Emerging technologies

A continuous journey …. Always accelerating

Different concepts can be given to define and "Emerging technology"
Among them a straightforward is to associate the emerging technologies with their capability to change a current ecosystem, the way of doing.

Several characteristics can be sketched

- The underlying promise to support a disruptive vision is a strong differentiator
- Most of the time they don't start from a blank page but rely on older technologies that are still incubating.
- The domain they cover is fairly …infinite (Hardware, Software, Cognitive/IA, Analytics, Medicine, Nanotechnology, Robotics, Aeronautics ….)
- Evolution of other technologies landscape can sometimes be a strong enabler (Acceleration due to the emergence of cloud).
- It is a continuous journey that keeps accelerating
- Not all of them will sustain an industrial life

Some decades in my life:

- In **1978** :My parents have a telephone at home, with 7, 8, 10, numbers. Using it is really costly (especially WW)
- In **1988** : We have a Minitel at home. ("11" to have the French Citizen Directory was a key innovation , and such and evolution of the WhitePages. btw it enabled new usage as only the first 3 minutes were free   )
- In **1998** : I have a Mobile Phone.
- In **2008** : I have a SmartPhone.
- In **2018** : I have a Personal Assistant taking care of me/my home.

Different models can be drawn to map the technology changes with its market reach or it the underlying expectations we have in them
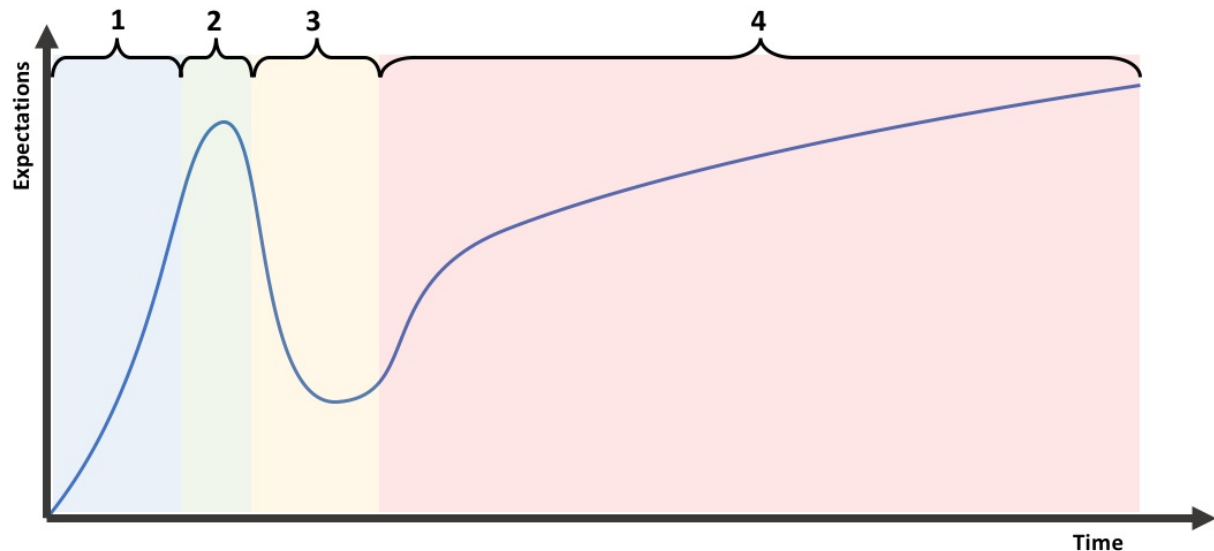
Invention, Innovation, Diffusion, …

Invention: A new idea emerges.
Innovation: THe idea is transformed into a 'useful' (marketable?) to society solution
Diffusion: The usage of the product is spreading

Imitation: Competition can try to take market-share by copying/enriching/re-envisionning the product

Hype Cycle

This model draws the evolution of the interest for emerging technologies

Phase 01 - **Innovation Trigger** : The technology emerges as a 'good idea'. At this stage it is usually a prototype, a promising vision.
Different factors can explain why a technology is triggered

- Disruption/Innovation : The level of disruption id brings to the market answering current concerns or envisioning future usage
- The Brand/Team that support the technologies (Commercial "R&D" from companies)
- …

Phase 02 - **Peak of Inflated expectation** : A "buzz" is generated over the innovation. Lots of initiative arise to develop new product on this technology

Phase 03 - **Trough of desillusion** : The "so what ?" phase occurs when first implementation don't meet the high expectations.. At this stage some technology may be stopped (or postponed before rising back).

