FULL STACK DEVELOPMENT THEROY

<u>**WEEEK - 01**</u>

What is an Enterprise? - Organizing the Enterprise - process - Understanding /Types of business activities -- What is business process? - - Why to automate business process? - Digital transformation through Convergence of IT & OT - Digital Transformation Success Stories - How technology has impacted digital transformation - Case study: Digital transformation through IT/OT convergence

What is an Enterprise?

➢ Enterprise refers to a for-profit business started and run by an entrepreneur. And we will often say that people running such businesses are enterprising.

➢ The roots of the word lie in the French word *entreprendre (from prendre),* meaning 'to undertake', which in turn comes from the Latin "*inter prehendere*" (seize with the hand).

➢ Entrepreneurs usually start an enterprise – with the associated risks – to make a profit, and for one of several reasons:

• **Problem-solving.** They see a particular issue that they feel they can solve.

• **Exploit ideas.** They have a **<u>new idea or product</u>** they believe will be successful.

• **Filling a gap.** They see a gap in the market they believe they can fill.

• **Competitive pricing.** They believe they can produce something on the market cheaper and offer it at a lower price.

• **Knowledge-based.** Where they believe they can supply specialist knowledge that customers will pay for.

Types of Enterprise

Various types of commercial enterprise exist within the UK. The main differences between them lie in how they are structured and legally owned.

1. Sole Proprietorship

Although often the smallest of companies, these represent the foundation of the UK's market economy. These can include 'trade' business, such as painters and decorators, or the owners of a single retail unit. And, in the modern era, many online businesses can fall into this category, from smaller enterprises selling products via Etsy or similar platforms to larger ones with a website and app.

2. Partnership

Partnerships usually consist of a small number of individuals who share ownership and decision-making (as well as profits). In some cases, such as legal firms, each partner may bring a particular speciality to the business to expand the overall services. In some cases, there may be a type of hierarchy where there are senior and junior partners.

3. Private Limited Companies (Ltd.)

➢ This sort of free enterprise has been legally incorporated and will have its own legal identity.
➢ It will have a set of shareholders who shoulder a limited amount of liability for any debts the enterprise incurs.
➢ Those shareholders will appoint directors to oversee overall operations and decisions of the business, though the relevant managers will oversee the day to day operations.

4. Public Limited Companies (PLC)

➢ Often confused with private limited companies, PLCs differ in that shares in the enterprise can be sold to the general public.
➢ To do this, they have to meet certain regulatory and legal criteria regarding the business's financial health, transparency of their accounts, how long they have been trading, and more.
➢ Being able to sell public shares can be useful in raising funds for things like expansion.

The Process of Organizing an Enterprise (With Diagram)

The five main steps involved in the process of organizing an enterprise.

The steps are: 1. Determining Activities 2. Grouping of Activities 3. Assigning Duties 4. Delegating Authority 5. Coordinating Activities.
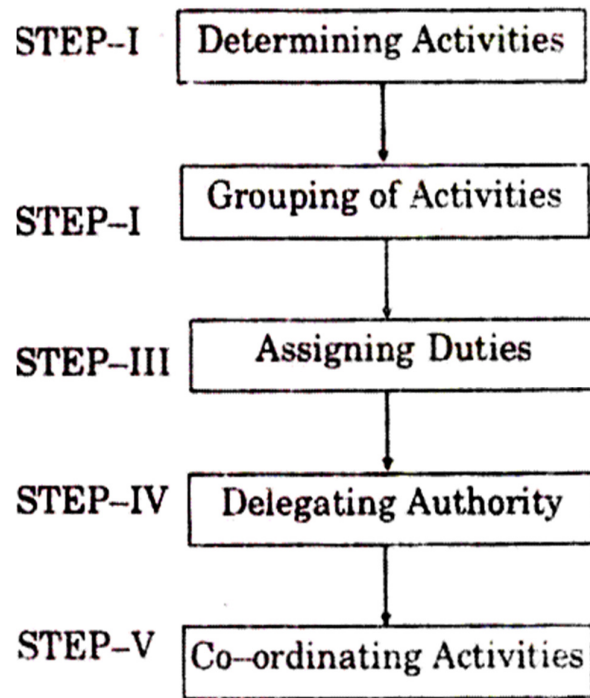
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STEP–I    | Determining Activities |
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STEP–I    | Grouping of Activities |
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STEP–III  | Assigning Duties |
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STEP–IV   | Delegating Authority |
                      |
                      ↓
STEP–V    | Co--ordinating Activities |
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Fig. 6.2. Process of orgaisation.

Organising an Enterprise Step # 1. Determining Activities:
  ➢ The first step in organising is to identify and enumerate the activities required to achieve the objectives of the enterprise.
  ➢ The activities will depend upon the nature and size of the enterprise.
  ➢ For instance, a manufacturing concern will have production, marketing and other.

