOUD SERVICE MODELS

Infrastructure-as-a-Service

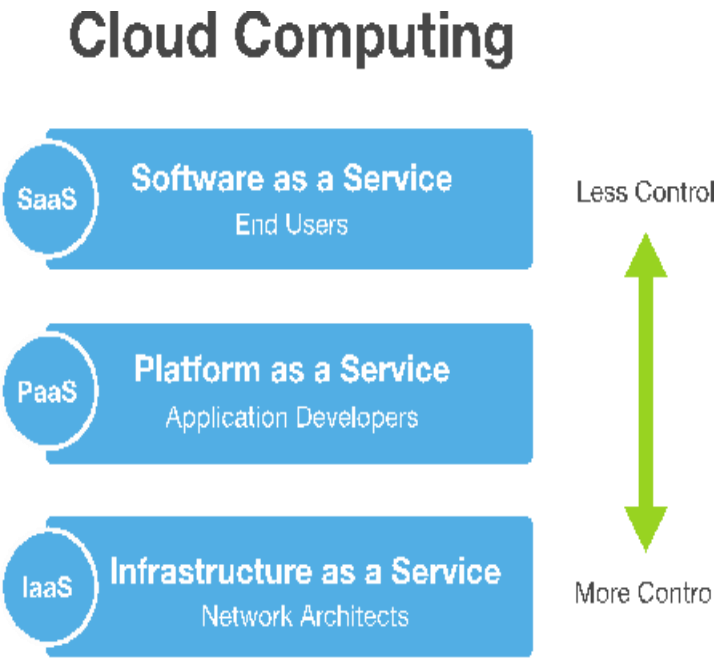
The most common cloud service is that one offering data storage disks and virtual servers, i.e. infrastructure. Examples of Infrastructure-as-a-Service (IaaS) companies are Amazon, Rackspace, Flexiscale.

Platform-as-a-Service

If the cloud offers a development platform, and this includes operating system, programming language execution environment, database, and web server, the model is known as Platform-as-a-Service (PaaS), examples of which are Google App Engine, Microsoft Azure, Salesforce. Operating system can be frequently upgraded and developed with PaaS, services can be obtained from diverse sources, and programming can be worked in teams (geographically distributed).

Software-as-a-Service

Software-as-a-Service (SaaS), finally, means that users can access various software applications on a pay-per-use basis. As opposed to buying licensed programs,



"I don't need a hard disk in my computer if I can get to the server faster… carrying around these non-connected computers is byzantine by comparison." ~

Steve Jobs, Co-founder, CEO and Chairman of Apple Inc

BY
MEPHYMONY, II Year/IT

CLOUD VENDORS

AMAZON WEB SERVICES

Amazon Web Services (AWS) is a comprehensive, evolving cloud computing platform provided by Amazon. It provides a mix of infrastructure as a service (IaaS), platform as a service (PaaS) and packaged software as a service (SaaS) offerings.

Compute:

Amazon Elastic Compute Cloud (EC2) provides virtual servers -- called instances -- for compute capacity. The EC2 service offers dozens of instance types with varying capacities and sizes, tailored to specific workload types and applications, such as memory-intensive and accelerated-computing jobs. AWS also provides an Auto Scaling tool to dynamically scale capacity to maintain instance health and performance.

Storage

Amazon Simple Storage Service (S3) provides scalable object storage for data backup, archival and analytics. An IT professional stores data and files as S3 objects -- which can range up to 5 GB -- inside S3 buckets to keep them organized. A business can save money with S3 through its Infrequent Access storage tier or use Amazon Glacier for long-term cold storage.

Databases, data management

AWS provides managed database services through its Amazon Relational Database Service, which includes options for Oracle, SQL Server, PostgreSQL, MySQL, MariaDB and a proprietary high-performance database called Amazon Aurora. AWS offers managed NoSQL databases through Amazon DynamoDB.

Migration, hybrid cloud

AWS includes various tools and services designed to help users migrate applications, databases, servers and data onto its public cloud. The AWS Migration Hub provides a location to monitor and manage migrations from on premises to the cloud. Once in the cloud, EC2 Systems Manager helps an IT team configure on-premises servers and AWS instances.

Networking

An Amazon Virtual Private Cloud (VPC) gives an administrator control over a virtual network to use an isolated section of the AWS cloud. AWS automatically provisions new resources within a VPC for extra protection.

Admins can balance network traffic with AWS load balancing tools, including Application Load Balancer and Network Load Balancer.

