PERSPECTIVES

from our Asia Pacific Junior Talents

Introduction

Get the future you want!

A sense of pride has taken the management team aback reading through the talent displayed by our junior colleagues in this report. It is with pride that Capgemini attracted, retained and grew these diverse profiles and can now give them a tribune to express their thoughts.

Aligned to our Capgemini Research Institute key topics of research, I found the angles our colleagues decided to shine lights on very telling. Our junior colleagues decided to focus their work on (1) the revolutions brought by Artificial Intelligence, (2) the many opportunities offered by Blockchain, (3) what will come next in the area of Digital Customer Experience, (4) what constitute a smart city and (5) how we can sustain our development while promoting a more inclusive business world. Throughout the topics, all contributors in the report have focused on the notion of purpose. It is also interesting to see many drew conclusions from a new normal powered by technology after the COVID19 disruptions. In this report just as in their professional life, the members of the new generation of professionals is focusing its attention, energy, thoughts and talent towards building a better world.

Contributors from this report embody the diversity of Capgemini. More than 20 writers from 6 countries around Asia-Pacific and a majority of women are represented in this document. Our graduate program team ran an opinion paper contest aiming at gathering insights and thoughts from our junior talent this past year. This program aimed at transcending geographic borders throughout APAC, promote exchange of thoughts and cultural awareness. It has led to the collection of a lot more content than what we are able to present in this report and I thank all participants to this contest. This report is a curation of some of the most interesting pieces. It may sometimes not always represent Capgemini research findings, but it always brings a fresh perspective and sometime thought-provoking views on the evolution of technology from the people who will build their career through it.

What are tech disruptions today will be old tech tomorrow, and this generation, just like other before them will live through the end-to-end transformation of the corporate world, powered by technology and social change. In this context, the diversity of talents, focused on purpose, with rich thoughts and an ability to adapt is Capgemini best asset to lead these transformations. It is for them to define and get the future they want!

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5G

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It is predicted that 50 billion devices will be connected to the Internet by 2020, and the number of mobile-connected devices will exceed 11.5 billion by 2019. We have billions of devices already connected to the internet and the number of mobile connected devices is also exceeding tens of billions.

The growth numbers in devices connected to the internet including billions of mobile connected devices are tremendous and is likely to continue at exponential pace over the next decade. This growth and upsurge in connected devices and hence data is already adding substantial amount of stress on existing networks. 5th generation wireless networks are expected to provide 1000-fold higher data throughput by the year 2030 compared to what we experience today. The advancements in technology, computing power and expectations from networks is leading to the buildup of use cases and applications for machine type communications like self-driving vehicles, smart factories, and health care management. The need to support high speed connectivity needs on sensors, devices, machines and a real time interoperability between these and its impact on all of us is pushing the excitement on 5G.

Asia Pacific region is home to 60% of the world population with many countries still in the developing phase. 5G is going to have a big impact on the competitiveness of countries, industries and overall population. The value capture is going to depend on regulation as well as operator capabilities as the impact transcends beyond the telecom industry. 5G will reboot relationships with enterprises and industry verticals with substantial cross pollination of interdependent services and it will give rise to the adoption of new positions in a fluid and fast changing value chain. Furthermore, enterprises would have to relook at their transformation agendas and the way to transform their business models. Customer experience, led by real time insights and enabled by 5G is going to look quite different as compared to what we see now. In general, the gap between industrial and consumer technology is expected to come down with the emergence of 5G.

This special issue is an attempt to provide a view from our graduates on research, innovations, and applications for 5G and beyond.

At Capgemini, as one of the leaders in Telecom and 5G services, we are looking forward to our contribution, participation and engagement with industry players on this exciting journey.

5G will change businesses for the better

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When asked about the application of 5G and the future of connectivity, Steven Mollenkopf, CEO of Qualcomm states, "5G is designed so that other industries – automotive, self-driving cars, connected health care, connected education, connected infrastructure – are really set up to use cellular for the first time at a massive scale."

Indeed, the introduction of 5G allows for industrial applications that are otherwise impossible. However, it has its own set of problems that might deter companies from adopting it quickly. Therefore, it is essential for business leaders to fully understand the impact of adopting 5G on business operations.