Organising an Enterprise Step # 2. Grouping of Activities:
  ➢ The various activities are then classified into appropriate departments and divisions on the basis of functions, products, territories, customers etc. Similar and related activities may be grouped together under one department or division.
  ➢ Grouping of activities helps to secure specialisation. Each department may be further sub divided into sections and groups. Grouping of activities should not only allow specialisation but keep in view the human factor, nature of activities and the needs of the organisation and the people.

Organising an Enterprise Step # 3. Assigning Duties:
  ➢ The individual groups of activities are then allotted to different individuals on the basis of their ability and aptitude.
  ➢ The responsibility of every individual should be defined clearly to avoid duplication of work and overlapping of effort. Each person is given a specific job best suited to him and he is made responsible for its execution.

Organising an Enterprise Step # 4. Delegating Authority:
  ➢ Every individual is given the authority necessary to perform the assigned task effectively. Authority delegated to a person should be commensurate with his responsibility.

➢ Through successive delegations a clear hierarchy of authority or chain of command running from the top to bottom of the structure is established. An individual cannot perform his job without the necessary authority or power.

Organising an Enterprise Step # 5. Coordinating Activities:

➢ The activities and efforts of different individuals are then synchronized. Such co-ordination is necessary to ensure effective performance of specialized functions.

➢ Interrelationships between different jobs and individuals are clearly defined so that everybody knows from whom he has to take orders and to whom he is answerable.

What is a business process?

➢ A business process is an activity or set of activities that accomplish a specific organizational goal.

➢ **Business processes should have purposeful goal**s, be as specific as possible and produce consistent outcomes.

➢ **Business process management** (BPM) is a systematic approach to improving those processes, which helps organizations achieve their business goals.

➢ If an organization is unable to perform certain business processes internally due to cost or resource constraints, the company might use **business process outsourcing**.

➢ Many organizations contract specific business tasks -- such as payroll, human resources (HR) or accounting -- to a third-party service provider.

Business process categories and examples

Business processes can be categorized into different buckets, with the most common three as follows:

Operational processes. Also called primary processes, these processes deal with the core business and value chain and deliver value to the customer by helping to produce a product or service. Operational processes represent essential business activities that accomplish business objectives such as generating revenue. Examples of this include the following:

- o taking customer orders
- o processing product payments
- o managing bank accounts

Supporting processes. Also known as secondary processes, these involve back-office processes within the business functions that keep the organization running. One key difference between operational and supporting processes is that supporting processes do not directly provide value to customers. Examples of supporting processes include the following:

- o accounting
- o HR management
- o workplace safety

Management processes. These processes measure, monitor, and control the activities related to business procedures and systems. Like supporting processes, management processes do not provide value directly to the customers. Some examples of management processes include the following:

- o   internal communications
- o   <u>governance</u>
- o   strategic planning
- o   budgeting
- o   infrastructure or capacity management

Some organizations and executives prefer to classify business processes by business function and group them under the following titles:

- o   accounting and finance business processes
- o   business development business processes
- o   HR management business processes
- o   marking and sales business processes
- o   product delivery business process

What is business process automation?

- ➢ Business process automation is a way to increase organizational efficiency by leveraging digital technologies to <u>carry out business processes with minimal human intervention</u>.
- ➢ By shifting the responsibility of completing routine tasks from humans to machines, business process automation allows employees to spend more time focusing on value-added activities.

Why automate business processes?

- ➢ Automating business processes is good for your employees.
- ➢ It frees up their time so they can focus on higher-level tasks instead of spending most of their day answering similar questions over and over. Plus, it offers a lot more efficiency in the long run.
- ➢ Automation helps you get your work done faster and more efficiently, thereby saving money and time, which you can then invest in other things.

What business processes can I automate?

Machines excel at following clearly defined steps. Therefore, you can automate any rule-based business process. Examples include:

- •   Document routing
- •   Invoice processing
- •   <u>Expense reporting</u>
- •   Employee on-boarding
- •   Data entry
- •   Screening against PEPs and sanctions lists

- Data deletion
- Transaction monitoring

What are the benefits of business process automation?

➤ Business process automation eliminates the bottlenecks that lead to lost time and revenue.

➤ The improvements in efficiency and control spread to every facet of the organization — from increased productivity and compliance to better customer experience and performance.

Here are the 10 main benefits of business process automation.

1. Time savings

➤ Business process automation saves your employees a great deal of time and allows them to work smarter, not harder.

➤ By charging machines with completing recurrent, rule-based tasks, employees can free up time to focus on work that requires critical thinking, creativity, or the human touch.