IBM Cloud

IBM Cloud is a suite of cloud computing services from IBM that offers both platform as a service (PaaS) and infrastructure as a service (IaaS).

- With IBM Cloud IaaS, organizations can deploy and access virtualized IT resources -- such as compute power, storage and networking -- over the internet. For compute, organizations can choose between bare-metal or virtual servers.
- With IBM Cloud PaaS -- which is based on the open source cloud platform Cloud Foundry -- developers can use IBM

services to create, manage, run and deploy various types of applications for the public cloud, as well as for local or on-premises environments. IBM Cloud supports various programming languages, such as Java, Node.js, PHP and Python and extends to support other languages.

- Compute -- Offers various compute resources, including bare-metal servers, virtual servers, serverless computing and containers, on which enterprises can host their workloads;

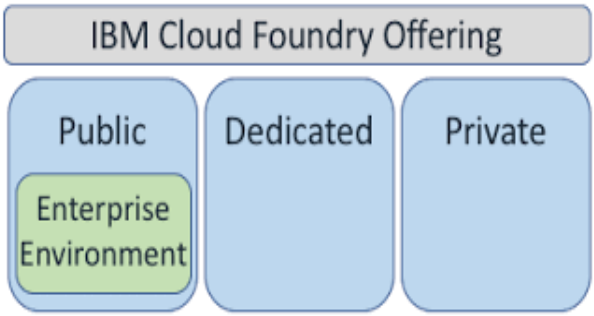
- Network -- Provides cloud networking services, such as a load balancer, a content delivery network (CDN), virtual private network (VPN) tunnels and firewalls;
- Storage -- Offers object, block and file storage for cloud data;
- Management -- Provides tools to manage and monitor cloud deployments, such as those for log analysis, automation and Infrastructure as Code (IaC);
- Security -- Includes services for activity tracking, identity and access management and authentication;
- Data management -- Provides SQL and NoSQL databases, as well as data querying and migration tools;
- Analytics -- Offers data science tools such as Apache Spark, Apache Hadoop and IBM Watson Machine Learning, as well as analytics services for streaming data;

IBM Cloud deployment models

Public: A public cloud that provides access to virtual servers in a multi-tenant environment. An enterprise can choose to deploy its applications in one or multiple geographical regions.

Dedicated: A single-tenant private cloud that IBM hosts in one of its data centers. An enterprise can connect to the environment using a direct network connection or virtual private network (VPN), and IBM manages the platform.

IBM Cloud Private: A version of the IBM platform that an organization deploys as a private cloud in its own data center behind a firewall.



BY

Godson Vince Alex II Year/IT

CLOUD REAL TIME APPLICATIONS

Scalable Usage:

Cloud computing offers scalable resources through various subscription models. This means that you will only need to pay for the computing resources you use. This helps in managing spikes in demands without the need to permanently invest in computer hardware.

Netflix, for instance, leverages this potential of cloud computing to its advantage. Due to its on-demand streaming service, it faces large surges in server load at peak times. The move to migrate from in-house data centres to cloud allowed the company to significantly expand its customer base without having to invest in setup and maintenance of costly infrastructure.

Chatbots:

The expanded computing power and capacity of the cloud enables us to store information about user preferences. This can be used to provide customized solutions, messages and products based on the behaviour and preferences of users.

Communication:

The cloud allows users to enjoy network-based access to communication tools like emails and calendars.

Most of the messaging and calling apps like Skype and WhatsApp are also based on cloud infrastructure. All your messages and information are stored on the service provider's hardware rather than on your personal device. This allows you access your information from anywhere via the internet.Office tools like Microsoft Office 365 and Google Docs

Application development:

Whether you are developing an application for web or mobile or even games, cloud platforms prove to be a reliable solution. Using cloud, you can easily create scalable cross-platform experiences for your users

.

These platforms include many pre-coded tools and libraries — like directory services, search and security. This can speed up and simplify the development process**.** Amazon Lumberyard is a popular mobile game development tool used in the cloud.

Big data analytics:

Cloud computing enables data scientists to tap into any organizational data to analyze it for patterns and insights, find correlations make predictions, forecast future crisis and help in data backed decision making. Cloud services make mining massive amounts of data possible by providing higher processing power and sophisticated tools. There are many open source big data tools that are based on the cloud for instance Hadoop, Cassandra, HPCC etc. Without the cloud, it won't be very difficult to collect and analyze data in real time, especially for small companies.

