



## Impact of Flexible Service Delivery on IT Service Providers in the Industry 4.0 Era

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### ABSTRACT

The digital revolution is a period, where technology and innovation are changing how organizations conduct business and how consumers engage and consume their products and services. This presents both enormous business opportunities and challenges for businesses to adopt new methods of working and the development and advertisement of products. This study aims to investigate the current developments by considering current market trends, technology, business requirements, and strategic approach to provide a digital transformation that impacts services provider's overall business functionality with the aim of enabling organizations to become more adaptive, responsive, and agile in their IT infrastructure, processes and culture. Our research indicates that digital transformation can be segregated into two key groups of technology and analytics in response to internal and external environments. The technology group is fueling the ability to bring flexible strategic change, by offering organizations significant opportunities to grow and transform their processes. The analytics group brings insights that are required to help transform businesses into becoming more adaptive and responsive to their respective environment. It is concluded that the digital revolution provides a significant opportunity for engaging and supporting business from an IT services provider's perspective. They must adapt to the requirements of their stakeholder and follow a collaborative approach, as no single player will be able to deliver all the business and IT change. They also need to adopt a systematic and flexible strategic approach to exploit the short-term and long-term benefits that digital transformations offer. At the same time, they need to sustain their ability to remain agile and quickly react to new technological trends.

### 1. INTRODUCTION

Most industries are facing significant disruption and highly dynamic and complex competitive pressures. Businesses are required to be more flexible, agile and must be able to respond to the changes in the environment. "Executives see the potential for using digital technologies to achieve transformation, but they are unclear on how to get the results" [1]. Many businesses see the achievements of other high-profile organizations and wonder what they need to do to transform and who can help them on their transformational journey. Technology has been a stable solution for driving innovation. However, the development

of emerging technologies has increased in recent years and is now being seen as the greater enabler for change, removing technology constraints and improve business processes.

The technology resolution has changed the way organizations are developing and providing the advantages for the productive output. This transition is so captivating that it is being called Industry 4.0 to represent the fourth revolution that has occurred. Starting from the first industrial revolution (mechanization through water and steam power) to the mass production and assembly lines using electricity in the second. It was extended through the initiatives linked with the adoption of computers and

automation in third [4]. The fourth industrial revolution take [5] what was started in third revolution and enhance it with smart and autonomous systems powered by data and machine learning. (Marr, 2018) The dynamic environment required to have the system delivery approach which will facilitate the changes as progressing. A flexible service delivery model is indispensable for empowering the agility, responsiveness, and innovation desirable for enduring in business today. The designing of the flexible service delivery model revolves around many factors which include the company's approach towards risk adoption, maturity of understanding the circumstances, competitive stance and clear strategic goal identification. (Summarized in Figure 1) The initial stages of and the changing conditions caused by the digital transformation require considerable change in the way businesses acquire and maintain the IT infrastructure for their service delivery and subsequently tackle business challenges. In these regards changes are required, with respect to business processes, new skills, working environment, organizational culture to name a few. However, organizations need to lead from the front and not be led by the technology. Businesses need to seek guidance from IT Service Providers, to develop a comprehensive framework for changes to become more adaptive and responsive in developing resilient IT infrastructure, processes and culture. It also requires taking small steps at a time to evolve a broader, flexible transformational strategy. This research aims to provide a holistic investigation in the future of digital transformation and the impact on service provider organizations, to help awareness and understanding among service providers communities, as this will be critical for future success. In this research, due to the global nature of many IT service provider organizations, the current state of technological trends in IT service delivery and main business requirements will be investigated from a global business environment perspective.

Furthermore, in the context of service providers, strategic technological developments will be studied to ensure a comprehensive study on organizational digital transformation. The main contribution associated with the research is directly linked with the digital transformation which is the key expectation associated with the current digital age with the identification of key disruptive technologies. It is also important to identify the key activities performed by the IT service providers for effective and efficient transformation. The rest of the paper is organized as follows: Section II provides a state of the art. The research methodology, framework and its components are explained in Section III. The findings of the study and its discussion is detailed in Section VII. The paper is concluded in Section VIII with some future research directions.

## 2. LITERATURE REVIEW

The fourth industrial revolution is also known as the digital age, "digitization is far greater than the internet, exponential technology advances and greater consumer power and increased competition means all industries face the threat of commoditization" [5]. Industries are transforming via the use of intelligent software, automation, data and analytics. Tectonic shifts in organizational cultures, resources, talent, business processes are paving new business models. A much overused but simple to understand reference case study [6], Uber revolutionized the taxi industry with the use of innovating software, disrupting how people consumer private hire car services.

The digital revolution is not just the huge step change but more fundamentally a constant development of change or an ongoing transformation to enable customers and industries to achieve greater outputs, flexibility and open up new business opportunities. Many of the large strategy and consulting organizations such as McKinsey, Deloitte, Accenture and Capgemini Consulting have pointed out the fundamental changes, the future operating models, the opportunities and challenges that lie ahead. As there are many different views and opinions on the digital revolution and the direction that organizations should take. A summary of the maturity of industry disruption is summarized in Figure 2.