2. Increased profits

➤

3. Higher productivity

Organizations that rely on technology to automate processes also see an increase in productivity. The main reason is that machines can handle multiple tasks simultaneously, thus speeding up processes.

By relying on technologies to help with some of their tasks, employees will also get more work done in the same amount of time.

4. Greater efficiency

Business process automation helps companies fulfil tedious tasks with minimal resources. Companies get faster and more reliable results with lower costs, thus improving efficiency significantly.

5. Error minimization

Even the most capable and skilled employees make mistakes. Lack of attention, absent-mindedness, forgetfulness, and multitasking can all hinder the performance of your employees — especially when performing routine tasks. Unlike humans, computers don't forget. Plus, they never get tired or distracted. Therefore, automating processes helps companies decrease the likelihood of human error dramatically.

6. Better standardization

Different employees often perform the same processes in different ways. But unfortunately, these ways are not always the most efficient.

On the other hand, automation solutions always follow the same steps to complete tasks and never stray from the rules you define. Hence, business process automation can help you standardize processes, achieve consistent results, and increase transparency across the organisation.

7. Auditable records

Automation solutions record each step of the process in an audit trail. That makes it possible to:

- track every step of the process

- see who did what and when

Audit trails not only promote accountability and data security but also help companies demonstrate their compliance in the case of official controls.

8. Improved compliance

Automation solutions simplify regulatory compliance. By employing security controls such as encryption and role-based access control, automation solutions help companies meet the GDPR's data protection requirements.

Plus, features like automatic data deletion enable companies to fulfil their legal obligations regarding data retention.

9. Superior customer experience

Convenience and fast access to products and services matter most to today's customers.

Business process automation enables faster response times, data-driven personalization, and consistency across different channels. This improves the customer experience and helps companies differentiate themselves from the competition.

10. Improved scalability

Manual processes are not scalable enough and can easily hinder business growth. For example, manually invoicing a hundred clients requires much more resources than only invoicing ten, and companies can't always cope.

On the other hand, automated processes are scalable. Machines can perform multiple tasks at the same time much faster than any human can.

Therefore, they can easily handle significant increases in workload, demand, and customer base.

The Need for IT/OT Convergence and its Benefits

➢ Historically, in most manufacturing companies, IT and OT are two separate groups, and they do not have much to do with each other.

➢ The operations side of the business has a dedicated group of OT experts to install and maintain production equipment and its associated software, monitor production, and take corrective action to ensure product quality. This group is usually separate from the IT department, which is focused on managing information and automating business processes.

➢ IT/OT convergence in the manufacturing industry means that production equipment and processes leverage business data from IT systems and information systems receive real-time data from OT systems as inputs into decision-making systems

Some of the benefits of IT/OT integration include the following:

Real-time production visibility:

- IT/OT convergence enables gathering real-time data from factory equipment.
- As a result, management has real-time visibility of production operations.
- This gives managers an instant view of production-order status and notification of machines' status, including those that are down, for example. Enhanced decision-making and planning: By monitoring

equipment temperature, vibrations, and machine tool wear, OT systems can alert personnel to schedule preventative maintenance before equipment starts generating defects.

- It also helps them anticipate short-term material requirements and schedule production to best utilize available machine capacity.

Improved financial performance:

- Through IT/OT convergence, manufacturers attain higher levels of machine availability and efficiently use resources, including raw materials, energy, and workers.
- This leads to lowered costs and higher profitability.

Key Challenges in IT/OT Convergence

To ensure proper integration of IT and OT pillars, manufacturers must develop a strategy to close the gap in data sharing, interoperability, security, system integration, and process optimization. The strategy should encompass five key imperatives.

- **Integrating data seamlessly between IT and OT systems:** To derive meaningful insights, manufacturers must ensure data integration between devices and sensors on the shop floor and the information systems that run the business. Data transfer must take place efficiently between the two. For some companies, this may mean retrofitting older equipment with sensors so they can connect with them.
- **Leveraging modern IoT platforms:** Industrial IoT (IIoT) platform bridges provide information systems access to data at the edge. IIOT platforms connect many devices, including machines, equipment on the shop floor, vehicles such as forklifts, and networking elements like sensors, edge applications, and routers. The IT function must provide enterprise-wide data with sufficient bandwidth and network controls to ensure high availability and reliability. One manufacturer that has done so is Marelli, which implemented an IoT Edge platform based on Microsoft Azure to digitalize its plant operations and connect assets on plant shop floors.
- **Utilizing and integrating next-generation technologies:** The latest devices and sensors support advanced technologies such as digital twins, augmented reality, and edge computing. While the manufacturing sector has traditionally been conservative in leveraging emerging technologies, the picture is changing, as leading manufacturers realize the benefits of these new digital technologies.
- **Driving the convergence of IT and OT skills:** IT/OT convergence is not only about implementing the technology stack. It also enables front-line workers such as plant supervisors, operators, and maintenance personnel to broaden their skills. To implement an agile way of working on the shop floor, cross-training should be done regularly. The data collected through IIoT solutions will also help track employee performance metrics, such as changeover time and capacity utilization, for better workforce planning and efficient knowledge transfer.
- **Addressing IT and OT security vulnerabilities:** Connecting legacy OT infrastructure to the internet or integrating with IT technologies may increase vulnerabilities to cyberattacks. For example, in May 2021, Colonial Pipeline Co., the largest fuel pipeline in the US, was hit by a ransomware attack. Although the attack targeted IT systems and did not directly target the computerized equipment managing the pipeline,