BY
SAMPATHKUMAR, III Year/IT

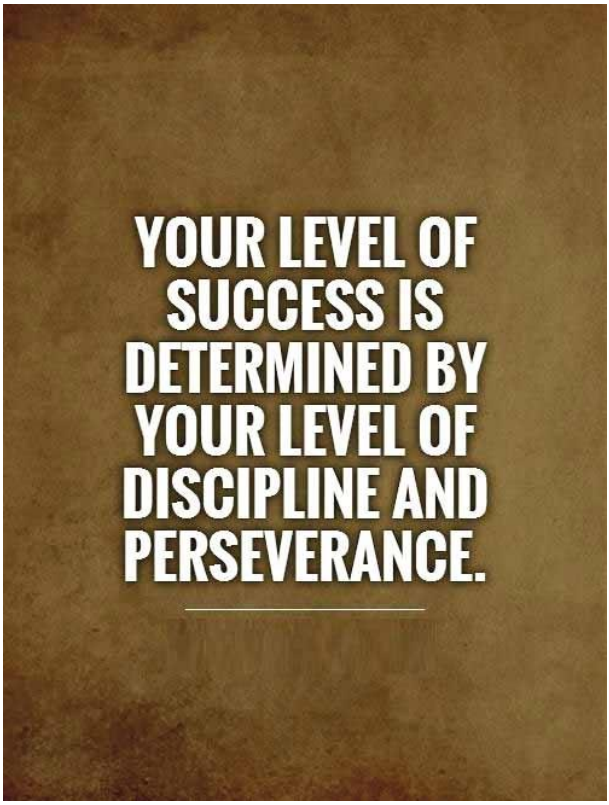
PROS AND CONS OF CLOUD COMPUTING

PROS

- Lower-Cost Computers for Users
- Improved Performance
- Lower IT Infrastructure Costs
- Fewer Maintenance Issues
- Lower Software Costs
- Instant Software Updates
- Increased Computing Power
- Unlimited Storage Capacity
- Increased Data Safety
- Improved Compatibility B/w OS
- Easier Group Collaboration
- Universal Access to Documents
- Latest Version Availability
- Removes the Tether to Specific Devices

Cons

- Downtime
- security and privacy
- vulnerability to attack
- Limited control and flexibility
- Cloud Computing platform dependencies
- Cloud Computing costs



BY
GOWTHAM T III Year/IT

BIG DATA

'Big Data' is also a data but with **a** huge size. 'Big Data' is a term used to describe collection of data that is huge in size and yet growing exponentially with time.

In short, such a data is so large and complex that none of the traditional data management tools are able to store it or process it efficiently.

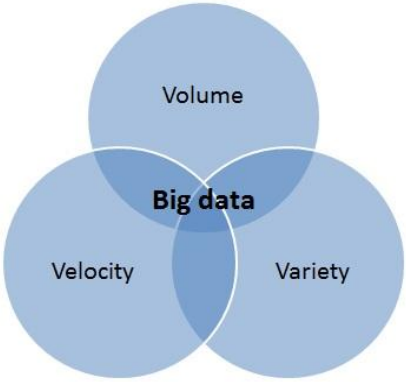
Big Data" is the data whose scale, diversity, and complexity require new architecture, techniques, algorithms, and analytics to manage it and extract value and hidden knowledge from it…

BY
MANICKAVEL V III Year/IT

Three Characteristics of Big Data V3S

Volume Velocity Variety

(• Data quantity • Data Speed • Data Types)\



1.Big Data Volume

- A typical PC might have had 10 gigabytes of storage in 2000.
- Today, Facebook ingests 500 terabytes of new data every day. Boeing 737 will generate 240 terabytes of flight data during a single flight across the US.
- The smart phones, the data they create and consume; sensors embedded into everyday objects will soon result in billions of new, constantly-updated data feeds containing environmental, location, and other information, including video.

2.Big Data Velocity

- Clickstreams and ad impressions capture user behavior at millions of events per second
- high-frequency stock trading algorithms reflect market changes within microseconds
- machine to machine processes exchange data between billions of devices
- infrastructure and sensors generate massive log data in realtime
- on-line gaming systems support millions of concurrent users, each producing multiple inputs per second.

3.Big Data Variety

• Big Data isn't just numbers, dates, and strings. Big Data is also geospatial data, 3D data, audio and video, and unstructured text, including log files and social media.