One of the ways that 5G can change businesses for the better is by providing timely and comprehensive data. A few capabilities that 5G technology boasts of are increased capacity and high speed in commercial launches compared to its predecessors. This capability will lead to greater industrial operations use cases, one being real-time analytics leveraging on edge computing.

With real-time analytics, companies can reap the benefit of having information flowing in from a large set of devices instantaneously. As a result, with a wealth of data from a larger set of consumers, leaders can make better decisions using real-time insights from current consumer trends.

Another example of using large sets of data can be found in usage-based insurance. As opposed to using traditional and static criteria, such as age and experience in driving, more dynamic insights about a driver's risk score can be derived with insurance telematics. A clearer insurance profile of the driver is generated based on their driving behavior. This helps insurance companies better manage risk, leading to significant cost savings. Hence, with fast and accurate data facilitated by 5G technology, businesses are equipped to make better business decisions.

Another way that 5G can change businesses for the better is by propelling sustainability efforts within the company.

Environmental sustainability is increasingly a concern for many companies due to culture shifts in consumers. Hence, it is vital for companies to internalize changing trends and adjust their business strategy or operations accordingly.

5G-enabled solutions such as smart grids and other smart city products can not only help companies be greener but save costs as well. Smart grids have digital information and control, dynamic optimization of grid operation and resources, smart integration, and many more. As a result, the solution is a more robust and efficient system that conserves energy and help the delivery company decrease costs. With demand reduced due to more efficient usage, there will be a decrease in wholesale market prices. Overall, it benefits all stakeholders including the environment. As 5G technology can be employed in environmentally focused solutions, businesses will be able to reduce their bottom line and meet the changing demands of consumers.

Although there are myriad other benefits that 5G can bring to companies, it does not come without concerns. Of which, the most pressing one is consumer privacy. With 5G shifting solutions to user-centric applications, one key challenge for realizing the vision is seeing how user data is handled by the technology system. This is especially crucial for companies to answer as they tiptoe along the line between ethical decisions and profits.

As 5G continues to roll out in various industries, companies need to take a proactive approach in setting up infrastructure that safeguards the data that they are receiving. This can take the form of setting up better cybersecurity measures or having a privacy policy that only uses the data of consumers within certain premises. Hence, even though there are valid concerns surrounding 5G and the negative consequences of its application, the onus lies in the company to ensure that the privacy of their customers are being upheld.

In conclusion, 5G is a much-awaited technology that presents many use cases that can change businesses for the better. It is essential for companies to understand which areas of their businesses can use the enhanced connectivity to drive their business forward and stay in the forefront of technology.

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5G and its Big Bang impact on the auto industry

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It's no secret that the global rollout of 5G is going to disrupt many industries. What's less obvious for some though is how profoundly it could reshape an industry like automotive. And by reshaping, I mean not only new cars, but also new production processes, new business models, and new offers.

Of course, at first there will be new cars, and that will probably be the most visible part of the 5G revolution. Existing but still under-represented electric vehicles (EVs) will benefit from the push given by 5G to production plants since better connectivity leads to better control, analysis, and overall performance. Given that electric vehicles have already attracted heavy investment – with major "legacy" brands having launched pure or hybrid electric vehicles – a significant push in performance could be the final piece of the puzzle for manufacturers to turn EV production into the new norm. Easier production means better speed of launch and ultimately higher return on investment, and both consumers and manufacturers are willing to move away from fossil fuel-powered assets. On top of that, 5G will certainly facilitate the use of infrastructure meant to support the deployment of electric vehicles, such as recharge stations. Being able to monitor battery levels better, find charging stations more easily, and identify efficient routes faster could significantly enhance the EV experience.

Beyond EVs, the next hot topic will certainly be autonomous vehicles. This is a topic that has been on the table for several years, but never made it to the next level. 5G will certainly change that. Indeed, autonomous vehicles have a machine learning-based approach – the more they drive, the more they can understand patterns that will help them shape the appropriate driving responses. But all this digestion of information is only possible if you're able to collect and store data in the first place. And for this you need the next level of connectivity, a level that only 5G can enable. The goal there is to turn the "vehicle-to-everything" (V2X) concept into reality. What is V2X? Basically, it's the ability for a vehicle to wirelessly connect to multiple sources of information in its surrounding environment, be it other vehicles or traffic lights. In 2016, eight corporations including car manufacturers (AUDI AG, Daimler AG, BMW) and telecoms (Ericsson, Huawei, Intel, Nokia, Qualcomm) created the 5G Automotive Association (5GAA), designed to support the development of V2X technologies. The association name makes it clear – without 5G there will be no V2X technology. Let's consider some figures: 5G is expected to provide wireless download speeds of above 500 Mbps in wide area network (WAN), whereas 4G is only 100 Mbps. And let's note that these are probably just some conservative estimates – the gain of connectivity speed is surely going to be massive.