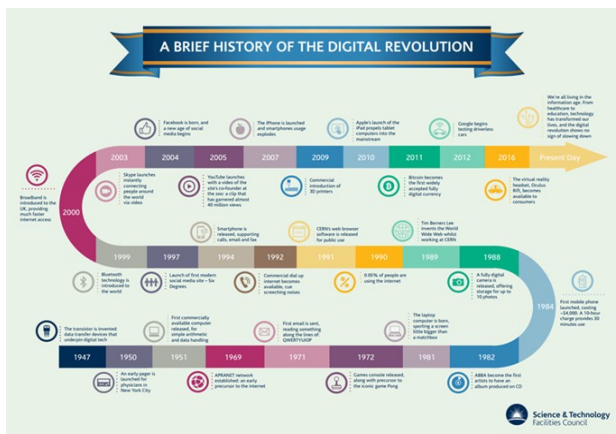


Figure 1: History of Digital Revolution [4]

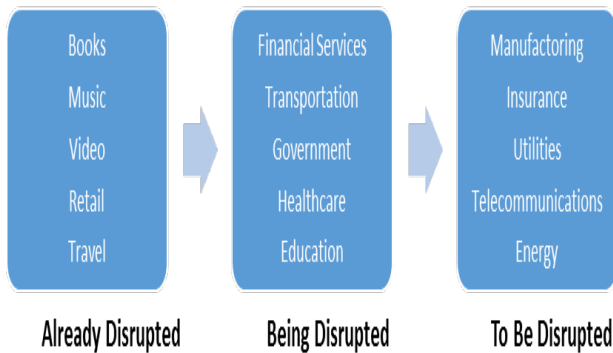


Figure 2: Maturity of Industry Disruptions

The industry 4.0 which is currently shaping, developed the challenges for the companies from the technological, organizational and management viewpoint. The introduction of disruptive technologies introducing significant changes in the way of working, optimization of process with the high competencies expected from employees. The organizations are expected to be more flexible and traditional service delivery approaches are unable to facilitate the dynamic approaches bringing by the Industry 4.0. In association with the perceived challenges organizations continuously exploring the prospects of the application of disruptive technologies and for the long-term competitiveness align with the dynamic environment faced by the organizations now a days. The flexible service delivery concept is important which expect the organization to be more elastic in time and space, with workflows demonstrating more transparent, decentralized, and less hierarchical (Picot and Neuberger, 2014).

It is observed that the literature reviewed above is focusing on the digital transformation approaches available for the consideration with identification of the challenges related to the traditional service delivery approaches to develop the value proposition. The discussion around the value propositions can develop the basic understanding linked with the new prospective technologies and flexible service delivery approach. Adoption of the specific digital strategy allow the organizations to adapt the suitable approach for the value development. The clear identification of opportunities and challenges linked with the digital service providers provide the overall development scenario.

This research focus on the identification of the key technologies which are playing important role in the Industry 4.0. Identification of the industry maturity model based on the cultural, organizational and insight prospects.

It also enables to develop the comprehensive understanding related to the opportunities and challenges faces by the digital service providers.

### 3. RESEARCH METHODOLOGY

This cross-sectional research which is based on the deductive approach comprising of literature, secondary data and expert opinion. The main strategy based on previously identified data sources is focusing on archival research which is directly linked with the identification of drivers affecting the digital transformation in the Industry 4.0 and overall digital revolution. The overarching context of this research was to investigate different disruptive technologies available to accomplish the successful transformation by the IT service providers based on the elements of the digital maturity model. The secondary data is coupled with the views and perspectives across a cross-section of experts coupled with the research by the industry to support the overarching objectives associated with this study. This methodology was chosen to provide a comprehensive understanding related to the current and future emerging technologies which are driving the current digital change within the context of Industry 4.0. Secondly how to facilitate the service providers to manage change and the need to adapt their internal transformation according to the digital maturity model.

The impact of digital transformation to IT service providers is evolving and manifesting new opportunities and barriers, new material is being released on day-by-day bases as the industry matures and improved use cases are developed. This provides the comprehensive data support to conduct the research related to the identification of drivers and what business organizations need to do to facilitate the change. The comprehensive data analysis approach developed to use the data collected. The research context also provides the support in relation to the collection and analysis of data with the researchers' experience linked with it.

### 4. TECHNOLOGY ADOPTION FOR VALUE PENETRATION IN INDUSTRY 4.0

The transformative power of technology has paved the journey to digital disruption. To keep ahead of the consumer demand, technology must accelerate. It has frequently been observed that improvements in computing power have largely kept pace with Moore's Law. After four decades of exponential increases, the world is now doubling an immense amount of processing power in every two-year period, which is leading to astonishing leaps forward in technological capabilities. The combinatorial effects of these technologies mobile, cloud, artificial intelligence, sensors and analytics are accelerating digital

progression at an alarming rate. Figure 3 shows the combined effect of new technologies driving the changing pace [8]. We now look at the emerging technologies that help to understand the development and penetration of value for the focus areas of industry 4.0 i.e. interconnectivity, automation, machine learning and real-time data.

**Digital Platforms:** Digital platforms are service connectors that provide full transparency and enable customers to find the best matching offer without the use of an intermediary [9]. Good examples are Expedia and Uber who own the digital platform, but they don't own hotels or taxis. This is innovating because it interconnects and augments the supply model with access to broader resources, lowers the transaction cost and has an exponential scale with users subscribing to the service with adaptive pricing model based on the supply and demand of the resources at a given point in time.

**Big Data:** Data is the most strategic asset that any organization has today. Big Data is not new and can be defined as data that is too big to be processed via traditional database management tools. Big data has some characteristics, the volume, variety and velocity coupling these together can provide a wealth of information and insight for business on their customers and future development of their services and products.