the company was forced to halt all pipeline operations to prevent the attack from spreading to its OT systems. This led to a gasoline shortage across the East Coast. The need for robust security measures becomes even more essential as IT and OT systems become more integrated.

The Role of Service Providers in IT/OT Convergence

To tackle the challenges, manufacturers can partner with service providers with experience with other clients in IT/OT convergence.

<u>One example is Hitachi Vantara, which specializes in addressing the need for IT/OT convergence.</u>

- Our recent visit to Hitachi Vantara's Application Reliability Center (HARC) in Hyderabad is a testament to how this provider is streamlining cloud operations for better IT and OT process integration. These centers opened in June 2022 and are an interesting addition to Hitachi Vantara's portfolio.

- They integrate site reliability engineering principles and intelligent automation technology to help design and build cloud-native products and services, improve reliability and cost for cloud applications, and manage hybrid and multicloud operations. They also expedite the modernization and scaling-up efforts of industrial clients. The HARCs provide cloud management services through a managed services model. They are driven by real-time monitoring of KPIs defined by the client and focus on real business outcomes.

How to Achieve IT/OT Convergence

- As manufacturers realize the importance of IT/OT convergence, they constantly deal with a lack of in-house skills in digital technologies such as cloud, data science, and AI/ML.

- Another big hurdle is the lack of cross-trained employees who combine strong functional knowledge with digital expertise. Therefore, IT and OT integration in manufacturing will not occur overnight.

- Manufacturers must develop a step-by-step approach to mitigate these challenges and facilitate integration. Here are three recommendations to keep in mind.

- Create a baseline of your current IT and OT environments and perform a gap analysis to determine requirements for convergence.

- Use a maturity model to understand how far along you are in the journey to smart and connected manufacturing. The maturity model should facilitate the adoption of new technologies like AI/ML, IoT, and advanced analytics across the value chain.

- The maturity model should also assess the maturity of your current industrial environment in terms of machine connectivity, levels of automation, data integration and interoperability, and network security.

- Build a road map and a blueprint to enable IT/ OT convergence. The road map should address skills shortages, maintenance costs, and infrastructure improvements, such as in the corporate network. The blueprint should include an end-to-end IT/OT reference architecture that covers key components, including devices, industrial and IT systems, and other assets from the edge to the cloud.

- Build a joint governance framework with clear roles and responsibilities to enable collaboration between IT and OT groups.

- Specific skills will be needed to conduct the assessment. Most manufacturers lack these skills in-house to accelerate the convergence of IT and OT. Therefore, they will need help from external partners, who are rising to address these needs.

Digital Transformation Success Stories

Some of the popular digital transformation success stories and understand how your organization can employ digital transformation initiatives to gain that competitive edge:

IKEA

For over 80 years, one of the world's most recognizable furniture and home accessory brands engaged in entirely analogue business operations. The retail giant was competing at scale, against small manufacturers as well as large retail warehouses, for affordable products as it faced a unique set of challenges:

- A complex supply chain pipeline
- Underoptimized goods supply
- Hectic traditional customer shopping experience

During the pandemic, IKEA had closed 75% of its stores for around seven weeks, losing $1.5 billion in revenue, a relatively large sum of money, and yet managed to stay relevant through the crisis.

How did IKEA manage to stay afloat?

IKEA had already prepared for a digital-first retail strategy. Over the years, IKEA revamped its customer journey. Interactions, purchase process, sales support, and guidance were all moved online, waiting for customers to adopt an end-to-end online shopping experience. The entire supply chain was modernized, reengineered, and optimized, driven by data and a customer-centric user perspective.

IKEA has also taken the digital transformation strategy forward by acquiring and testing AR and VR capabilities to further engage customers. The company recently acquired Geomagical Labs to develop AI-enabled AR/VR solutions that let users visualize and model IKEA products in their rooms before they purchase—a simple solution accessible via a smartphone app, pushing customers a little further down the buying journey.