Now, it's not only car fleets that will transform, it's also services linked with the auto industry in general. With autonomous car could come new forms of shared services, whether we're talking about improvement of existing chauffeur companies such as Didi, Caocao, Shouqi, or about the emergence of autonomous vehicles only transportation services. The former would obviously mean a massive disruption in the market and could drive demand for these vehicles in the not-so-long term.

The industry knows that the right connectivity power is what's lacking if we want the next generation of vehicles to emerge and I believe 5G meets these requirements to an extent that will make its deployment much more groundbreaking than what was the 3G to 4G transition. Of course, the scenarios mentioned in this paper might come to life progressively and will need to be supported by ambitious country or city-wide 5G deployment road maps. But everything indicates that the ambition to invest is shared in both the public and private sector. Let's see how this materializes in the coming years and months, but it surely sounds exciting!

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AI

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Artificial intelligence is not just about a new set of tools and technology. It offers the chance of transforming the way we do business, across every dimension of operations. Companies today face more challenges than ever. They need to anticipate, react – be resilient in the face of crisis – outperform their markets. Artificial intelligence can help meet those challenges through activating the data the organization is creating, making it into an asset that drives business processes, augments the human intelligence, and amplify business outcomes.

We can already see the impact of this highly evolutive technology on how to transform the business, benefit our work and live, and improve social good. But on the flip side, the rapid development in AI today has unleashed a range of ethical issues such as the privacy & surveillance, and an upswing in unemployment due to the substitution of human labor with machine output, which can harm the business and brand reputation, and damage the trust and satisfaction of employees and consumers. Capgemini research shows that organization need to address AI ethics from the start in order to scale AI adoption across organization. Data scientists are responsible to identify where to use AI in the organization and how to develop it. However, business leaders of organizations need to formulate a long-term ethical AI strategy and provide critical guidance on definitions, processes and metrics to follow. When acquiring and analyzing data, data, AI and IT team need to make AI system transparent and explainable. Too much focus on accuracy can lead to "black box" which is the nature of AI/ML algorithms. The organization needs AI being clear, consistent, and explainable in language people with different backgrounds can understand.

In addition, the more data acquired and used in the training system, the more accurate and insightful the predictions, but it will raise more privacy concerns. Organizations need to make an appropriate data acquisition strategy and a strong approach towards data privacy and security. Machine learning algorithms detect patterns and make predictions based on historical data, so the model output may be unfair to certain users due to the bias of raw data collected, data drift and model drift. The organization needs to practice strong data management to eliminate or reduce data bias, adopt MLOps principal to develop, test and monitor models to ensure the stability and sustainability of AI.

As presented by our junior talent in this section, the impact of AI is not a future, it is happening now. We know of the power of AI, so we know that we must build it in the right way to make AI transparent, explainable, accountable, robust, safe, fair, responsible and sustainable.

Are we prepared for the medical AI revolution?

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Imagine you are managing a hospital during a new pandemic. This disease has an unusually high hospitalization rate, and things are spinning out of control: you have a limited number of physicians, agonized after grueling long shifts; you have limited ventilators and medication, putting physicians in moral distress as they prioritize one patient over another.

A consultant comes to your door with a recommendation. "Would you consider our latest strategic offering, AI Doctor?" she says. "Artificial intelligence has progressed in ways you never could have imagined. Our AI Doctor ingests patient data such as X-ray images and listens to patients' symptoms to make diagnoses. It makes all the hard choices – who gets intensive care, who receives the ventilators etc., so your doctors don't have to. It also never gets tired! While your doctors are taking their days off, AI Doctor would happily stay in charge, 24/7, 365 days a year."