**Internet of Things:** Internet of Things (IoT) refers to the massive use of advanced sensors and wireless devices communicating in all kinds of physical objects [9]. The industrial scale use of these devices generate volumes of data that can be used for providing granular insight from the digital view of the physical world. IoT is changing the face of industries, cities and the development of future products. For example, the connect car, allow end users to personalize their car, thus allowing car manufacturers more insight into your requirements, using sensors to collect performance and health information of a vehicle. It is also contributing towards generation of huge volumes of the data with different shapes and forms.

**Cloud Computing:** Cloud computing is a pervasive service offering a utility computing service and consumption model. Cloud computing provides convenient, on-demand network access to pools of configurable resources which can be rapidly provisioned with minimal administrative effort [10]. Cloud provide users with some key characteristics, on-demand access to computing services via a self-service portal, pools of resources that can be consumed based on customer requirements, these can include physical or virtual machines or access to a data center is another country. Elastic scalability, the ability to provision resources at

scale when the application demands it and finally measured services, where the resource can be measured and billed based on their consumption. Access to cloud computing has enabled the business to spin up IT or business projects with speed outside of normal IT operations. Gaining access to resources provides agility, time to market, allowing customers to respond to changing market conditions.

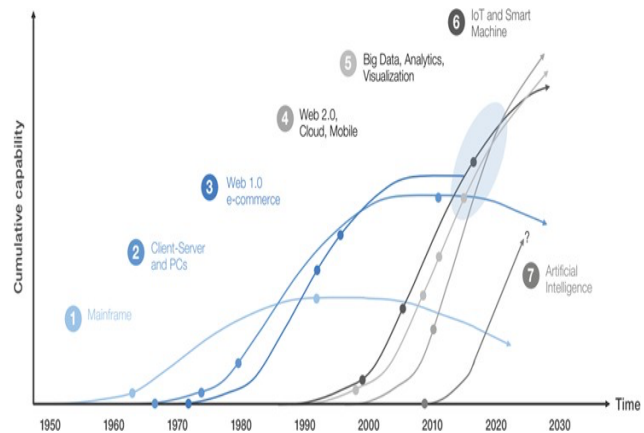


Figure 3: The accumulative effect of technology innovation [8]

Flexibility	With the evolution of the web, social and cloud-based products are now the norm. The evolution of data, digital systems and control need to be viewed and considered through a very different thought process. Almost every application and device can be connected to the internet, connecting to vast pools and streams of data. At this point creating fixed solution doesn't make sense according to Dimension Data [7]. Security needs to be flexible, transparent and driven by the value and importance of the data as it flows through a business.
Risk	The security paradigm has to be reviewed, renewed, and re-enacted to shift away from fear-based to opportunity-based, allowing cybersecurity to provide new value as an enablement tool for businesses and consumers alike. To manage risk and security in the future organization cannot simply shut off the less secure system, it must adapt to include them without compromise. Risk management in digital requires a big picture view, which can protect an entire IT ecosystem overtime [7].
Features	Most consultancy papers point to a potential increase in security needs to support the development of IoT and the interaction between and digital systems.

Table I: Technology Security Drivers

Cloud computing is considered an integral component to the success of IoT.

**Artificial Intelligence:** Artificial Intelligence (AI) has been around since 1950's, however, with the innovation of hardware and software has greatly increased the use of such capabilities with industries. Cloud computing, big data and IoT has fueled the widespread use and adoption of AI at both personal and industrial scale. AI in its narrow



form is very real, and the technology is ready today and is deployed in business today, e.g. Chatbots, responding to human interactions or robots on an assembly line recognizing shapes or products and sorting them. However, its widespread use is opening up application areas in new domains that were not considered suitable for AI applications.

**Blockchain:** The use of Blockchain across industries is increasing with many use cases in financial services, a medical industry where information is shared in an indisputable and irrevocable transaction logging process without the need of a 3<sup>rd</sup> party in the middle to keep the integrity and trust of the information. Blockchain has opened up the ability to share information encrypted or unencrypted in a ledger format that can be scaled across thousands of nodes on a peer-to-peer network. It allows businesses and consumers access to information with the assurance that once written, cannot be deleted or changed. Some of the examples use cases include digital currency, smart contracts, diamond fraud etc.

**3D Printing:** 3D printing is the ability to create physical products through a digital model; this is transforming manufacturing organizations, reducing the need to have large inventory stock of spare parts, thus reducing cost and waste. The ability to print out tools digitally or in large instances print out concrete houses are examples where 3D printing in enabling developing economic worlds with the digital blueprints to self-sufficient.

Category	Areas of Services Opportunity
Business Operations	Process digitization, Efficiencies – BPaaS, Decision making – Analytics, End-user productivity
Customer Experience	Digital generation and engagement, Digital collaboration Personalization and customer intimacy, Speed and Simplicity
Innovation	Develop innovating products, Co-developed IP Product and services, Connected customers and interactions
Technology	Cloud, mobility, IoT, AI, Big Data and analytics, Blockchain, bitcoin, hyper ledgers, Automation and Robotics
Data and Insight	Strategic Marketing with insight, Right data source selection and analytics, Advance predictive analytics
People and Change	Organizational structure, Culture and Communication, Education, Training and development, Talent management and sourcing
Business Models	Transform existing business model, Financial transformation, Shared economy, Enable business to leverage crowd sourcing, Enable mobile e-commerce
Value	Speed and time to market, Help deliver new products to market, Assist business gain market share, Adopt emerging technologies
Digital Platforms	Provide plug and play infrastructure, Digital platforms at scale (AWS, AZURE), Help move from products, build platforms, Trusted and secure services

**Smartphones:** Smartphones developed in the wave of the internet revolution, they are the most successful consumer device ever with over a third of the world's population in 2017 or 2.6 billion connected devices. The smartphone is the center of human eccentricity and consumption of information opening the doors to new application and information. Smartphones have transformed how users interact with businesses, e.g. mobile banking through to social connection and collaboration with WhatsApp, Instagram, Twitter and SnapChat. The emerging wave is using the capabilities of the smartphone as IoT sensors; the ability to connect users with other services, smartphones today can provide GPS information, temperatures gauges, cameras and proximity sensors all capabilities enriching the end user experiences.

