DARQ – Distributed Ledger Technology, Artificial Intelligence, Extended Reality and Quantum Computing

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***Abstract*—DARQ is going to make the new era of technology in all fields of science. With DARQ we see the new era of medical science with the use of quantum computing with artificial intelligence for the treatment of people. DARQ gives a new revolution to computing by making it fast processing, it gives a new era of internet speed, and data encryption. Position your business for leading the post-digital era by finishing your digital transformation. Next, determine which DARQ technologies are best suited for your customers' needs and then decide how to access them. That may mean building your own AI engine or buying an existing engine. As you hire new employees, carefully consider their skills related to DARQ technologies and how they can help create the experiences customers will soon expect.**

***Keywords*—Distributed Ledger Technology, Artificial Intelligence, Extended Reality, Quantum Computing, Qubit**

I. INTRODUCTION

You use social media to interact with the customer. Employee collaborates with each other over mobile technology. Digital technology now gives you a clear picture of what you want and need. And cloud computing shows your team real-time view of the same data, regardless of location. As you finish digital transformation, the customer now increasingly expert this level of services and automation. Its no longer impressive or competitive advantages to simply use the emerging technologies. Very soon, we will be living and working in a post-digital world [1]. We are now at a turning point. Instead of focusing on adopting and using these foundational digital tools, it's time to look to the next phase your enterprise will likely no longer land opportunity and customers simply from being a digital business. Success will shortly be defined –if it isn't already-by how fast enterprises can master what Accenture can DARQ technologies: Distributed ledger Technology (D), Artificial Intelligence (A), Extended Reality (R), and Quantum Computing (Q) [2]. According to Accenture in 2019 the 89 percent of the company is using one of the following technologies.

Distributed Ledger Technology (DLT)
By providing the backbone for new technologies, such as cryptocurrency and Blockchain, DLT lets consumer and businesses control their data and contact transaction in a manner previously not possible. With a single source of truth, people can securely conduct the transaction and collaborate on a large scale with strangers. DLT gives enterprises to control and verification of data.

Companies are increasingly using DLT for self-executing contacts, which can be used for a wide range of purposes, including travel insurance, rental properties, and financial investments. For example, a small contract for trip insurance automatically deposits the refund into the traveler's account if the flight is canceled by the airline or other set conditions are met. To help reduce privacy concerns, social media networks will likely integrate DLT into their platform to give users control of who sees and uses their data.

A. Artificial Intelligence (AI)

The business now can process large amounts of data to get insights to streamlines the process and make data-based decisions [3]. By automating tasks, enterprises are reducing errors and giving employees time for tasks that require creativity or working with customers. Accenture used AI in its "Specialization at scale" program to create teams based on employee skills and specialization instead of relying on self-reporting for a 93 percent accuracy rate.

B. Extended Reality (XR)

People are impressed with new experiences and new ways to interact with the world. XR helps businesses provide value to their customers through these new experiences, which are immersive, on-demand and hand-free. Instead of offering expensive and time-consuming training on new equipment, employees can learn to safely operate machines using XR technology. Employees can also collaborate from a separate location in ways previously not possible, such as working on the design phase of new products. With XR, entertainment audiences can even interact with characters and become immersed in the functional world on screen. As 5G technology becomes more widespread, companies can use XR to its full capacity, such as powering realistic online shopping to virtually "try on" clothes. However, for XR to reach its full capacity the current challenge of network connectivity, application development and processing power must be overcome.

C. Quantum Computing (QC)

With this emerging technology, researchers will be able to solve the computational problem that was previously impossible. As the least mature of the DARQ technologies, the Quantum system is still too fragile and expensive for most companies. However, new affordable systems are being developed as well as the ability for businesses to access the Quantum system over the cloud, making the technology more

accessible. Quantum computing will likely power many new advancements in chemistry and materials science, resulting in new drugs and product advancement. Other uses include traffic optimization, supply chain, logistics, and cybersecurity.

II. DARQ

DARQ is a combination of distributed ledger technology, artificial intelligence, extended reality, and quantum computing.

A. Why DARQ Matter?

New technologies have always acted as catalysts for change. Why? Because they consistently deliver extraordinary new capabilities for businesses. Each of the four technologies that make up DARQ will be used individually by businesses across the economy to differentiate their products and services [4]. In fact, individual DARQ technologies are already making a difference across industries today. AI plays a critical role in optimizing processes and influencing strategic decision-making. XR, an immersive technology, creates entirely new ways for people to experience and engage with the world around them. Distributed ledgers are perhaps best known in the context of cryptocurrencies, but they are expanding networks and capabilities by eliminating the need for trusted third parties. And quantum computing, the DARQ technology that remains the most experimental, will usher in novel ways to approach and solve the hardest computational problems. But collectively, the DARQ technologies will also power the innovation and opportunity uniquely associated with the coming post-digital era. As the business landscape transitions into a combination of digital natives and businesses well into their digital transformations, DARQ is the key that will open unimagined new pathways into the future.