• Traditional database systems were designed to address smaller volumes of structured data, fewer updates or a predictable, consistent data structure.

• Big Data analysis includes different types of data

BY
RUBA M IV YEAR/IT

Types of Data

Big data' could be found in three forms:

1. **Structured**
2. **Unstructured**
3. **Semi-structured**

Structured

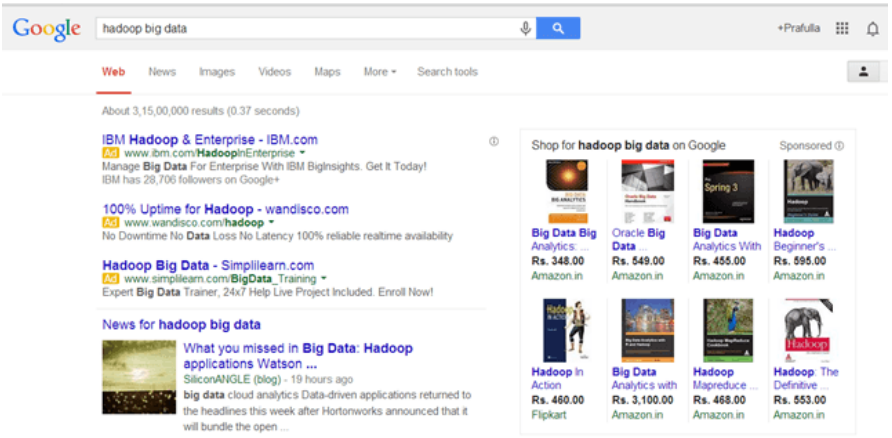
Any data that can be stored, accessed and processed in the form of fixed format is termed as a 'structured' data. Over the period of time, talent in computer science have achieved greater success in developing techniques for working with such kind of data (where the format is well known in advance) and also deriving value out of it.

Do you know?

Data stored in a relational database management system is one example of a **'structured'** data.

Unstructured

Any data with unknown form or the structure is classified as unstructured data. In addition to the size being huge, un-structured



data poses multiple challenges in terms of its processing for deriving value out of it. Typical example of unstructured data is, a heterogeneous data source containing a combination of simple text files, images, videos etc.

Semi-structured

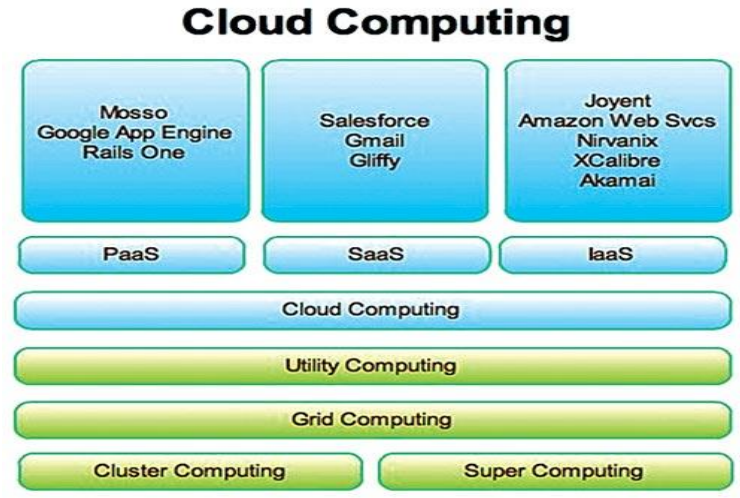
Semi-structured data can contain both the forms of data. We can see semi-structured data as a strcutured in form but it is actually not defined with e.g. a table definition in relational DBMS. Example of semi-structured data is a data represented in XML file.