The digital transformation of Netflix

- Netflix is our best option for keeping up with the latest movies & television shows that everyone talks about. Their mission is to entertain the world by hosting movies, TV shows, and documentaries.
- The company is currently valued at $149 billion, and much of its success can be attributed to its ability to anticipate the future and transform.
- To improve customer experience and satisfaction, Netflix CEO Reed Hastings approached Blockbuster with an offer. Initially, Blockbuster was a video rental service, but by 2007, technology was advancing, and people were becoming more comfortable using it.
- As a result of their online viewing system, Netflix was able to address the concerns customers had with Blockbuster, such as late fees, and they were successfully able to deliver new value to their customers

through a Digital Transformation, as well as change their buying habits and the way they watch movies in general.

Amazon Reinventing Retail with Data and Automation

- Picture a bookstore evolving into a digital behemoth that can summon your heart's desires with a single click. Enter Amazon, the epitome of retail transformation that has rewritten the story of shopping. Their journey began with books, but their destination was a global marketplace that transcends borders and time zones.

- At the core of Amazon's transformation is a symphony of data. They've harnessed the power of analytics to understand customers better than they understand themselves. With AI-driven recommendations, they curate personalized shopping experiences that leave traditional retail in the dust.

- But Amazon's impact doesn't stop at the screen; it echoes in the warehouses where algorithms orchestrate an intricate dance of products, ensuring quick deliveries that defy imagination. Supply chain optimization isn't just a phrase; it's the pulse that keeps this retail titan ticking.

- Automation is the heartbeat of Amazon's revolution. Behind the scenes, robots navigate the aisles, and drones prepare for takeoff, making doorstep deliveries a reality straight out of science fiction.

- And the customer experience? It's the gold standard. From easy returns to seamless payments, Amazon has rewritten the rulebook, turning shopping into an adventure rather than a chore.

- In the digital age, Amazon isn't just a retailer; it's a trailblazer that's redefined convenience, speed, and the very essence of how we shop and live.

What is digital transformation?

- Digital transformation in business has historically been defined as using technologies to create new – or optimize existing – processes, culture, and customer experiences.

- Technology is implemented to meet changing business and market needs, and to take a company into the digital future. Its adoption impacts the entire organization and requires revolutionary thinking and action. For many businesses, it's a daunting initiative, but taking the digital leap has profound benefits for employees and customers.

The impact of digital transformation

Digital Transformation and the Value Chain

- Physical commodities run out, eventually causing a scarcity in the supply chain. A digital economy, on the other hand, is an economy of abundance.

- Computer bits are ubiquitous and possess an unlimited possibility of duplication with absolute fidelity at a minuscule cost.

Effect on the Value Chain

- Companies seek to deliver the desired product to market with maximum value and the lowest cost. The production and marketing of physical items cost money and resources. But digital transformation upends the traditional business model, especially in the manufacturing industry.

- A digital economy functions with efficiency, minimizing ongoing expenses. A company passes these savings along to the consumer. But with consumers paying lower prices, total revenue decreases.

Disruption of Industry

- Mature markets suffer. The music industry in 1995, based on sales of CDs, cassette tapes, and vinyl records, had a value of $21.5 billion, according to a 2019 IEEE Digital Reality white paper.

- Since then, the value of the industry as a whole has dropped more than 50 percent. Digital representations of music have transformed the industry into an economy of bits.

- Similarly, the newspaper industry has suffered from digital transformation.

- Advertising revenue in print has dropped from $65 billion in 2000 to less than $15 billion, according to the white paper. A slight uptick in digital advertising has not been enough to offset painful losses in the print sector.

Perception of Value

- Digital transformation has a profound effect not only on individual industries but also on value perception as a whole. An economy is driven by data no longer emphasizes specific features of a tangible product.

- Efficiency, convenience, and ease of use are the new currency.

- For example, societal perception of the automobile industry has changed drastically in the last few decades. Car manufacturers used to focus on features that appealed to the driver, such as top speed and acceleration. With the proliferation of self-driving cars on the horizon and the popularity of ride-sharing services now, consumer perception of what's important is changing. A rider's amenities will supersede the driver's needs.

Digital Transformation and Digital Disruption

- The COVID 19 pandemic forced many companies to adopt new business models based on digital solutions. The in-person collaboration came to a sudden halt.

- Businesses that survived discovered new, efficient digital workflows.

- Digital transformation simultaneously requires businesses to adapt and enables them to do so.

- By embracing change, a business can keep up with an evolving market and consumer expectations while addressing challenges specific to the pandemic.

Smartphones

- Digital transformation disrupts established industry.

➤ Perhaps no other emerging technology has caused a more noticeable supply chain disruption than the over three billion smartphones in circulation worldwide.

➤ In effect, a smartphone is its own digital platform, having an impact on markets ranging from music to entertainment to transportation to photography.