B. What DARQ Will Do?

History has shown that when sets of technologies like these converge over a short period of time, they can spark a massive change, letting businesses reimagine entire industries. DARQ will have the same game-changing effects [5]. Companies already recognize the power of DARQ. Eighty-nine percent of businesses are currently experimenting with one or more DARQ technologies, expecting them to be key differentiators, and are substantially increasing their DARQ investments. While each of the individual emerging technologies that make up DARQ are at a different point on the adoption curve, it's clear that the first wave of companies using DARQ technologies to drive differentiation is already here. Once the collective power of DARQ begins to manifest itself, it might be too late for adopters who lag behind to catch up. DARQ will let leaders in the post-digital era reimagine their businesses. Being ready to harness the full power of DARQ in that post-digital future means beginning the journey today. Figure 1 shows the relation of DARQ with other technologies.

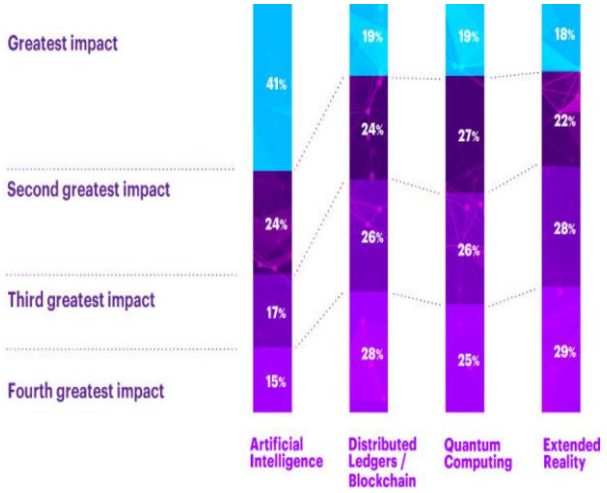

Figure 1: DARQ Relation with Other Technologies

III. DISTRIBUTED LEDGER TECHNOLOGY (DLT)

Distributed ledger technology (DLT) is a digital system for recording the transaction of assets in which the transactions and their details are recorded in multiple places at the same time. Unlike traditional databases, distributed ledgers have no central data store or administration functionality [6]. In a distributed ledger, each node processes and verifies every item, thereby generating a record of each item and creating a consensus on each item's veracity. A distributed ledger can be used to record static data, such as a registry, and dynamic data, i.e., transactions. This computer architecture represents a significant revolution in record-keeping by changing how information is gathered and communicated.

A. Origins of Ledgers

Ledgers, which are essentially a record of transactions and similar data, have existed for millennia in paper form. They became digitized with the rise of computers in the late 20th century, although computerized ledgers generally mirrored what once existed on paper. However, throughout history, a central authority needed to validate the authenticity of the transactions recorded in the ledgers. For example, banks need to verify financial transactions. Now, 21st-century technology has enabled the next step in record-keeping with cryptography, advanced algorithms, stronger compute power and near-ubiquitous computational power, making the distributed ledger an increasingly viable form of record-keeping.

B. Distributed Ledger Implementations

Blockchain, which bundles transactions into blocks that are chained together, and then broadcasts them to the nodes in the network, is probably the best-known type of distributed ledger technology [7]. It powers Bitcoin, the digital currency created in 2009. Bitcoin is also known as being a peer-to-peer network. There are 5 steps in the execution of Blockchain

1. Transaction: Two parties, A and B, decide to exchange the unit of value (digital currency or a digital representation of some asset, such as land title, birth certificate or education degree) and irritate the transaction.

2. Block: The transaction is packaged transaction thereby creating a "block". The block sends to the blockchain system's network of participating computers.
3. Verification: The participating computers (called "miners" in the bitcoin blockchain) evaluate the transaction and through mathematical calculations determine whether they are valid, based on agreed-upon rules. When "consensus" has been achieved, typically among 51% of participating computers the transaction is considered verified.
4. Hash: Each verified block of the transaction is time-stamped with a cryptocurrency hash. Each block also contains a reference to previous block hash, thus creating a chain of records that cannot be falsified except by convincing participating computers that the tampered data in one block and in all prior blocks is true. Such a feat is considered impossible.
5. Execution: The unit of value moves from the account of party A to the account of party B.