Phase 04 - **Slope of enlightment** : The industrial application of the technology is developed.

Phase 05 - **Plateau of productivity** : Technology is now mature. The scope of application can vary from a niche market up to a new industry standard.

Because they are a simple representation of a 'Point Of View' on the technology, this type of

curve is often used as communication mean (See Gartner Group and can be challenged. https://www.gartner.com/technology/research/methodologies/hype-cycle.jsp)

As an example, from 2015 … 2018 (as per the Gartner Group Emerging technology HypeCycles perpective)

- IoT Platform have emerged and expectations are currently inflating
- Autonomous vehicle after a peak of inflated expectation positioning they adoption within 5/10 years in 2015 seems now to be positioned since 2016 as arriving to maturity in more than 10 years, associated with disillusion (currently)
- Blockchain applications are challenged
- Machine Learning (and its cognitive application) conserves it high expectations

Our 2-Days Journey

The perspective for the Emerging Technologies for this course will be around the revolution on IT platforms required to support Software disruption : **The Emerging Technology of the Cloud Computing. - A journey in the Cloud**.

The objectives of this journey is to understand how Cloud transformed IT solution delivery:

- Technology consumptions
- Capabilities at our hands (Cognitive, Web, API, no SQL…)

What it is not : A formal lecture on how disruptive the cloud is, blablaba… A course on How to code in nodeJS..

What it is: Hand-on sessions in order to capture what is cloud, and how to operate it thru easy implementations around

- A noSQL Data Repository
- Cognitive capabilities (Real time translation, language detection, Personality profiling)
- APIs to be integrated with the external world
- Implemented in a seamless Build and Deploy approach
- Hosted In the cloud !! (2-clicks provisioning, Scalability…)

Your deliverables :

- A project implementing what you have learned : From a provided baseline, you will be able to enrich it with as many services you want. **_The more you have, the better is is!_**
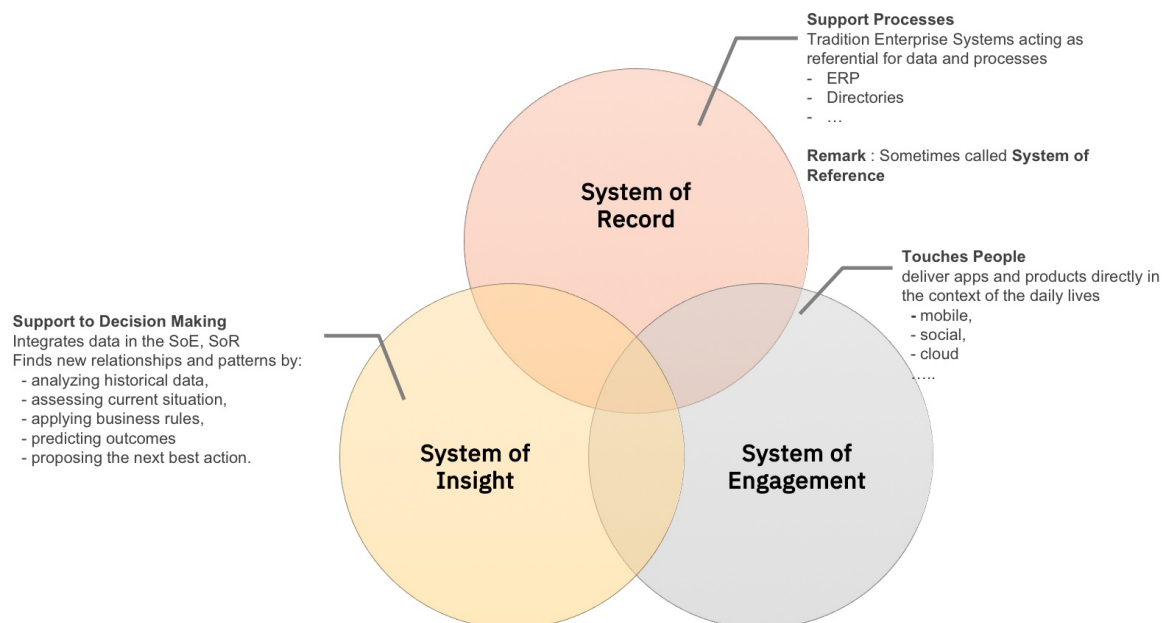- a 10-pager max report stating

