

MANAGING DIGITAL ENTERPRISE

Lecture 2

Emerging Digital Technologies

By

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Flash back to the previous lesson 1

- 1. Introduction to Digital Enterprises*
- 2. Importance of Digital Enterprises*
- 3. Characteristics and Core Components of Digital Enterprises*
- 4. Impact of Digital Transformation on Traditional Business Models*

Lecture 2 Agenda

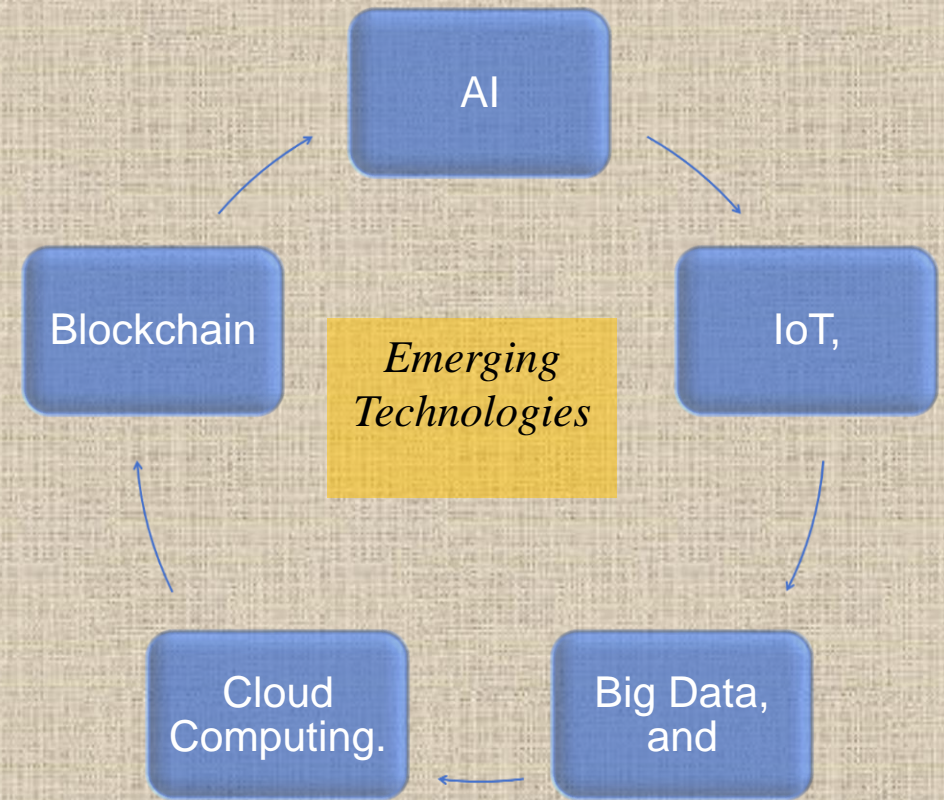
1. Introduction to key emerging technologies
2. Applications and implications of;
 - AI,
 - IoT, Blockchain,
 - Big Data, and
 - Cloud Computing.

Introduction to Key Emerging technologies

What is the meaning of Emerging Digital Technologies?

Technologies that are rapidly developing and have the potential to significantly impact society and industry.

These Technologies do enhance efficiency, and also unlock new business opportunities.



Key Emerging Technologies *N., & Rezaee, A. (2020)*

1. Artificial Intelligence (AI)

□ What is AI?

AI refers to the simulation of human intelligence by machines, particularly computer systems. It involves machines performing tasks that typically require human cognitive functions, such as: Learning, Reasoning, Problem-solving, perception, Language understanding

Artificial Intelligence (AI) Cont.

Types of AI:

1. **Narrow AI (Weak AI):**

- ▣ Designed to perform a specific task, such as voice recognition or image classification.
- ▣ Most common form of AI today (e.g., Siri, Google Assistant).

2. **General AI (Strong AI):**

- ▣ Theoretical AI that can understand and reason like a human being across any task or situation.
- ▣ Still in the experimental phase.