## 5. INDUSTRY MATURITY MODEL FOR SERVICE CREATION

Rapid innovations in technology, change in market conditions, changes in regulation and cost pressures are some of the factors affecting digital transformation and are placing a significant strain on all industries today in Industry 4.0 era. We have seen the impact of digital change, with business case studies from Uber to Kodak [12], the digital age has had a profound impact that some well-known industry names are no longer in existence. A quick overview of the various industries and their current status regarding digital disruption is summarized in Figure 5.

A survey of 2,000 executives on the impact, structure, barriers, and enablers of digital technologies across 15 industries [13], reveal that company executives feel that their industry will moderately or massively be impacted by digital disruption. When these industries are segmented (refer Figure 5), the opportunity for business growth and efficiency become apparent with the adoption of pervasive technology. Digital transformation provides industries with unparalleled opportunities for value creation from expanding profit pools, creating new revenue models and enabling unprecedented access to global markets. It used to take Fortune 500 companies an average of 20 years to reach a billion dollar valuation; today's digital start-ups are getting there in 4 years.

The advancement of technology in surging the digital transformation of many businesses, shifting in spending due to changing business priorities and a change in the technology road map, lessening the investment in legacy IT. Organizations are reviewing and piloting emerging technologies to help support this digital strategy. The internet and cloud computing, big data, AI and mobile devices have developed a platform for partners to develop new products and services. By leveraging these capabilities banks can interact to create deeper customer relationship and access new sources of revenue [15]. A summary of the

digital technology forces for which businesses are required to rethink their strategy is depicted in Figure 6b. This technology push is not going away as the most disruptive ones will take at least a decade to develop to become mainstream [16].

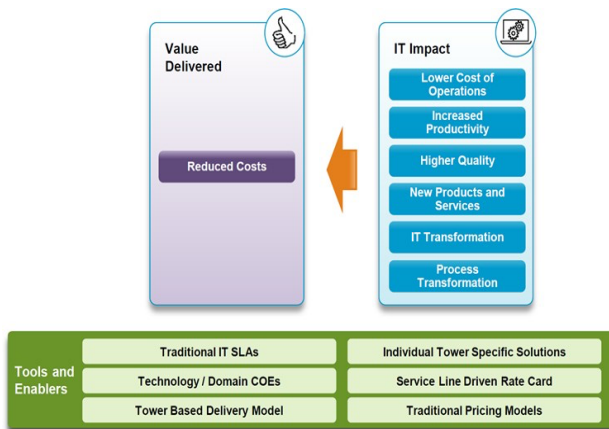


Figure 4 (a): Traditional Service Model

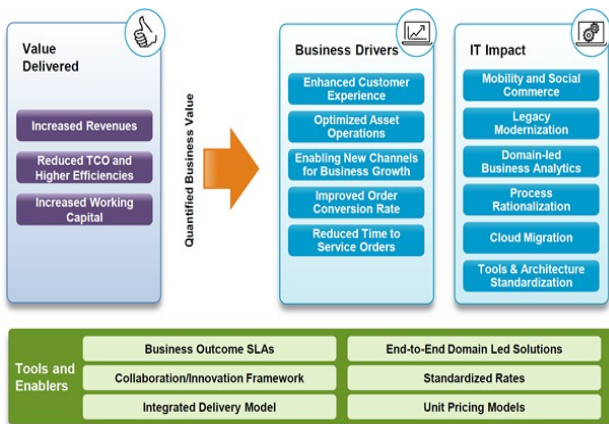


Figure 4 (b): New Service-driven Model [11]

Understanding the maturity by business leaders to assess the current technology baseline and understanding the maturity of the market helps to ascertain future growth and where service providers should focus on the development future digital products and services. The maturity can be assessed in culture, technology, organization and insights dimensions of digital maturity model 4.0 [14] (Refer Figure 6a).

**Culture:** The culture of the organization needs to be assessed and changed to succeed in delivering an end-to-end digital transformation. It requires a clear vision and strategy to articulate and communicate the digital organization strategy. Maturing business is nearly twice as like as less digital mature entities to have a single person or group leading the effort. Also, employees in digital

maturing organizations are highly confident in their leader's digital fluency [17]. Digital fluency, however, does not demand the mastery of the technologies. Instead, it requires the ability to articulate the value of digital technologies to the organization future.

It is important for the organizations to be connected with the new product curve and make it the part of the organizational culture which will be critical for organizations to attract and retain the best human resource to build a comprehensive talent pool [18], [19]. "The ability to digitally re-image the business is determined in large part by the clear digital strategy supported by leaders who foster a culture able to change and invent the new" [17]. What is unique to digital transformation is that the risk taking is becoming the norms as more digitally advanced companies seek to become. What is also important that employees across all age groups want to work for a business that is deeply committed to digital progress [20]. One of the common problems with any transformation is dealing with the psychological behaviors of an organization [21]. It is critical for a program to address the culture and structure of the organization. Breaking down the barriers between silo teams, improving communication, ensuring feedback are listened to and measured for improvement.