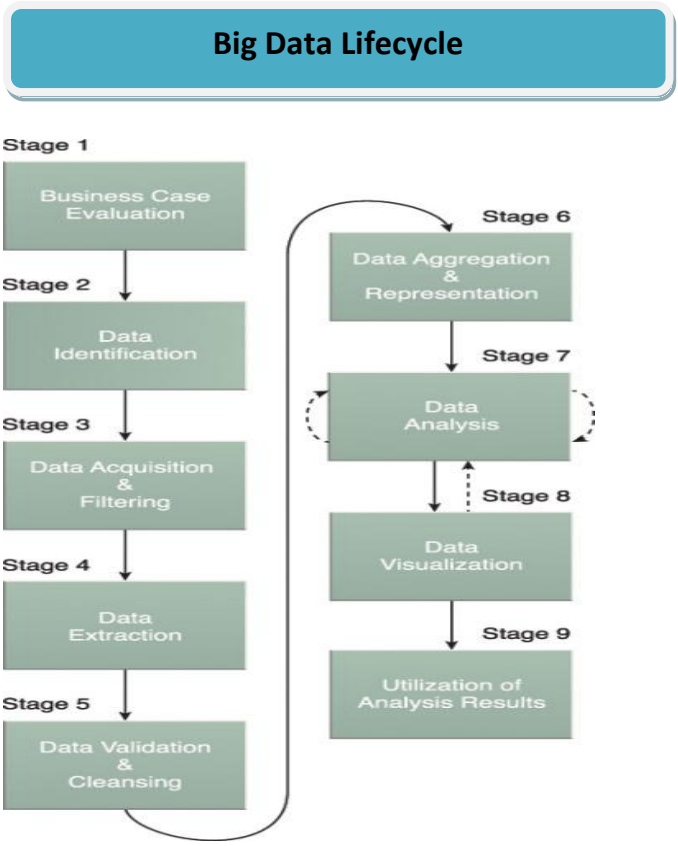
Examples Of Semi-structured Data

Personal data stored in a XML file-

<rec><name>Prashant
Rao</name><sex>Male</sex><age>35</age></rec>
<rec><name>Seema
R.</name><sex>Female</sex><age>41</age></rec>
<rec><name>Satish
Mane</name><sex>Male</sex><age>29</age></rec>
<rec><name>Subrato
Roy</name><sex>Male</sex><age>26</age></rec>
<rec><name>Jeremiah
J.</name><sex>Male</sex><age>35</age></rec>

BY
SAMPATH KUMAR S III Year/IT





1. Business Case Evaluation

The beginning of the Big Data Lifecycle starts with a sound evaluation of the business case. Before any Big Data project can be started, it needs to be clear what the business objectives and results of the data analysis should be. Begin with the end in mind and clearly define the objectives and desired results of the project. Many different forms of data analysis could be conducted, but what exactly is the

reason for investing time and effort in data analysis? As with any good business case, the proposal should be backed up by financial data.

2. Data Identification

The Data Identification stage determines the origin of data. Before data can be analysed, it is important to know what the sources of the data will be. Especially if data is procured from external suppliers, it is necessary to clearly identify what the original source of the data is and how reliable (frequently referred to as the veracity of the data) the dataset is. The second stage of the Big Data Lifecycle is very important, because if the input data is unreliable, the output data will also definitely be unreliable.

3. Data Acquisition and Filtering

The Data Acquisition and Filtering Phase builds upon the previous stage op the Big Data Lifecycle. In this stage, the data is gathered from different sources, both from within the company and outside of the company. After the acquisition, a first step of filtering is conducted to filter out corrupt data. Additionally, data that is not necessary for the analysis will be filtered out as well. The filtering step will be applied on each data source individually, so before the data is aggregated into the data warehouse.

4. Data Extraction

Some of the data identified in the two previous stages may be incompatible with the Big Data tool that will perform the actual analysis. In order to deal with this problem, the Data Extraction stage is dedicated to extracting different data formats from data sets (e.g. the data source) and transforming these into a format the Big Data tool is able to process and analyse. The complexity of the transformation and the extent in which is necessary to transform data is greatly dependent on the Big Data tool that has been selected. Most 'modern' Big Data tools can read industry standard data data formats of relational and non-relational data.

5. Data Validation and Cleansing

Data that is invalid leads to invalid results. In order to ensure only the appropriate data is analysed, the Data Validation and Cleansing stage of the Big Data Lifecycle is required. During this stage, data is validated against a set of predetermined conditions and rules in order to ensure the data is not corrupt. An example of a validation rule would be to exclude all persons that are older than 100 years old, since it is very unlikely that data about these persons would be correct due to physical constraints.

6. Data Aggregation and Representation

Data may be spread across multiple datasets, requiring that dataset be joined together to conduct the actual analysis. In order to ensure only the correct data will be analysed in the next stage, it might be necessary to integrate multiple datasets. The Data Aggregation and Representation stage is dedicated to integrate multiple datasets to arrive at a unified view. Additionally, data aggregation will greatly speed up the analysis process of the Big Data tool, because the tool will not be required to join different tables from different datasets, greatly speeding up the process.