For example, digital transformation has completely reworked every industry associated with photography. Embedded cameras nullify film manufacturing and camera sales. Smartphone cameras have a virtually unlimited "film roll" and no need to develop prints.

- The rise of social media has occurred in lockstep. Users can upload photographs immediately to the internet, driving the popularity of apps that use digital photos.

- Instagram, for instance, started in 2010 and now features users who share more than 40 billion images every day, according to the IEEE Digital Reality white paper.

- Smartphone use has infiltrated other industries as well. In manufacturing, smartphones have enabled real-time monitoring of productivity, sales, and supply chain performance.

Internet of Things -Advancements in Health Analytics

- Beyond just monitoring, though, manufacturers have embraced digital transformation to predict and react. Retailers are learning to harness artificial intelligence to support data analytics.

- Smart devices can "talk" to the internet and connect with each other, a phenomenon known as the Internet of Things, or IoT. Complex sensors on these networked devices feed machine-learning algorithms.

This modernization, part of what's known as the fourth industrial revolution or Industry 4.0, involves a transformation of the entire production line: supply chain, distribution, and operations. Certain countries, such as Finland and Germany, have launched initiatives that encourage all stakeholders to rethink the entire manufacturing value chain.

These initiatives include friendly regulations, investment in infrastructure, support for research, IoT deployment and expansion, and fiscal support for participating industries. In short, Industry 4.0 uses digital technology to create a more sustainable, efficient business model.

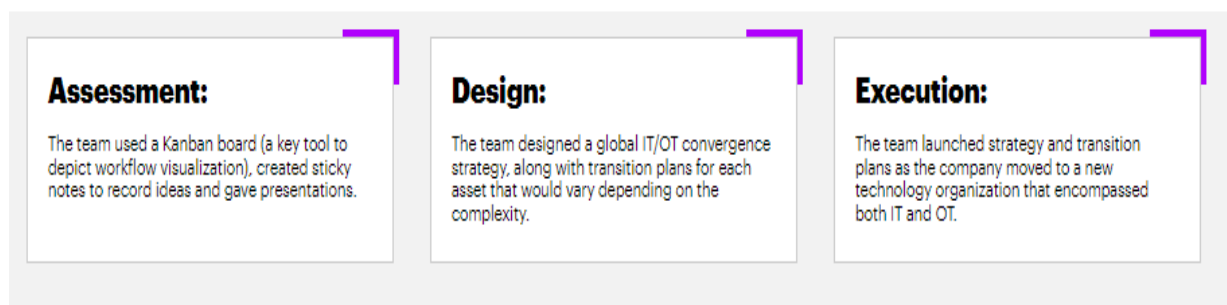## Case Study: Digital transformation through IT/OT convergence

A copper mining company brought information and operational technology under a single governance and operating model to aid digital transformation.

Challenge

- With the goal of becoming a leader in the use of automation in its operations, a large copper mining company wanted to take advantage of an information technology (IT) and operational technology (OT) convergence movement sweeping across industries.
- In a highly competitive and rapidly changing technology landscape, the company knew that a digital transformation, aimed at bringing IT and OT together under a common governance structure, could be the difference between surviving and thriving.
- With Accenture's help, the company would launch a program to make better use of its technology and data, change the way it worked and ultimately, build a foundation to support its overall vision for digital transformation.

What Accenture did

- The company and Accenture team designed and implemented unified technology governance and a common technology operating model across various sites and brought the management of IT and OT together under one new centralized technology organization.

- Because of the complexity involved and because processes and technologies varied widely at different sites, the effort was divided into three phases:

Assessment:

The team used a Kanban board (a key tool to depict workflow visualization), created sticky notes to record ideas and gave presentations.

Design:

The team designed a global IT/OT convergence strategy, along with transition plans for each asset that would vary depending on the complexity.

Execution:

The team launched strategy and transition plans as the company moved to a new technology organization that encompassed both IT and OT.

People and culture

- Because the effort involved a significant change in culture, stakeholders were consulted throughout the project, helping people understand what was happening and building buy-in for the new approach.
- The company and Accenture also highlighted the fact that the convergence of IT and OT would benefit the workforce by creating a wider variety of technical career paths, opportunities to learn and develop skills, and

the potential for employees to apply their skills to a broader range of roles across the company's operations and sites.

- Furthermore, they showed how the breaking down of silos and the integration of IT and OT teams will bring a more coordinated response to business requirements, the ability to share resources and exploit the same contracts, and significant cost reductions.

Value delivered

- This initiative has provided greater visibility across the company's technology landscape and enabled IT and OT to operate under a single model, using higher-quality operational data.

- The new approach allows management to optimize operations from a holistic perspective and use technology more efficiently and effectively. It has also allowed the company to enhance its focus on safety, production volume and operational costs. And it has enabled leading practices such as predictive asset management and integrated planning and scheduling.