**Organization:** An organization expected to have the flexibility to enhance performance by following a dynamic and iterative managerial process where the basic model of management (soft systems thinking) keeps focus on organizational learning which is an iterative process by approach and it will have the main focus on learning within the management [22]. Linked with culture the organizational structure needs to adapt to execute digital strategy, it is key for business leaders to understand what the future structure should look like? Does the organizational model today support cross-function collaboration? Do we have defined and repeatable process to manage digital programs or do we have the necessary skills to support future digital functions?

Maturing digital businesses look and behave differently to their fewer peers, the difference has less to do with the technology changes discussed but with the organization approach and the business fundamentals. They are committed to the strategy and have a stronger will to transform all areas of the business, processes and people to achieve the desired results.

Technology-Security	Cloud Computing	Big Data	Digital Platforms
Security considered as competitive advantage within the solution approach	Competitive costing approach	Considering data as new oil for organisational decision making	Digital platforms integral for business functions
Provide integrated device connectivity	Improved efficiency	Data provides the futuristic approach	Integral for continuous organisational development
Continuous improvement innovation approach	Move IT from a cost center to an internal IT service provider	Act as the change management tool	Stakeholder integration based on internal & external stakeholders
Data-centric security		Future development approach	

Table III: Summary of Themes

Organizations are willing to take more calculated risks to bring a cohesive organization together, managing the distractions, growing the strategy, investing in people and learning on the journey.

*Insight:* Having a baseline of understanding of your business is key, using smart data to derived insight is important to measure maturity and success of a given transformation. Having clear and quantifiable goals for measuring success, ensuring that employees understand how their performance is linked to the corporate digital goals, having easy access to customer information and activity to steer changes in the strategy. The ability to course correct with feedback programs from customers and employees will help organizations understand the maturity with clearly measured goals. IT service providers have a significant opportunity to help the business deliver on the dream of a successful transformation.

## 6. DIGITAL SERVICE PROVIDERS: OPPORTUNITIES AND CHALLENGES

### 6.1 Opportunities

The general business opportunity for IT service provider are centered on a few key areas to help the businesses achieve their cost efficiency goals, optimizing their business processes and assist with organizational and cultural changes. However, there are additional opportunities where IT service providers can bring significant value and impact, help business truly transform. Table III details main key areas where IT service providers can provide greater value delivering business impact and executive engagement.

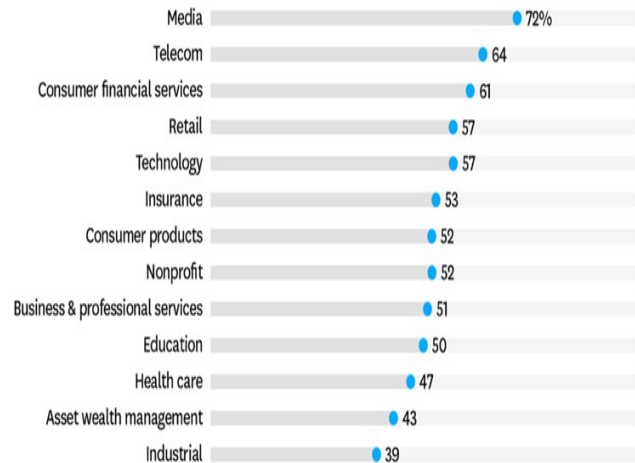


Figure 5: Industries Affected by Digital Disruption [13]

### 6.2 Challenges

To gain the economic and competitive advantage that has been outlined earlier in the paper, there is a need for broader change by business, IT service providers and government bodies.

*Government:* Government and other supporting bodies need to assist and overcome certain challenges to improve growth. Investment in-country IT infrastructure is fundamental to the growth, providing industries with access to reliable high-speed internet connectivity will ensure stable growth of digital technologies. There is a need to re-examine and revise industry regulations and policies, e.g. data protection. Data protection policies are important for multinational business as they regulate the flow of transnational data flow, data ownership and data usage. To support the investment in digital processes and transformation, legacy policies need to cater for the digital world, catering for new types of data sources. Government and industries need to harmonize their policies and regulations which will help the development of digital across the global and multinational business.

Digital transformation brings a new challenge for the requirement of different skills for the future, according to and therefore governments and businesses need to foster education. The changes in the structure and flexibility within the working of organizations have a direct implication for training and continued development [23]. There is a greater need for interdisciplinary training as well as lifelong learning and personalize learning.

*IT Challenges:* The digital transformation of processes brings some IT-related challenges that include strategic



direction, technology selection and adoption, policy formulation, standards development for technology providers. Despite the opportunity for growth and transformation business still, need to address and solve various IT related issues to capture the full potential of the digital impact.

First and the foremost challenge is to seize the attention and mindset of the IT executive leadership [24]. However, investment and strong leadership practices need to be applied to foster the learning and development. An organization which has shaped openness and ready to change with new knowledge will undergo a successful transformation.

Investment is needed, but at present, it is difficult to ascertain the true return on the investment and such unclear on the economic benefits. Modernizing IT infrastructure will provide a platform for growth, scalability and flexibility. Many businesses are tethered to a legacy IT infrastructure estate with high technical debt, expensive technologies and heavy maintenance spending leaving little investment for innovation and growth.