Other entities using blockchain include Overstock.com, the online retailer based in Salt Lake City that delivered a first when it traded stock on a blockchain-based platform in December 2016.

C. Importance of Distributed Ledger

Distributed ledger technologies have the potential to speed transactions because they remove the need for a central authority or middleman. Similarly, distributed ledgers have the potential to reduce the costs of transactions [8]. Experts also believe that a distributed ledger technology is much more secure because each node of the network holds records, thereby creating a system that's more difficult to manipulate or successfully attack. Many also consider a distributed ledger a much more transparent way of handling records because the information is shared, and thereby witnessed across a network, which also makes a successful cyberattack much more unlikely.

D. Distributed Ledger Benefits

Much of the early interest in distributed ledger technology has been around its application in financial transactions. That's understandable, considering that the cryptocurrency bitcoin gained worldwide use, while also simultaneously proving that DLT can, indeed, work. Banks and other finance-related institutions became early innovators in this space, as well. However, DLT proponents say digital ledgers can be used in multiple areas, including government and business dealings, in addition to financial transactions. Experts believe digital ledgers can be used in tax collection, property deed transfers, social benefits distribution, and even voting procedures. They also say DLT can be used to process and execute legal documents and other similar exchanges. Some believe that individuals can use this technology to hold and better control personal information, and then selectively share pieces of those records when needed; use cases here include individual medical records and corporate supply chains. Additionally, proponents say digital ledgers can help better track intellectual property rights and ownership for art, commodities, music, film and more.

E. Future of Distributed Ledger

Whether distributed ledger technologies, such as blockchain, will revolutionize how governments, institutions, and industries work is an open question. Articles in the academic and financial press have questioned whether distributed ledger technologies as they exist now are sufficiently reliable to put into wide-scale use. Issues include the paucity of regulations for this new form of exchange and security concerns.

IV. ARTIFICIAL INTELLIGENCE (AI)

In the field of computer science, artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and other animals. Computer science defines AI research as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals. More specifically, Kaplan and Haenlein define AI as "a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation". Colloquially, the term "artificial intelligence" is used to describe machines that mimic "cognitive" functions that humans associate with other human minds, such as "learning" and "problem-solving".

V. EXTENDED REALITY (XR)

Extended Reality is the term referring to all real-and-virtual combined environments and human-machine interaction generated by computer technology and wearables. It includes representation forms such as augmented reality (AR), Augmented virtuality (AV), Virtual Reality (VR), and the areas interpolated among them. The level of virtuality range from partially sensory inputs to immersive virtuality also called VR. Figure 2 shows that extended reality is a combination of AR, MR, and VR.

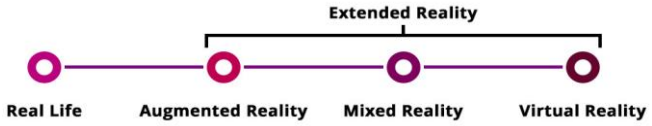

Figure 2: Extended Reality

A. Augmented Reality (AR)

It is the interactive experience of the real-world environment where the objects that reside in the real-world are "augmented" by computer-generated perceptual information.

B. Mixed Reality (MR)

Sometimes referred to as "Hybrid reality", is merging of the real and virtual world to produce new environment and visualization where physical and digital object co-exists and interact in real-time.

C. Virtual Reality (VR)

VR is an interactive computer-generated experience taking place within a simulated environment. It incorporates mainly auditory and visual feedback, but may also allow another type of sensory feedback.

VI. QUANTUM COMPUTING (QC)

Quantum computing is the use of quantum-mechanical phenomena such as superposition and entanglement to perform computations that are roughly analogous to (although operate quite differently from) those performed on a classical computer. A quantum computer is a device (whether theoretical or practically realized) that performs quantum computation.

A. Qubit

As binary digits or bits are the basic unit of information in classical computing, quantum bits, or "qubits", are the basic unit of information in quantum computing. Yet bits are always in one of two definite states (0 or 1), whereas qubits can be in a superposition of the quantum states 0 and 1. The field of quantum computing was initiated by the work of Paul Benioff and Yuri Manin in 1980, Richard Feynman in 1982, and David Deutsch in 1985.

VII. CONCLUSION

It's impossible to predict when the post-digital era will actually begin—and its birth date will likely only be known in hindsight. If you wait to experiment with and integrate DARQ technologies, your company may have to play catch-up for years. You don't want to simply meet your customers' expectations—you want to be the company that changes their daily life and their interactions with the world.

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