3. **Superintelligence (Theoretical):**

1. AI that surpasses human intelligence in all areas, capable of innovation and decision-making at an unprecedented level.
2. Not yet realized; raises ethical and existential concerns.

Artificial Intelligence (AI) Cont.

AI - Applications

1. Healthcare

Diagnostics: *Hsien, et al (2021)*

- Machine learning algorithms analyze medical data to identify diseases accurately.

Examples: Early detection of cancers, predicting patient outcomes.

Personalized Treatment Plans:

- AI tailors treatments based on individual patient data and preferences, improving patient care.

2. Finance:

Fraud Detection:

- AI systems analyze transaction patterns in real-time to identify and flag fraudulent activities.

Algorithmic Trading:

- AI algorithms make rapid trading decisions based on market data, optimizing investment strategies.

Artificial Intelligence (AI) Cont.

AI – Applications Cont.

3. Retail

Personalized Shopping Experiences:

AI analyzes customer behavior to recommend products and customize marketing efforts, enhancing customer engagement.

Demand Forecasting:

AI predicts inventory needs based on sales trends and market dynamics, reducing stockouts and overstock situations.

4. Customer Service

Chatbots:

AI-powered chatbots provide 24/7 customer support, handling inquiries and resolving issues without human intervention.

Virtual Assistants:

AI enhances customer interactions through natural language processing, offering personalized assistance.

Artificial Intelligence (AI) Cont.

AI – Implications

1. Job Automation

Impact on Employment:

AI can automate repetitive tasks, leading to job displacement in certain sectors.

Upskilling Needs:

Workers may need to acquire new skills to adapt to an AI-driven environment.

2. Ethical Concerns

2. Bias in AI Systems:

AI algorithms can amplify societal biases, affecting decision-making in areas like hiring and law enforcement.

Accountability Issues:

Determining responsibility when AI systems make errors or cause harm presents legal and ethical challenges.

Artificial Intelligence (AI) Cont.

AI – Implications Cont.

3. Data Dependency

Need for Large Datasets:

AI performance often relies on access to vast amounts of quality data for training and validation.

Data Privacy Concerns:

Collecting and using personal data raises issues regarding consent and privacy, necessitating robust data governance.

4. Security Risks

Vulnerabilities:

AI systems can be targets for cyberattacks, potentially leading to data breaches and manipulation.

Adversarial Attacks:

Techniques to trick AI models (e.g., altering input data) can undermine their effectiveness and reliability.

Key Emerging Technologies Cont.

2. Internet of things (IoT)

The Internet of Things (IoT) refers to the network of interconnected physical devices that communicate and exchange data over the internet.

Key Components of IoT:

1. Devices/Sensors:

Physical objects embedded with sensors and software that collect and transmit data (e.g., smart thermostats, wearable fitness trackers).

Internet of things (IoT) Cont.

Key Components of IoT: *Cont.*

2. Connectivity:

Methods for devices to connect to the internet and to each other (e.g., Wi-Fi, Bluetooth, cellular networks).

3. Data Processing:

The analysis of collected data to derive meaningful insights, often performed in the cloud or on local devices.

4. User Interface: Applications or dashboards that allow users to interact with IoT devices, monitor data, and control operations.

Internet of things (IoT) Cont.

IoT - Applications

1. Smart Cities

Traffic Management:

IoT sensors monitor traffic flow and congestion, enabling real-time adjustments to traffic signals and routes.

Waste Management:

Smart bins equipped with sensors notify waste collection services when full, optimizing collection routes and schedules.

2. Health Care *Acharya (2020)*

Remote Patient Monitoring:

Wearable devices track vital signs (e.g., heart rate, glucose levels) and send data to healthcare providers for real-time monitoring.

Telemedicine:

IoT devices facilitate remote consultations and health management, enhancing accessibility to healthcare services.

Internet of things (IoT) Cont.

IoT - Applications

3. Manufacturing

Predictive Maintenance:

IoT sensors on machinery monitor performance and predict failures, reducing downtime and maintenance costs.