7. Data Analysis

The Data Analysis stage of the Big Data Lifecycle stage is dedicated to carrying out the actual analysis task. It runs the code or algorithm that makes the calculations that will lead to the actual result. Data Analysis can be simple or really complex, depending on the required analysis type. In this stage the 'actual value' of the Big Data project will be generated. If all previous stages have been executed carefully, the results will be factual and correct.

8. Data Visualization

The ability to analyse massive amounts of data and find useful insight is one thing, communicating the results in a way that everybody can

understand is something completely different. The Data visualization stage is dedicated to to using data visualization techniques and tools to graphically communicate the analysis results for effective interpretation by business users. Frequently this requires plotting data points in charts, graphs or heat maps.

9. Utilisation of Analysis Results

After the data analysis has been performed an the result have been presented, the final step of the Big Data Lifecycle is to use the results in practice. The Utilisation of Analysis results is dedicated to determining how and where the processed data can be further utilised to leverage the result of the Big Data Project

"Processed data is information. Processed information is knowledge Processed knowledge is Wisdom."

Ankala V. Subbarao

BY

KARTHIGA S IV YEAR/IT

Tools used in Big Data Scenarios

BigData Cluster	Big Data Tools
NoSQL:	• CouchDB, DatabasesMongoDB, Cassandra, Redis, ZooKeeper, Hbase
MapReduce:	• Hadoop, Hive, Pig, Cascading, Oozie, Kafka, S4, MapR, Flume
Storage:	• S3, HDFS (Hadoop Distributed File System)
Servers:	• Elastic, Heroku, Elastic, Google App Engine, EC2
Processing	• R, Yahoo! Pipes, Mechanical Turk, BigSheets, Datameer

BY
KARTHIK P II Year/IT

Big Data Application

Big Data Contributions to Learning

Big data has great influence in the education world too. Today almost every course of learning is present online. Along with the online learning, there are many examples of the use of big data in the education industry. Applications named as the Bubble Score allow teachers to convey multiple-choice assessments through mobile devices and notch up paper tests through the cameras of the mobile phones. Equipment like this usually assists teachers to send out the outputs to rank books and trail development all along distinct characteristics.

Adaptive learning : Further than just reformation coursework and the grading development, data-driven classrooms opened up the

understanding of what children learn when they study it and to what height. Enterprises produce digital courses that use big-data-fuelled prognostic analytics to locate what a learner is learning and what components of a lecture plan most excellently ensembles them at those situations.

Problem control : Sometimes, a student submits his friend's homework instead of his own. In that situation, instead of getting the punishment he gets appreciation and the other innocent student gets the punishment. So in these situations, big data entertains the cross checks of the assignments in order to find out whose writing matches with the assignment's writing.

Big Data Contributions to Banking Zones and Fraud Detection

Big data is hugely used in the fraud detection in the banking sectors. In banking sectors as the big data is implemented, it finds out all the mischief tasks done. It detects the misuse of credit cards, misuse of debit cards, archival of inspection tracks, venture credit hazard treatment, business clarity, customer statistics alteration, public analytics for business, IT action analytics, and IT strategy fulfillment analytics. The SEC uses this big data in order to keep a track of all the commercial market movements.

They are at present using network analytics and natural speech processors to grasp unlawful business activity in the economic marketplaces. Retail traders, Private and public actor banks,

prevaricate funds and others in the monetary marketplace make use of big data for business analytics used in big businesses, reaction dimension, prognostic Analytics etc. In businesses big data helps a lot in knowing the shopping patterns of customers and CRM tactics of the competitors so that they can apply them in their businesses in order to improve the sales.

Big Data Contributions to Insurance Services

Be deficient in modified services, be short of adapted charging and the need of beleaguered services to fresh fragments and to specific market segments are some of the main challenges. Big data is the technology tool that is being used in the production to offer purchaser insights for see-through and simpler commodities, by finding out and foreseeing buyer behavior from side to side information obtained from internet websites including the social media as well as CCTV video recording.

The big data as well enables for the better purchaser preservation from insurance agencies. In the claims administration, extrapolative big data business analytics has been utilized to provide more rapid service given that enormous quantity of information can be worked on particularly in the countersigning period. Scam discovery has also been improved. In the course of gigantic data from digital conduits and social media, real-time controlling of allurements all through the argument series is used to afford insights.