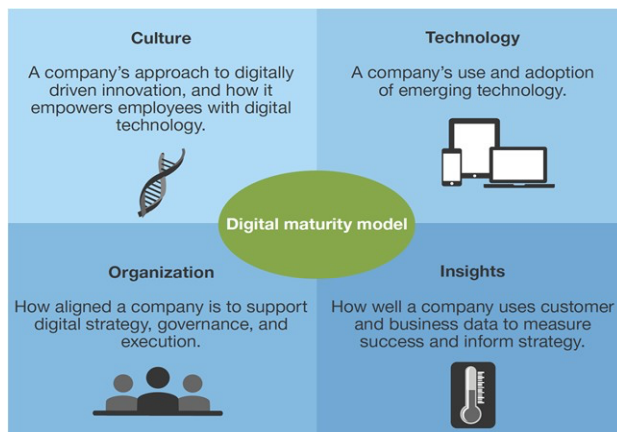


Figure 6 (a): Dimensions of Maturity Model [14]

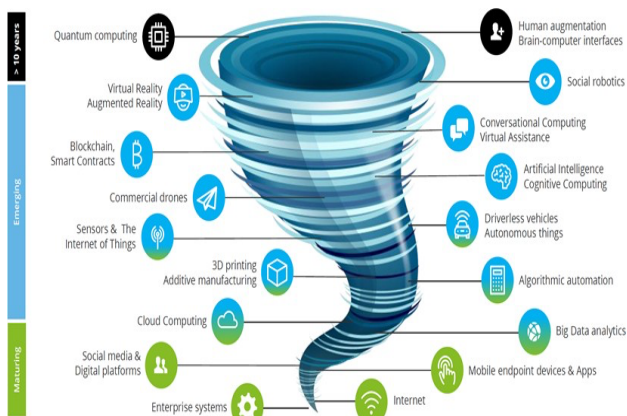
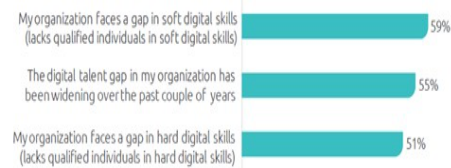


Figure 6 (b): Digital Disruptive Technology Forces [9]

Percentage of organizations that acknowledge the shortage of digital talent



Percentage of organizations that acknowledge the impact of the digital talent gap



Figure 7 (a): Shortage of Digital Skills

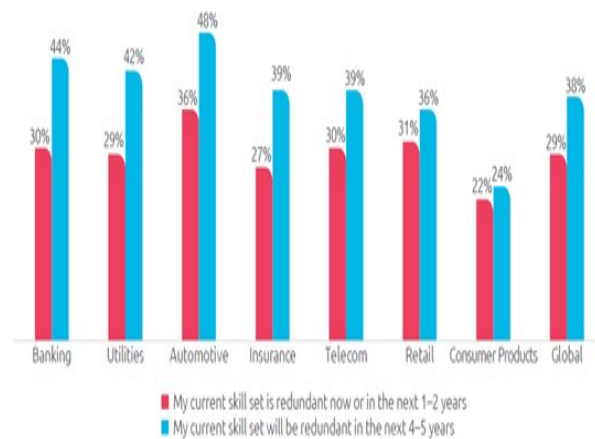


Figure 7 (b): Industry View of Redundant Skills [25]

Reference to EMC Computer Systems, through optimization lowered their maintenance spend dropped from 80% to 58% [26].

There are broader security predicaments that IT teams are facing today, with growing demands from mobile devices and application becoming more common in the workplace, IT needs to carefully balance user productivity, management and security of business data enable the businesses to develop. With ever more social applications being deployed on mobile devices to improve end user productivity, increase the risk and vulnerability from malware and hackers to obtain access and information from mobile devices. IT departments need to invest in intelligent security management systems which provide predictive behavior recognition of user and data activity to assess security risks.

Another main challenge is that of Big Data analytics. Business can struggle with the collecting and correlating data sourced from different systems and the departments who are the owners of the data. Moreover, business are more often incapable of consolidating the different types of data and using the results derived from this data



analysis. This arises from the lack of advanced technology investment and higher performance software as well as the shortage of skills and relevant experiences among staff [27].

Business Model	Culture and Digital Mindset	Skills Requirement	Product and Services
Companies need to assess the creative future opportunity access approach	Knowledge of digital expected to be at a mature level	Digital organizational capability supported by the transformation of workforce	Hybrid product approach (full package required)
IT service providers need to be more data driven	Robust information for strategic business change required	Leadership with the right organizational mindset	Maintain customer interaction and intimacy by leveraging new services
Available skills and processes to deliver and support next generation of services and solutions	Business needs to be digitally fluent to drive a digital vision	Employees need to be more technology literate and digitally savvy	
Assess the viability and cost of delivering new solutions to market			

Table IV: Emerging Technologies

*Service and Technology Providers:* A key challenge for service and technology providers is IT standards, as technology suppliers and vendors continue to develop new technologies and their intercommunication via Application Programming Interfaces (API). One example will be for the businesses building IoT based solutions, there is always a need for a common language and to accelerate the integration and automation. Technology providers need to demonstrate the viability of their capabilities and solutions and provide convincing evidence for clients and partners to invest in the technologies to deliver the desired outcome, a move away from the traditional 'market-architecture' which requires to develop products that have been tested and validated. Another challenge for technology providers is the rapid change required from their technology that demands to have a robust, agile approach for imperatively releasing new features and functions. A shift in product development mindset is also required, products no longer have a set shelf life. There is a need to change the future product life cycle to adapt and be more flexible in towards changes in business environment.