Supply Chain Optimization:

Real-time tracking of inventory and shipments helps manage supply chains more effectively, improving efficiency and reducing waste.

4. Retail

Smart Shelves:

Shelves equipped with sensors track inventory levels and notify staff when restocking is needed.

Customer Experience:

IoT devices can provide personalized offers and recommendations based on customer behavior and preferences.

Internet of things (IoT) Cont.

IoT - Implications

1. Data Security Risks

Increased Attack Surface:

The more devices connected to the internet, the more entry points for potential cyberattacks.

Vulnerabilities:

IoT devices often have limited security features, making them easy targets for hackers.

2. Privacy Concerns

Personal Data Collection:

IoT devices gather large amounts of personal data, such as location, health information, and daily habits, raising privacy issues.

Data Misuse:

There are concerns about how collected data is stored, used, and shared, especially without explicit user consent.

Internet of things (IoT) Cont.

IoT – Implications Cont.

3. Standardization Challenges

Lack of Universal Standards:

Different manufacturers may use branded protocols, leading to compatibility issues between IoT devices.

Interoperability:

The integration of various devices and systems can be complex, leading to difficulties in creating a seamless, interconnected network.

4. Scalability and Network Strain

Data Overload:

As more devices are connected, managing and processing the sheer volume of data generated becomes increasingly challenging.

Bandwidth and Connectivity:

Increased demand on network infrastructure can lead to performance bottlenecks, requiring robust, scalable solutions..

Key Emerging Technologies Cont.

3. Blockchain -

Blockchain is a decentralized, distributed ledger technology that records transactions across multiple computers in a secure, transparent, and tamper-resistant manner.

Key Characteristics of Blockchain:

- **Decentralization:** Transactions are not controlled by a single central authority (e.g., a bank or government), but by a network of computers (nodes).
- **Immutability:** Once data is recorded on the blockchain, it cannot be altered or deleted, ensuring the integrity of the records.

Block Chain Technology.

Key Characteristics of Blockchain Cont.

Transparency:

All transactions on the blockchain are visible to participants, promoting trust and accountability.

Security:

Blockchain uses cryptographic methods to secure transactions, making it highly resistant to fraud and hacking attempts.

Block Chain Technology Cont.

Types of Blockchains:

Public Blockchain: Open to anyone (e.g., Bitcoin, Ethereum), offering full transparency but with slower transaction speeds.

Private Blockchain:

Restricted access, usually used within organizations or specific groups, offering faster transactions and greater privacy.

Consortium Blockchain:

Managed by a group of organizations, offering a balance between transparency and privacy.

Block Chain Technology Cont.

Blockchain - Applications

1. Voting Systems

Secure, Transparent Voting:

Blockchain-based voting systems ensure election integrity by providing a tamper-resistant and transparent way to record votes, reducing fraud and ensuring privacy.

2. Supply Chain Management

Tracking and Traceability:

Blockchain ensures end-to-end visibility and traceability of products, from raw materials to the final product..

Smart Contracts:

Self-executing contracts with terms directly written into code, enabling automation of business processes like payments and inventory management.

Block Chain Technology Cont.

Blockchain - Implications

1. Security and Privacy

Enhanced Security:

Cryptographic features make it highly secure, reducing the risk of hacking and fraud.

Data Privacy Concerns:

While blockchain ensures transparency, concerns about the privacy of data (especially in public blockchains) may arise, as all transactions are visible to participants.

2. Regulatory Challenges

Lack of Clear Regulations:

Many governments have yet to establish clear legal frameworks for blockchain technology.

Cross-border Legal Issues:

Global adoption of blockchain raises questions about jurisdiction, as transactions span multiple countries with different regulatory environments.

Key Emerging Technologies Cont.

4: Big Data:

Big Data refers to extremely large datasets that are too complex or massive to be processed using traditional data processing techniques.



Big Data Cont.

Key Characteristics of Big Data (The 3 Vs):

1. Volume:

- ▣ Refers to the enormous amount of data generated daily from various sources, including social media, sensors, and business transactions.