You think this is a brilliant idea and call the procurement team right away. As you enthusiastically share AI Doctor's functionalities with the team, they appear to be somewhat doubtful. "As you know," the team leader explains, "our hospital has been sued quite a few times over medical malpractice, some attributed to human negligence, others to machine failure. If the AI makes decisions that are challenged in court, who should be held accountable for the legal consequences?"

Even with your rudimentary legal knowledge, you admit this is a challenge. How can we set up a mechanism to deal with AI's ethical mistakes, when regulators are having a hard time catching up with the technological developments?

One way to think of it is that an AI agent shall not constitute a human being. Yet, the AI Doctor product could be originated from a tech firm, implemented by a system integrator, managed by a hospital, with its training datasets coming from numerous practitioners. The line of accountability remains unclear. Another solution, of course, is to treat the AI agent as a human – ensuring that it enjoy legal rights we do. But that implies you losing control over AI Doctor. For instance, if it starts making mistakes you cannot reboot it, since that might constitute murder. As the manager of this hospital, simply thinking of it sends shivers down your spine.

While you are still contemplating the first challenge, the procurement lead comes up with another one. "Look, even if we do have a mechanism to deal with AI Doctor's mistakes, we still need a mechanism to prevent one. How can we ensure that it is up to par on medical professionalism to make ethical judgments? It doesn't have to pass the board, after all," he exclaims.

You unwillingly agree. Biases in AI are not uncommon, and as a leisure technology enthusiast, you know it might originate from two sources – datasets and algorithms. On datasets, scholars have already warned the medical AI community on how the current lack of diversity in genomic data, as well as undertreatment of certain racial groups are fed into medical AIs as training data, affecting their performance. On algorithms, powerful neural networks are often used for complex applications such as medical AIs. However, compared to traditional algorithms such as decision trees, they are more opaque in nature and more difficult to explain. These "algorithm black boxes" make AI Doctor's behavior more unpredictable, and less trustworthy in an industry where human lives are at stake.

As the debate continues, you look out into the hallway, where the patients are struggling and the doctors are restless. You cannot help but envision a scenario in which new AI regulations define clear accountability for humans, ethical physician practices are used as training data, and explainable algorithms help humans understand and improve medical AIs – things would turn out so much better for both your patients and physicians.

But as these grand challenges remain unsolved, at least in the near future, you will still be on your own in this painful struggle.

Decoding artificial intelligence

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AI is like a magic trick. While the word "artificial intelligence" could make us think that robots have their own mind, its technology and application can tell a different story.

Sure, AI development involves a lot of computer programming, creating and iterating algorithms, and database building. But up until 2020 at least, AI applications have mostly been designed to complete unwanted tasks rather than replace people's jobs (or humanity). In fact, we might just need to learn it right to leverage the most out of AI.

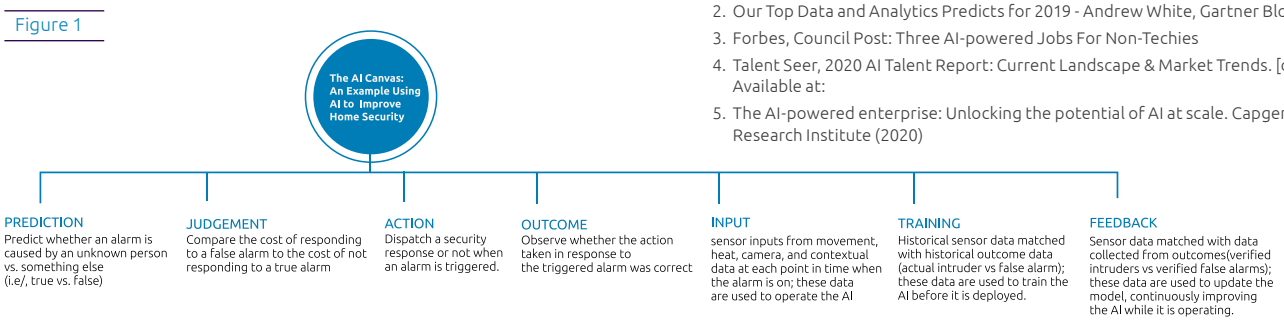
Application of AI within business

Using one of the real examples applied to Peloton Innovations, an AI Canvas (Figure 1) is developed to improve home security using AI. By combining historical and real-time data, the model is designed to predict, judge, act, and evaluate tasks based on the client's needs.

