Adapting Service Delivery for Quantum Programming

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Abstract. Brief presentation to summarize the possible and predictable changes and challenges that service delivery needs to support to adequate to the quantum programming and other general quantum technologies.

Keywords: Service Delivery; Quantum Programming

1 Context

Context about the present service delivery and the state of the digital transformation in IT. Presenting the current situation of service delivery, the need to improve and expand IT services, driven by the digital transformation and digital world, including a brief summary of tendencies and innovations such as:

- Cloud: Organizations are moving services to the cloud driven by various reasons, such as economy, high availability or flexibility.
- New Standards, laws and frameworks: Agile frameworks, new technologies and worries has created a new set of standards, frameworks and new laws. These new items are shaping the current service delivery.
- AI: artificial intelligence, machine learning, deep learning, etc. The AI arrived at IT services and its use is increasing exponentially. We need to understand the utility and challenges this is creating.
- IoT: Internet of things is maybe one of the flagships of the digital transformation. Connectivity and online IT services needs to be delivered, maintained and improved for every device joining the internet. This is creating a high number of troubles with security, availability and compatibility.
- 24x7: Current services are defined for the need of high availability. Users demand access at all times and services providers need to cater this requirement.

2 The evolution of IT Services

A brief exposition of the evolution of IT services and the prediction of its future. Talking about the different phases' services have suffered and trying to predict the possible future phases.

"Life services" of IoT and daily life are going to increase, permeating every aspect of life, work, health, sports, leisure, education, etc. We need to understand this possible reality and prepare to the needed changes. Quantum programming is becoming a reality and can make that the digital transformation takes a new level of deep.

3 What is going to change

A brief summary of the different IT services and service delivery aspects that are going to change to adapt to the quantum programming and engineering. We must face and prepare to meet these challenges.

3.1 Services

Current services will improve thanks to quantum programming. We need to understand this need to be treated as part as the future service delivery. This new technology will enable us to surpass the limits of our current services:

- Improved output: quantum programming and engineering will open the door to maximize output and remove limitations, as it could be used to access, generate and compute data faster using parallelism.
- Real time: current concept of real time is hard to describe as "real" real time. Queues implemented in the services, maximum channel capacity, etc. to protect the stability of services could disappear as a necessity thanks to quantum programming.
- Better statistics: Profiling and statistics could use all the data in real time. We can prepare services to enable "perfect" decisions based on the actual experience of the service and users. Also, this can be applied to improved predictions of future data.
- Real AI: Existing AI is still a prototype of what we envisioned as AI in the past. Using improved inference engines, learning and data, we have created an AI that simulates intelligence, but it's still bound by most of the classical constraints of time and data quantity to take decisions. Quantum programming may be the birth of real AI, an AI so fast in evaluating predictions, all the predictions, that could really surpass our own software engineering.

3.2 Architectures

Business and IT architectures are prepared for the actual technology, frameworks and processes used to operate and deliver IT services. Quantum programming will bring as we have previusly discusses changes to IT services. Those changes will impact the Business architecture and current models as Zachman or Togaf, we will need to change business to understand and use quantum computing posibilities and make use of the improve performance and decision making, these should be reflected in updated architectures and business models.

IT architectures will be impacted deeper, as not only it currents systems should change to assimilate new processes and models, but actual IT infrastructure and platforms need to change. These must be followed by changes in IT architecture understanding and management.

If possible that current hardware limitations in most organizations will further accelerate the current trend of moving infrastructure to the cloud, as organizations will need more memory and data space to allocate the output of quantum programming.

3.3 Agreements and Relations

Quantum programming and quantum computing will modify current services and by correlation we must change the agreements and contracts managing those services. SLAs must be improved to define better the needs for the quantum software development, precision of the data to be produced and managed. We must also consider changes relating privacy with clients, as quantum programming can produce data that can generate high risk of be consider PII (personal identifiable information), as it could be really be used to generate personal profiling at new levels of understanding.

In the field of agreements, relations with other business units and collaborators of IT should change. Stakeholders of it services must start understanding how to define new needs in terms of formula or statistics to make use of the future IT service capabilities, but to do so, they need to understand these transformation and be aware of the need to change the definition of business service and needs.

3.4 New Roles

Simply put IT and organizations are going to need new roles and people to fill those roles:

- Physicist and mathematicians to help with the intrinsic matrix formulas that quantum programming need for the code.
- Middleware expert to create and integrate connectors between classical software and services with the new quantum ones.
- Process experts to develop the flow of business processes integrating quantum methods.

- Statisticians to study and mitigate the deviation of quantum programming and computing.
- Researchers to study and create new ways to make use of the quantum possibilities.
- Quantum programmers to develop the new code.
- Confidentiality and privacy experts to manage the risk of using quantum programming to generate different types of profiling.

3.5 Data Management

Service data has been managed by classical databases until the apparition of Big Data. Big data enabled us to manage a larger quantity and more disperse types of data, but services are still limited by the constrains of queries speed and hardware. Quantum programing parallelism and concurrent capabilities should be exploited to let us create the concept of bigger data, managing all our data, information and knowledge all at a time and letting us correlate everything. Maybe even, we should prepare to create "The biggest data", were we can manage not only our data, but all the data of various organizations maximize the use of the information.

3.6 Risk

As we have explained in previous points, the new quantum programming can bring many ways of improving the service delivery, but it will also bring new risk and dangers.

We must be aware of the risk of managing colossal amounts of data, the deviation caused by quantum programming and computing, the uncertainty of using the correct quantum circuit and not being able to test all the outputs, failure and hardship to connect classical and quantum systems, and, of course, the risk of using the quantum programming for not very noble reasons.

We must understand that the quantum era could bring the end to our current safe IT measures protecting our systems and perimeters. We must prepare for it.

3.7 Quantum Services Open a New Future

Quantum services is the general term for services that today are impossible or hard to deliver, but quantum programming could make it real. Exploit of quantum architecture, programming and systems could make us integrate service delivery seamless in people life, at real time and less cost.

Also, in the end, quantum computing and programming is a half open door at this moment, in time it will make possible and reveal new possibilities and technologies.

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