An introduction – The App Revolution !

Web and mobile has totally transformed the way we consume applications:

- Application are positioned everywhere, and seamlessly (Business, PErsonal Life, Social Life)
- End user oriented: Not only User Interface but also User eXperience
- From massive, "All-in one" , vertical corporate applications /web sites, to agile, atomic, API-based applications.

SoR, SoE, SoI: Different types of applications, Different concerns, Different Challenges

Support Processes
Tradition Enterprise Systems acting as referential for data and processes
- ERP
- Directories
- …

Remark : Sometimes called **System of Reference**

System of Record

Touches People
deliver apps and products directly in the context of the daily lives
- mobile,
- social,
- cloud
…..

Support to Decision Making
Integrates data in the SoE, SoR
Finds new relationships and patterns by:
- analyzing historical data,
- assessing current situation,
- applying business rules,
- predicting outcomes
- proposing the next best action.

System of Insight

System of Engagement

Applications are everywhere !

- New ways of interacting between client and providers: Web application, Mobile Application,Wearable, IoT
- New ways of interacting between applications : The API Economy
- New domains : Cognitive computing, Big Data
- New ways of implementing : Development to Operation cycle, Agility, Velocity, FailFast !

Application Design and Delivery has been reshaped : It is about speed and choice ! :

- Self Service tools to address the E2E design, implementation, and run

Developers' expectations have evolved.

Developers now expect:

- To be able to deploy updates to their applications in **seconds**
- To write their code in **whichever tool or language** they choose
- To be able to **continually integrate** working copies of code into a shared mainline at multiple points during the day
- To **focus on writing code**, not on the administration of servers, virtualization, operating systems, and middleware.
- To **"fail fast"** - or ensure applications fail immediately and visibly to speed debugging and fixes
- To **integrate useful APIs** into their applications

> who wants to write code that's already been written and tested?

- …

This is all what this journey is about

A brief history of Cloud

Some Definitions

Cloud : in the IT acception, can be seen a style to deliver computing capabilities under several promises to external customers using Internet technologies

Cloud Provider : The party that provides cloud-based IT resources is the cloud provider.(IBM Cloud in these sessions)

Cloud Consumer : The party that uses cloud-based IT resources is the cloud consumer. (YOU in these sessions)

Cloud Service : Any IT resource that is made remotely accessible via a cloud. (WHAT you will use in these sessions)

Since when servers, software, infrastructure,… are represented by … a cloud ?

hmmmm, tricky question.
By definition,

> **cloud:** *noun*
> a mass of something such as dust or smoke that looks like a cloud: A cloud (Cambridge Dictionnary)

The definition of an IT cloud is not well established. So ….

My proposition: The term *cloud* is commonly used to describe an consolidation of objects that visually appear from a distance as… a cloud. Early used in IT as a metaphor of the Internet in computer network diagrams as an abstraction of the underlying infrastructure it represents. As a "Cloud" it is now a bag of so many thing : Infra, Servers, Network, Capabilities, Software…..

Technology Drivers

Cloud is not an ex-nihilo invention but an evolution from IT computing since the 50s.