- Finally, the unified approach to IT and OT has positioned the company to continue to better take advantage of digital technologies. Technology professionals can work as an integrated team to identify and address IT/OT-related problems and move quickly to replicate improvements and innovations across the company—which will be key to real.

How digital transformation can bring revolution in teaching learning process

- Sustainable development includes social well-being, which depends on education.
- Information technology has emerged to spread shared knowledge and is a primary driving force behind education reforms.
- The introduction of new technology-assisted learning tools such as mobile devices, smartboards, MOOCs, tablets, laptops, simulations, dynamic visualisations, and virtual laboratories have altered education in schools and institutions.
- The Internet of Things (IoT) is proven to be one of the most cost-effective methods of educating young brains. It is also a robust mechanism for integrating a world-class learning experience for everybody].
- Educational technology businesses are continually attempting to create novel solutions to expand access to education for individuals who cannot obtain adequate educational facilities. Social media as a learning tool has come a long way.
- Large numbers of teachers and students use social media as an essential element of the overall e-learning experience. It is a critical venue for exchanging information about crucial topics these days.

- Traditional classroom instructions fall short of providing an immediate learning environment, faster evaluations, and more engagement.

- Indeed, today's technology's adaptability and non-intrusive character make learning more appealing to the next generation.

- An online classroom calendar, where we may display class schedules, assignment schedules, field excursions, speaker events, examinations schedules, or semester breaks, will help students plan accordingly. Student response systems, such as smartphones and clicker devices, provide a quick and easy technique for teachers to determine students' learning of the presented content quickly and whether more explanation is required [8,9].

- Digital technologies influence agricultural operations, and they will soon revolutionise how farming is done in developed countries, reducing our dependency on pesticides and substantially cutting water use. COVID-19 Pandemic, lockdown, and quarantine are three concepts that have recently entered our lexicon.

- People worldwide are aware of the catastrophe caused by the coronavirus epidemic. In this crisis, digital technologies are at least keeping the educational system afloat. Students are learning from the convenience of their own homes.

- Integrating technology into education provides students with an engaging learning experience, allowing them to remain more interested in the subject without being distracted.

- The utilisation of projectors, computers, and other cutting-edge technical gear in the classroom may make studying fascinating and entertaining for students. Student learning can become more dynamic and engaging by establishing tasks in class that incorporate technology resources, oral presentations, and group participation. Participation can extend beyond verbal communication as well

Design Thinking

What is Design Thinking?

- Design Thinking is a problem-solving methodology, by prioritizing the consumer's needs above everything else, that uses empathy, experimentation, and iteration to generate innovative and successful solutions.

- It is frequently utilized in product and service design, but it can also be used in problem-solving and decision-making. The technique is centered on comprehending the people for whom the solution is being built, and it includes prototypes and testing to refine and improve the solution.

How Is Design Thinking Relevant to Software Development?

- Software development does not occur naturally. It must possess empathy for the client. Customers have no interest in the technologies used to develop the application or service they require. They are predominantly concerned with utility, so developers must also prioritize it.

- There is a common occurrence of miscommunication between solution developers and clients. One could argue that scheduling more phone calls, meetings, and conversations can resolve this miscommunication.

- However, the answer may be much more complex. You can discern their true desires only by comprehending and empathizing with your consumers. This is where you should start.

- Therefore, critical reasoning is of greater importance than correct techniques. Because software development is intended to improve and simplify our lives, it is crucial to comprehend user needs and desires and to employ design thinking.

What Are the Steps of Design Thinking?

Empathy

- Empathy is the ability to understand and feel others' pain. The first step in design thinking is seeing products and services through your users' eyes to comprehend their needs and desires.

Define

- This step summarizes and interprets primary data. Define your issue. You must now carefully examine what empathy has revealed. Users, their wants, and their perspectives should define your perspective.
- You also need to master your user identity. The present user wants research findings. You want to clarify and comprehend the problem and inspire the team to find solutions.

Ideate

- Motivate yourself now. After problem-solving, gathering as many ideas as possible is essential. Great views, diverse viewpoints, and distinct perspectives are needed. All pictures—no matter how minor—must be backed during exploration. Imagine your destination and how to get there.

Prototype

- Prototypes can be physical objects, models, or designs, but their primary purpose is to test your idea and show how your end product will look and feel. Since it's just a design, prototyping is cheap and quick. The result of all previous phases, this draft shows your product's potential appearance.

Successful plans require failures. Finding and fixing flaws now saves time and money later.

Full stack development - Industrial perspective

- ➢ The full-stack development industry has come a long way in the past few years, and there is no doubt that the next decade will bring even more exciting advances.
- ➢ As technology evolves, the full-stack development industry will continue to grow and expand, providing new and innovative solutions to businesses and individuals.