ADVANTAGES OF BIG DATA

- Understanding and Targeting Customers
- Understanding and Optimizing Business Process
- Improving Science and Research
- Improving Healthcare and Public Health
- Financial Trading
- Improving Sports Performance
- Improving Security and Law Enforcement

DISADVANTAGES OF BIG DATA

- Big data violates the privacy principle.
- Data can be used for manipulating customers.
- Big data may increase social stratification.
- Big data is not useful in short run.
- Faces difficulties in parsing and interpreting.
- Big data is difficult to handle.

BY
GEETHANJALI K III Year/IT

Cloud Computing and Big Data

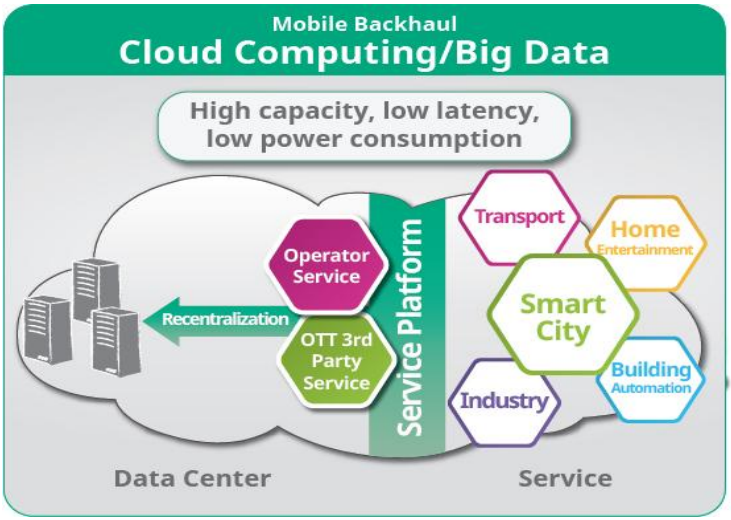
Big Data is all about extracting VALUE out of "Variety, Velocity and Volume" (3V) from the Information Assets available, while Cloud focuses on On-Demand, Elastic, Scalable, Pay-Per use Self Service models. The question often asked is then what is the relationship between Cloud and Big Data. Why are these two entirely different areas discussed together?

Big Data need large on-demand compute power and distributed storage to crunch the 3V data problem and Cloud seamlessly provides this elastic on-demand compute required for the same.

The burst workload nature of the Big Data Computing Infrastructure makes it a true case for the Cloud. Amazon "Elastic Map Reduce"

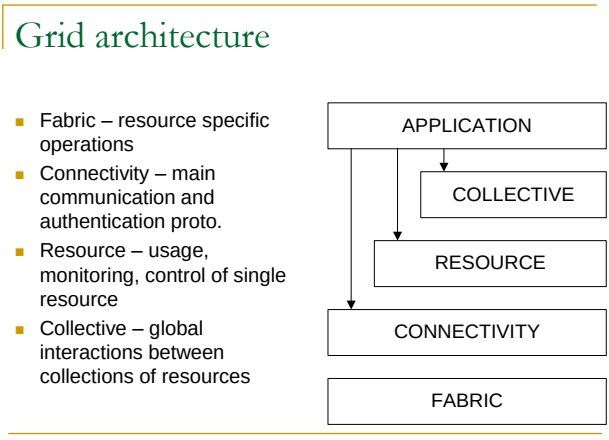
demonstrates how Big Data processing can be done leveraging the power of Cloud Elastic Computes.

Both Cloud and Big Data is about delivering value to enterprise by lowering the cost of ownership. Cloud brings this through the Pay-per user model turning CAPEX to OPEX while Apache open source has brought down the licensing cost of such a sophisticated solution ideally which would have cost millions to build and buy. Both Big Data and Cloud has been driving the cost down for the enterprise and bringing VALUE to enterprise. We have witnessed the early adopters of the Big Data moving away from the Traditional Licensing Models to a more open-sourced model and thus lowering the overall Cost per Terabyte (TB) processing. Both Cloud and Big Data delivers value and the key is how agile the enterprises get to break the hurdles of enterprise open source adoption and jump into the Big Data Journey.



BigData and Cloud Concerns

Cloud and Big Data brings in data security and privacy concerns. This is where System Integrators has been building solutions that marry Cloud and Big Data within the Enterprise to build Elastic Scalable Private Cloud Solution to bring in the same value which enterprises can leverage to bring a Scalable Distributed Processing in action within the enterprise. Again we could see the similarity between Cloud and Big Data with respect to Security Concerns and how innovative solutions could drive these adoptions within the enterprise.