1950s: Mainframe : a central computer accessed through 'passive' terminals

1970s: Virtual Machines: Hardware is 'virtualized'. More operating system can be run in a single isolated environement (For ex. The linux VM we will use in these session)

1990s: Several distributed initiatives emerged

- Grid computing
- SaaS (Online Services)
- Virtuliazed Private Network (VPN) - Sharing Common Physical infrastructure in full confidentiality
- Service Oriented Architecture
- Clustering
  2010s Emergence of new approach to deliver IT: IaaS, SaaS, PaaS, Containers, API Economy…

Business Drivers

1 - Capacity Planning

Capacity planning is the process of determining and fulfilling future demands of IT resources. It is summarized as the maximum amount of processes that an IT resource is capable of delivering in a given period of time.

The challenge is to correctly balance the resources' capacity to the End user demand (Risk analysis to be done per application type):

- Avoiding service disruption due to to small capacity
- Avoiding overcapacity infrastructure that is not used.

Different strategies for different risks:

- **Lead Capacity Strategy** – Strong anticipation of the demand
- **Lag Strategy** – No anticipation : IT resource is provision when its full capacity is reached
- **Match Strategy** – Trade off by relying on small increments

2 - Cost Reduction

Costs can be split in

- **Acquisition Cost**
- **Operating Cost**:
    - Technical personnel required operate the environments
    - Licenses Costs
    - Run Cost (Power, Cooling)
    - Access and security…
    - Administration (License Management…)

3 - Support of the Digital Transformation

More organizational agility is required to adapt and evolve to successfully face change caused by both internal and external factors

Benefits of going in the cloud

1 - Reduced Investments and Proportional Costs

2 - Scalability as clouds can instantly and dynamically allocate IT resources to cloud consumers

2 - Availability and Reliability

Challenges of going in the cloud

1 - **Reversibility and Portability Between Cloud Providers** What do I do if I want to change my Cloud provider ?

2 - **Control over my computing capabilities** Public Clouds are centrally governed by Cloud providers

3 - **Security Vulnerabilities** AS we moved the data from a Private, totally mastered Datacenter to the Public/Private/Hybrid Cloud

4 - **Legal compliance** Depending of the location of the cloud Datacenter some legal issues can raise (such as maintaining the data within a geo)

##The Promises (Expectations) of the Cloud

Cloud in the IT acception can be seen a style to deliver computing capabilities under several promises to external customers using Internet technologies :

1 - **Instant Provisionning**

- Target end-users can provision IT capacity without administrative/human involvement

2 - **Multitenancy (and resource pooling)**

- Different customers can consumes the same resource exposed by the provider in total confidentiality

3 - **Elasticity**

- It is the the automated ability of a cloud to transparently scale (UP and DOWN) IT resources to map the demand/request

4 - **Measured usage**

- Usage of the platform is monitored and billing is (most of the time) aligned to the consumption of the resources

5 - **Resiliency**

- Cloud service enable architectural pattern allowing to avoid/reduce to a minimal time the potential disruption

Cloud delivery Model

A cloud delivery model represents a pre-packaged combination of IT resources offered by a cloud provider.

Three common cloud delivery models have become widely established and formalized:

1 - Infrastructure-as-a-Service (IaaS)

Infrastructure as a Service (and specifically IBM's acquisition of SoftLayer) was the cloud's initial answer to the need for faster deployments, faster environment setup, etc… by abstracting the infrastructure from the customer.

2 - Platform-as-a-Service (PaaS)

In a large number of use cases, customers want to move even faster and don't need to spend the time managing the platform (VM, OS, Middleware, Runtime).

3 - Software-as-a-Service (SaaS)

A software program positioned as a shared cloud service and made available as a "product": For example : A mail Platform

Cloud deployment Model

1 - Public Cloud

A public cloud is a publicly accessible cloud environment owned by a third-party cloud provider.(Hint : The cloud we will used in these session is one of them)

2 - Private Cloud

Private cloud is owned by a single customer/organization and usually hosted on Premises. It is a way of addressing some challenges raised as risks above

A new evolution is the **Virtual Private Cloud** – Also known as a "dedicated cloud" or "hosted cloud," this model results in a self-contained cloud environment hosted and managed by a public cloud provider, and made available to a cloud consumer

3 - Hybrid Cloud: The principle of reality   . It is a consolidation of the Pros and Cons of Public and Private Clouds, interacting with on Premises/legacy Data Centers of the customers

##References

Reference	Description
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