*Service Offering:* IT service and technology providers need to adapt to the industry change, the service-orientated approach via consulting engagement, projects or managed services needs to be aligned with the critical agenda themes. Value-based service offers, the traditional outsourcing model to date which primarily focused on the cost reduction, initially with the ability to deliver at scale and service based on the market expectations and environmental variability. "Traditional out-sourcing deals have been coin-operated, margin-driven with very few levers to improve quality of service delivery. With a relentless focus on driving supplier, cost has reduced the quality of service and some cases damaged the brand and reputation of IT departments" [28]. Figure 4a denote the traditional service model [11].

With the rapid maturity in automation and business opting for cloud-based or SaaS solutions, IT service providers need to adopt from one-dimensional cost reduction to helping clients with their digital strategy [11]. Figure 4b details a new approach to value-based sourcing. Cloud has changed these prospects; IT services can be procured anywhere, anytime, on demand and with the transparency of cost. IT service providers are under pressure to change their business models with more flexible approach demonstrated throughout the service delivery. This is impacting IT service providers who still operate tradition service contracts (cost-center based billing).

*Commoditization:* With the increase in cloud adoption, the risk of commoditization for service and technology providers is increasing daily. "The disruption resonated by cloud computing is essentially commoditizing all the software and hardware offerings within the industry focusing specifically high value diversified segments [29]. This commoditization is driven by the transformation of IT infrastructure and services from scarce to an abundant resource. With major web-scale organizations, e.g. Amazon Web Services, Microsoft, Azure, Google Cloud and others shift the value pools from "build" your own to IT to "Buy" as service which offered all the traditional capabilities of IT will out the time, cost and skills required to build the service. IT service providers need to rapidly adopt that "engineering, building, testing" has limited value and embrace that this is a commodity exercise. The move to 'converged solution' which are tailored to workloads, pre-architected and tested, can be deployed in modular building blocks for service consumption, e.g. High- Performance Computing as a service in Healthcare (HPCaaS).

Another approach for IT service providers is to adopt and offer industry-specific solutions, where the added service value is in the end-to-end solution coupled with industry

experience and expertise to support transformation in each industry.

**Skills Gap:** The challenges IT service providers are facing is talent and skills, if we reflect on the legacy outsourcing contracts with offshoring capabilities [30], some outsourcing service providers have an abundance of resources with legacy skills, the dilemma now faces, how do I transform? Do I transform and up-skill my teams and how much would that cost? For the speed, they need to review current staffing profiles, future opportunities and strategic plan to reduce staffing and recruit relevant skills into the business.

Almost every organization has digital skills gap problem, move over 54% of organization surveyed by Capgemini and LinkedIn [25] agreed that the digital talent gap was hampering their ability to transform digitally. They fear that they will lose competitive advantage because of this shortage. Figure 7 (a) details the shortfall in the digital skills. Coupled with this concern employees are anxious that their skills are already redundant or soon will be. 51% of employees surveyed felt that their skills would be obsolete in next 12-24 months. A view across the industry where employees feel their skills will be redundant is presented in Figure 7 (b).

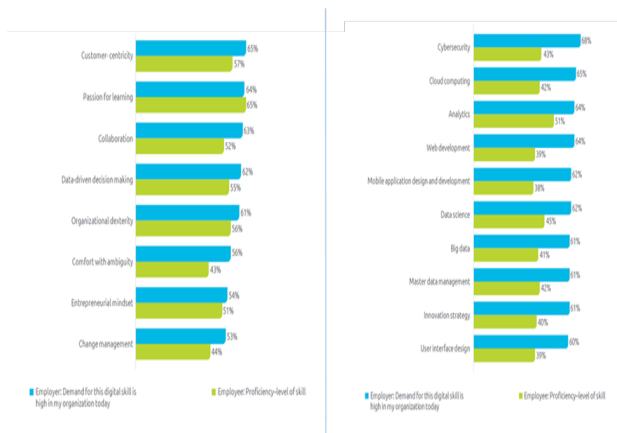


Figure 8: Demand for Hard & Soft Digital Skills [25]

Business are under pressures to attract, develop and maintain the talent with the right skills and experience that will show the digital transformation of their organizations. The demand for digital skills is ever increasing, the top 'soft and hard' digital skills in demand today is depicted in Figure 8 above. This organic approach is in the nick of time but an expensive process, other considerations would be to partner with other providers or consider merger and acquisition activities to increase relevancy, market share, brand and speed to market penetration.

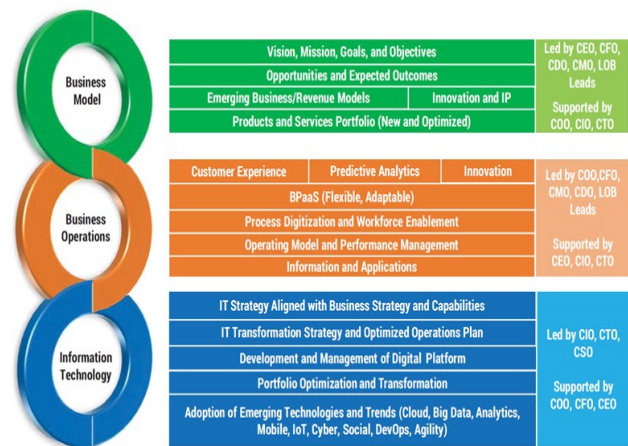


Figure 9: Digital Transformation Framework [12]