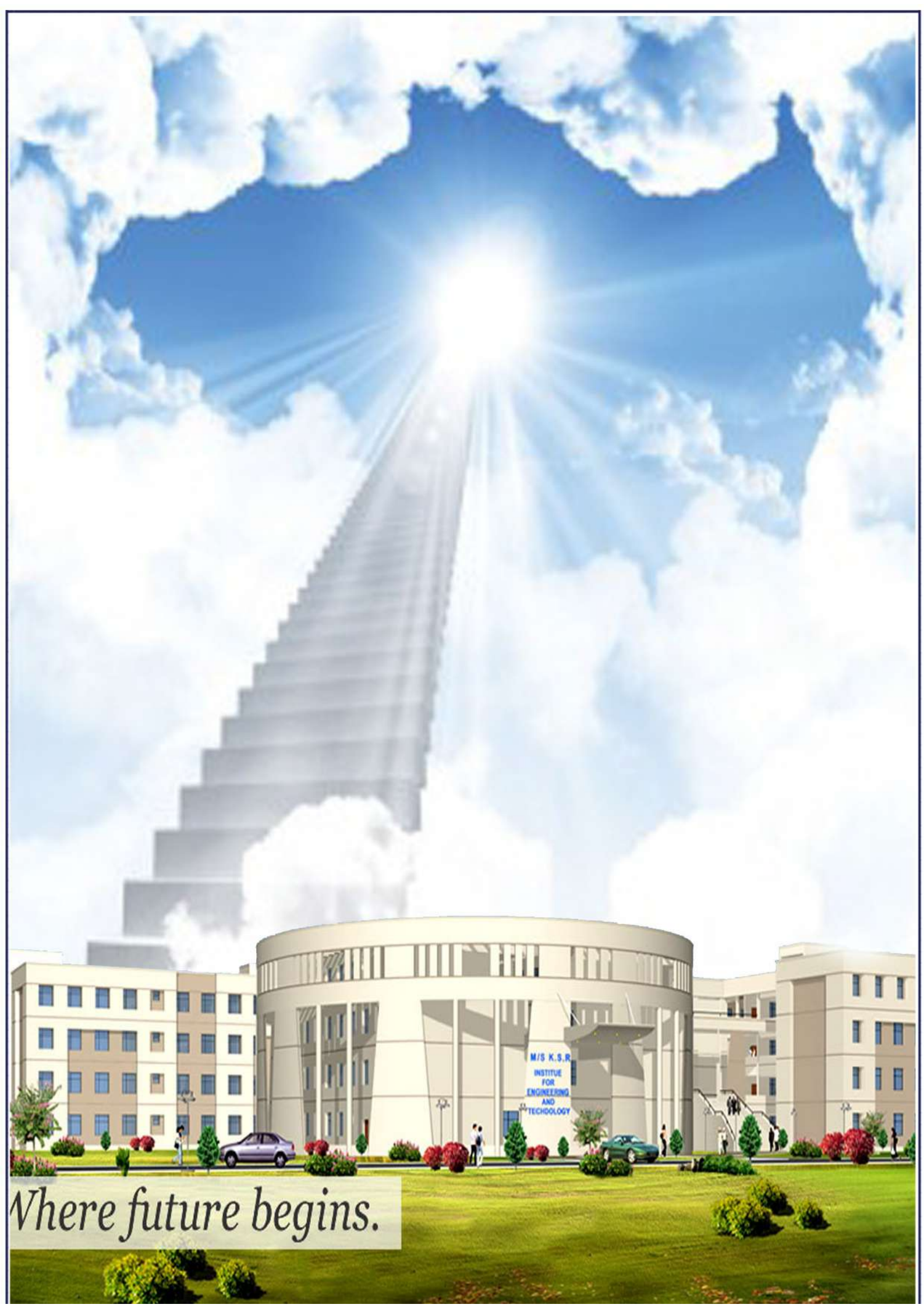
BY
INDIRA R III Year/IT

Program Outcomes (POs)

PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the IT enabled solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, analyze and provide solutions to the problems reaching substantiated IT enabled conclusions.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the desired needs within realistic constraints.
PO4	**Conduct Investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on engineering activities with the engineering community and with society.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes(PSOs)

PSO1	**Programming Skill**	Work as Software Engineers for providing solutions to real world problems using programming languages and open source software.
PSO2	**Web Designing Skill**	Ability to use the web designing skill to establish new solutions for the societal needs.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