Introduction to Full-Stack Development

- ➢ Full-stack development is a comprehensive web development approach using multiple technologies and frameworks to create a complete web application. It combines front-end development, back-end

development, database management, and server-side scripting. It is becoming increasingly popular as it allows developers to create applications from start to finish.

➢ In the next 10 years, the full-stack development industry is expected to grow even further. According to Bureau of Labour Statistics data, the role of a web developer is expected to grow 13% from 2018 to 2028, much faster than the average occupation.

Key Trends in Full-Stack Development

Here are some key trends to look out for:

1. Artificial Intelligence (AI):

➢ AI can be used to create more efficient and powerful applications and can also help developers automate certain tasks. Recent advances in data analysis, machine learning, and high-performance computing have pushed the boundaries of novel applications ranging from speech recognition to robotics.

➢ As artificial intelligence advances the technology stack, having a single developer who understands how these disparate parts fit together will be invaluable. With their comprehensive technical knowledge, full-stack developers play an important role in the ongoing advancement of artificial intelligence. SciKit Learn, TensorFlow, PyTorch, and Google ML Kit are examples of popular AI tools and frameworks.

2. Machine Learning:

➢ Machine learning (ML) is a subset of AI dealing focused on developing computer systems that learn and adapt without following explicit instructions. A never-ending supply of data from every layer of the tech stack is critical to machine learning success.

➢ Full-stack developers can use their broad view of the tech stack to assist data engineers and scientists in satisfying their insatiable appetite for new data. Full-stack developers can use machine learning automation to build and make data-driven decisions faster. Pandas, TensorFlow, SciKit, and NLTK are popular machine-learning tools.

3. Internet of Things (IoT)

➢ While IoT development requires professionals from various fields, full-stack developers are precious due to their ability to build and integrate disparate systems.

➢ The challenge for full-stack developers is understanding how to integrate devices, what information can be collected from devices, how to make the data usable, and how this information can benefit users. Node-RED, OpenRemote, Flutter, and Arduino are popular IoT platforms and tools.

4. Blockchain Technology

➢ You may be familiar with Blockchain in relation to cryptocurrencies, but it can also be used for identity management and supply chain management. Blockchain is decentralised and secure, but it does have some limitations, such as scalability.

➢ Regardless, the encryption and transparency that Blockchain provides are gaining popularity in a variety of industries. Blockchain simplifies complex financial and banking operations, particularly for the financial industry. Businesses will require full-stack developers to migrate their operations to the blockchain as they become more aware of the benefits.

➢ MetaMask, Embark, Web3j, and Prysm are examples of popular Blockchain development tools.

The Growing Demand for Full-Stack Developers

➢ Full-stack developers are in demand for their ability to work with multiple programming languages and frameworks, such as HTML, CSS, JavaScript, PHP, and MySQL.

➢ They are also in demand because they can quickly and efficiently develop user-friendly and secure applications.

➢ Additionally, the demand for mobile applications will continue to increase, requiring full-stack developers to create and maintain mobile applications.

➢ The demand for full-stack developers is expected to increase due to the emergence of new technologies such as blockchain and the Internet of Things.

Future Scope of Full-Stack Developers

➢ According to a LinkedIn report, the demand for full-stack developers has increased by 35% yearly since 2015. According to another report from the US Bureau of Labor Statistics, the number of available jobs for these professionals will increase from 135,000 to over 853,000 by 2024. So, in addition to the numerous job opportunities available, this particular career path is among the highest-paying.

Benefits of full stack development services for your enterprise

1. Improved team management

➢ It is straightforward to start up since a group of full stack developers form a team to initiate a full stack development strategy. It means, they'll communicate more effectively, be more transparent and listen to one another's views more intently.

➢ Managing a full-stack development team is a lot easier than managing a group of individual developers. Furthermore, it improves team dynamics and reduces team burden, making everyone more comfortable in the process.

2. Cost-effective development

➢ Affordability is one of the crucial reasons why enterprises choose to hire a full stack development company. Hiring individual developers or professionals and managing them is a time, money and efforts investment.

➢ Full-stack web developers will take control of everything for you. Full stack developers can work on every part of your project if you're producing a minimum viable product (MVP). It will save you a substantial amount of time by eliminating the need to hire independent developers repeatedly.

3. Multiple technology expertise

➢ A significant advantage for your company is to hire a full stack developer with multiple technology expertise. It reduces your organization's dependence on several developers for a single product.

➢ Moreover, you can opt for different tools and technologies to build your unique product and choose the one which best fulfills your requirements. Their technological competence gives them an unbeatable ability to

make product updates and modifications at a faster rate compared to independent developers. Thus, working with a full stack developer associated with a service provider is an efficient web development move.