## 7. DIGITAL TRANSFORMATION FRAMEWORK

The business side of digital transformation has also attracted a lot of attention from consulting firms. Unfortunately, this attention has led to confusion as to what digital transformation means and as a consequence, it has been inconsistently defined and unevenly applied. By definition "digital business transformation is organizational change through the use of digital technologies and business models to improve performance" [31]. Strategic analysis and business cases assessment need to be conducted to understand the why as discussed in the previous section. An effective digital framework is required, and plan can support IT service providers in achieving their full potential in the digital age of disruption. IT service providers are adopting digital transformation in the following three ways:

- 1) Digital Business Model: The business model change is the rarest and least predictable and it causes the most disruption to entire ecosystem
- 2) Digital Operations: Transformation may be required to support the change in the business model by adding a new business capability or improving operations through transformation
- 3) Digital Technology: Taking a portfolio/service catalogue approach to IT and managing it effectively to maximize efficiency while delivering the IT agility that business needs

These approaches are well integrated with each other and organizational need for them to interlock in a holistic manner instead of being separate silos. A high-level overview [12] for a digitally transformed business is depicted in Figure 9. IT service providers have a unique opportunity to enable a more effective and rapid transition to their customers, but this requires a great deal of effort by them. IT service providers need to adopt 'digital approach', transformation needs to be reviewed across

seven key areas of the business [31], namely 1) Business model, 2) Organizational Structure, 3) People, 4) Process, 5) IT Capabilities, 6) Offering and 7) Engagement. Transformation needs to be considered across all aspects of a business comprehensively. The digital age is still very embryonic, and IT service providers are still in the early phases of their transformation with a progressive approach targeted.

## 8. ANALYSIS AND DISCUSSIONS

In this section, we present the findings of our research. The initial objective of the research was to understand the current trends and state of digital transformation in the digital age. This was the prime objective from which the other objects were defined which includes identifying current disruptive technologies in the digital age and the changes required by IT services providers to contribute towards a successful digital transformation.

*Technology Drivers:* The research was to investigate the technologies, and what are the main drivers of the digital transformation. The perceived opportunities that these technologies outline their importance based on their proposed value. Security was mentioned in every consulting report including Deloitte, McKinsey, Capgemini Consulting, Accenture and IMD. The importance of cyber-security was critical for each organization. A summary of data security findings are in Table IV. It was also identified that protection of business brand and assets with a flexible and agile approach that would allow the business to grow and expand (Table IV).

*Emerging Technologies Fueling Digital Transformation:* The first technology area is Security that was mentioned in almost every report. This was followed by Cloud computing, Big Data and Digital platforms etc. Secondary data analysis demonstrated the following theme linked with the technology drivers to define the importance of technology drivers selected for this research.

As mentioned, and discussed in the literature review, which outlined the importance of digital transformation and the wide-ranging implications and opportunities for businesses in the future. The importance and relevance of the topic were animating as all expressed their excitement about the opportunities, challenges that the digital transformation will bring. The analysis of the information gained in the literature review also showed a broad agreement that the digital age is disruptive and of significant importance across all industries from the board level down.

It is valid to say that digital transformation is not a single player game, businesses will need to foster stronger

relationships with consultancies and technology partners to deliver on the business outcomes they need to achieve. They also need partners that they can trust to help them on their transformational journey. The following sections will focus on the analysis of the technologies, requirement for change by IT service providers and the how they should approach their change.

*Digital Change Management:* This section will focus on the analysis of the technologies, requirement for change by IT service providers and how businesses should approach their change for successful digital transformation. During the literature review, significant information from various journals and consultancy papers demonstrated the three dimensions lend with facilitation of change. These dimensions include:

- 1) Culture and digital mindset
- 2) Product and services
- 3) Business model and skills requirement

Information provided by the consultancies and industry leaders provide useful advice and guidance on how to handle the transformation and develop a successful strategy for change where the key management aspect of change is continuous improvement. Businesses need to develop a flexible transformational plan due to the continuous emerging technological trends. There will be no perfect moment to start, even if its information gathering, identification of the opportunities which will help formulate the business case for change. It's almost impossible to designate the time frames for the change or the maturity of the technology. A summary of our findings from the above themes is summarized in Table IV.

The analysis showed a broad agreement that the digital age is disruptive and of significant importance across all industries. It is true to say that this is not a single player game, businesses will need to foster stronger relationships with consultancies and technology partners to deliver on the business outcomes they need to achieve. They need partners that they can trust to help them on their digital transformational journey.

## 9. CONCLUSION

The study aimed to assess the impact of change on IT service providers in the digital age. It investigates the current state of digital age, consideration to emerging technologies driving change and impact to services providers and the strategic approach to transforming. There are several recommendations from the research finding; changes must happen in the business model of IT service providers to capture the digital age and the transformations that have commenced.

Secondly, it is critical to install the right digital culture which needs to be aligned with the business strategy. Leaders need to define and direct the workforce, foster a collaborative approach to ensure adoption and employees personally feel strategically this is the correct journey to digital. Couple with this, senior leaders need to review what skills and experience are required in their new organization and build a comprehensive plan to attract, develop and retain people with the skills and attitude to build a digital business.

Finally, this is an ecosystem play, not one single IT service provider can deliver on all requirements of their clients. They need to build strategic alliances with technology, business and platform partners to capture new digital revenue streams.

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