MiM 2020-2021 Period 4
1 credit

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MiM: Exponential Digital Technologies

Introduction

Just until recently Information Technologies (IT) was confined to the caving academic and business arenas of Systems Departments. Business typically saw IT as the "no-land" and a show-stopper for growth, dealing with such growth more as a risk than as an advantage. Academia focused on IT research with tangential organizational impact analysis. This situation changed with the advent of Digital and its foundational paradigm shift: IT was accessible and affordable to people and companies thanks to three key technologies and their combinational paradigm: cloud, mobility and platforms. Companies that made Digital strategic to their core organization fostered unprecedented business competitiveness, challenged incumbent industries and businesses, and at times eradicated long-standing business moguls, the latter being disruptive.

A Digital Transformation (change) plan to accommodate Digital disruption is no longer an advantage, it is just a foundational basis in which to operate day-by-day that does not serve a future or near-by purpose, which is to meet the exponential growth of data-driven companies. Digital Transformation plans are "must-haves" from the recent past which now must include digital technologies that accelerate change to meet exponential growth. Business managers must understand what are the general purpose digital exponential technologies that can help them meet exponential growth in their specific industries. The question is, what are those technologies that foster exponentiality and how can a business manager include them in the organization? The answer revolves around Digital Density which is the percentage of connected data that is available per unit of activity – such activity can be a country, a region, an industry, an organization, etc. Such Digital Density relates to data connected via processes that allow information flows and interactions of physical entities that can be remotely observed, monitored and/or controlled.

Objectives

The specific objectives of the module are:

- Describing Digital Density and GPTs– origins and fit into Digital to better business manage the upcoming exponential organization
- Understanding the three most relevant foundational digital technologies: AI, BC and QC
- Explore ethical topics around Digital
- Get some advice on how to potentially get hired by top Digital companies

Competences

Basic Competences

- CB7. The students know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
- CB8. The students can integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.
- CB9. Students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to specialized and non-specialized audiences in a clear and unambiguous way.
- CB10. Students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.

General Competences

- CG1 - Listen, understand, and contrast the points of view of others to make an objective composition of a business situation. Communicate in a structured and persuasive way. (Interpersonal communication).
- CG2 - Work effectively in multicultural teams, assuming the leadership of a project when required. Integrate the value of diversity in the decision process and teamwork. (Ability to work in multicultural teams).
- CG3 - Critically evaluate the information and the context of a business situation to reach its own conclusions for making prudential decisions. (Critical thinking).
- CG4 - Acquire the self-knowledge and self-control necessary to work effectively in professional environments under pressure, understanding the motivations of others and the culture of the company. (Emotional intelligence).
- CG5 - Apply proven ethical criteria in making business decisions, respecting the intrinsic dignity of each person and the achievement of the common good. (Integrity).
- CG6 - Develop a proactive and open mindset to organizational change in order to design and promote process improvement initiatives and facilitate one's ability to adapt to new organizational cultures. (Innovative spirit).

Specific Competences

- CE03 - Analyze and design optimized customer-oriented operations and logistics systems, according to the principles and applicability of the Lean philosophy (eliminate what does not add value).
- CE04 - Design strategies for product and service operations optimizing the supply chain by applying the theory of restrictions (TOC), input-output analysis and queuing theory.
- CE14 - Identify the mechanisms of team management that generate an environment of collaboration, communication, trust, and achievement of the common goal.
- CE16 - Apply strategic principles and tools in order to align the development and commercialization of a brand's products and services with the needs and desires of its customers ("Customer Centricity").

Content

The content is delivered in academic and interactive sessions that take shape in the form of lectures and case studies taught by IESE professors and technology experts coming from top companies.

Extracting value from the new billions of connections between computers, tablets, smartphones and sensors requires a different approach to managing data. Connections between people, providers, clients and things are now permanent and there is no longer a

clear distinction between the off-line and on-line worlds. Also, the cost of data management continuously decreases, making computation cheaper and thus more accessible to the general public fostering digital democratization. The Digital Density Architecture allows for a dynamic use of the capacity required to manage such data, which in turn results in the need of designing and operating new business models. These new business models impact organizations creating the Virtual Circle of digital transformation permitting the on-going creation of new business models. In fact, the key characteristic of Digital Density is that it reshapes business models and organizations.

The Digital Density Architecture interconnects the physical and digital worlds, and the business logic via a layer model (see Figure 1). The bottom layer is the physical world including organizations, people and things. The connection layer relates the physical and digital worlds. A typical organization connects to the digital world by digitizing processes (e.g., enterprise resource planning (ERP), customer relationship management (CRM), etc.). The people are connected through human machine interfaces (HMI) like webs and applications. Things are connected through sensors that gather data on their state, like temperature or speed, or through actuators that change such state like generating acceleration. Finally, the layer above connects to the digital world and in turn to the business logic.

General Purpose Technologies (or GPTs) refer to the role of technology in fostering transformational economic growth such as the steam engine, electricity, information technology or the internal combustion engine. These technologies impact the whole economy but their productivity gains do not occur upon their arrival to society and business. There are three distinctive characteristics of GPTs:

- Pervasiveness – referring to the wide spread of the technology across most sectors
- Improvement – the improvement of the technology over time with a continuous decrease in costs for the end-users
- Innovation spawning – the technology makes it easier for ulterior inventions resulting in new products or processes

Following the characteristics of GPTs described above, there are three main GPTs that are exponential: Artificial Intelligence, Blockchain and Quantum Computing. Other digital technologies certainly do affect exponentiality, but the premise for this module is that they are not as foundational to exponential change as the chosen ones and therefore will not be explored. These technologies exhibit non-exclusivity, such as Classical Computing also being part of the 2nd wave of data contributing (and actually being essential) to Quantum Computing development and application. The exponential technologies that build the Digital Density Architecture act as a basic infrastructure for the data to be turned into value. These exponential technologies can be General Purpose Technologies or industry-focused ones providing specific value to end-user needs. Also, following the Digital Density Architecture and its explanation of the layers, one can associate GPTs that are exponential to such layers as follows:

- GTPs that are exponential connecting the physical world layer and the connection layer:
- Organizations that digitize their processes can use the exponential technology Blockchain to scale up digital density associated to automated processes
- People that use HMI interfaces can use the exponential technology Artificial Intelligence to scale up digital density associated to decision making
- GTP that is exponential at the digital world layer:
- Processes, HMIs, sensors and actuators can use the exponential technology Quantum Computing to scale up the growth of digital density associated to much higher capacities in storing and processing of data

Evaluation

Participant evaluation results in “Pass/No Pass” based on two ratings:

- participation and attendance (30%)
- a 1-page essay write-up to be uploaded the day before each session (20%) where the participant describes his/her own view on each one of the topics discussed in response to two questions:
    - Summary of the topic
    - Current and future applications and challenges
- a Final Multiple-Choice Exam at the end of the 2nd Module (50%)

The IESE Business School's Honor Code and Learning Partnership apply to all activities in this course. For individual assignments, unless explicitly stated, you should not interact with anyone else. For deliverables to be done in teams you should interact only with the members of your team.