2. Velocity:

- ▣ The speed at which data is generated and needs to be processed. Real-time data analytics is essential to derive actionable insights.

3. Variety:

- ▣ Data comes in multiple formats, including structured (e.g., databases), unstructured (e.g., social media posts), and semi-structured (e.g., XML files).

Big Data Cont.

Types of Big Data:

□ **Structured Data:**

- ▣ Organized data that fits into rows and columns (e.g., spreadsheets, databases).

□ **Unstructured Data:**

- ▣ Data that lacks a predefined format (e.g., text, videos, images, emails).

□ **Semi-structured Data:**

- ▣ Data that doesn't fit into a rigid structure but contains tags or markers (e.g., JSON, XML).

Big Data Cont.

Big Data – Applications Cont

1. Healthcare

- ▣ Big Data analyzes vast amounts of patient data
- ▣ Predictive Analytics for Disease Prevention: i.e. analyzing historical data and patterns,

2. Inventory Management:

3. Fraud Detection etc.

Big Data Cont.

Big Data – Implications

- Big Data often involves collecting personal and sensitive data from consumers, raising concerns about how this data is stored.
- Big Data systems are vulnerable to cyberattacks and breaches.
- Securing Big Data requires sophisticated encryption techniques
- The storage and processing of massive datasets require robust IT infrastructure.
- Analyzing and interpreting Big Data requires specialized skills in data science, machine learning, and statistics.

Key Emerging Technologies Cont.

4. Cloud Computing

Cloud Computing is the delivery of computing services such as servers, storage, databases, networking, software, and analytics over the internet ("the cloud") to offer faster resources, and economies of scale.

Characteristics of Cloud Computing:

On-Demand Self-Service:

Users can access computing resources as needed, without requiring human interaction with service providers.

Cloud Computing Characteristics Cont.

Broad Network Access:

Cloud services are accessible from anywhere over the internet, using various devices like phones, laptops, and tablets.

Resource Pooling:

Cloud providers pool their resources to serve multiple users, using multi-tenant models where resources are dynamically allocated based on demand.

Rapid Elasticity:

Cloud computing allows users to quickly scale resources up or down depending on their needs, offering flexibility and agility.

Cloud Computing Cont.

Types of Cloud Computing:

Public Cloud:

Services offered over the public internet and available to anyone (e.g., AWS, Microsoft Azure, Google Cloud).

Private Cloud:

Services offered over a private network, dedicated to a single organization for more control over resources and security.

Hybrid Cloud:

Combines both public and private clouds, allowing data and applications to be shared between them for greater flexibility.

Cloud Computing Cont.

Cloud Computing - Applications

Data Storage and Backup:

Cloud offers scalable and secure storage, ensuring easy access to backups and reliable disaster recovery options.

Software as a Service (SaaS):

Cloud-based applications (e.g., Microsoft 365, Google Workspace) enable real-time collaboration and seamless access without local installation.

E-commerce Scalability:

Cloud solutions allow e-commerce platforms to handle fluctuating traffic, analyze customer behavior, and optimize operations on demand.

Cloud Computing Cont.

Cloud Computing - Implications

- ❑ Storing sensitive data in the cloud increases vulnerability to breaches, with the need to comply with regulations like GDPR.
- ❑ Downtime and Reliability Issues: where services may experience outages
- ❑ Vendor Lock-In: where by Switching cloud providers can be difficult and costly, leading to dependency on a single provider.
- ❑ Pay-as-you-go models can lead to unexpected costs, especially with improper resource management and over-provisioning.

Conclusion

Emerging technologies like AI, IoT, Blockchain, Big Data, and Cloud Computing are transforming industries by enabling innovation, automation, and connectivity. While these advancements offer significant benefits, they also present challenges such as security risks and privacy concerns. Effectively managing digital enterprises in this landscape is crucial for harnessing these technologies' full potential and driving sustainable growth.

Summary

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2. Applications and implications of;
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References

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THANKS