Ideally, clarifying these critical factors within the process of implementing AI into home security would either reduce the business's costs or enhance performance. With its increasingly accurate and high-fidelity predictions, it will be able to predict home intruder before they even enter.

However, greater potential may also mean greater risks. As Gartner predicted, 80% of AI projects through 2020 will remain alchemy, and frontline workers will find it difficult and ineffective to implement the "upgrade" as they used to. This is the challenging part for business decision makers, as they will need to have clarity on what AI will contribute, its interactions with human workers, and how it will be used to influence decisions and measure success. They will also have to decide on the types of data input to train, operate, and improve the AI model. It is advised that, "to get started with AI, your challenge is to identify the key decisions in your organization where the outcome hinges on uncertainty."

Figure 1



AI talent

AI projects generally involve difficult and complex decisions, with high involvement of data input and navigation. Fundamentally, this requires a lot of technical experts to maintain and sustain the background running of the technology, but there might be more to it than that.

Senior technology leaders have suggested that while computers are outpacing human counterparts in performing repetitive tasks, there are also new portfolios of jobs that are very dependent on humans: junior threat hunter, analytics translator, and conversation designer. Junior threat hunters need clear and concise communication skills to investigate and evaluate unusual activities and threats on networks. Analytics translators need to synthesize and put data into a particular business context, acting as a bridge between the technical knowledge of data scientists and the operational expertise of managers. Conversation designers, for example, for a chatbot, require experts in conversation and personality creation to write scripts that maps out user experiences.

As AI-related technology continues to develop, it sure will need a lot more people to work on not only the cognitive aspects, but also talent to work on its humanity-related aspects and enhance its user experience, especially when a lack of diversity in AI is a main issue to be tackled. A 2020 AI Talent Report points out that women constitute a mere 15% of Facebook's AI research staff and 10% of Google's, and that only 4% and 2.5% respectively of them are African Americans. Negative effects such as biases and discrepancies towards minorities within programs and systems designed are then likely to be presented and applied.

AI in the Future

That said we are still at an early stage of AI development. A report from the Capgemini Research Institute shows that only 13% of businesses have successfully deployed use cases of AI in production and continue to scale more throughout multiple business teams – of which retail and life science are leading the scaling race across sectors. The recent economic shutdown due to COVID-19 is expected to affect business performance and suspend investments on AI initiatives.

But with risks there also come opportunities. The lockdown has made working from home (WFH) the new norm and increased people's dependence on shopping online. It will be interesting to see how businesses in the retail sector will continue to leverage AI on capturing gaps in markets and optimize their presence online.

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Questioning the humanity of artificial intelligence

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Just how much automation do we need today? It seems as if more and more work could be done better, if not more efficiently, by robots. Years ago, we never would have imagined the possibility of bots taking over the tedious everyday tasks we experience in the office. Yet here we are in a day and age where the Matrix is beginning to look morenrealistic. This begs the question, how far should we let AI take over the humanity required for the economy?

Robotics simplifies the human workload and no one can deny the impact it has on the global job market. Oxford Economics predicts that over 20 million jobs will need to be redeveloped to upkeep with the surge in AI. With a society constantly improving on efficiency, is the redevelopment of jobs really an opportunity cost we can afford? Maybe, with the growing global population, it wouldn't be so bad to keep some processes simple? After all, such practices merely improve cost efficiency in organizations, meaning the rich save more money and the poor lose out. The inequality of who benefits the most from such automation is largely skewed towards the upper class.

The lack of a human conscience has been a point of debate for the development of AI. Communications between sentient beings imply a sense of intimacy between the entities. The ability to understand each other on a non-logic-based level. John R. Searle famously points out how a computer, if programmed appropriately, is a mind, (Searle, 1980, p. 417). But the issue is, do we even know the extent of how human minds are programed? If so, how can we possibly know the complexity of how robots should be programed?

We next must consider the security of AI. As we know, AI is non-discriminatory. Anyone can use it. But what if it falls into the wrong hands? Chief envisioning officer at Microsoft UK, Dave Coplin, indicates that priority goes to ensuring "the right people are making these algorithms." With more organizations expanding their AI capabilities, it becomes increasingly available to the public. In the future, such a tool may even become more treacherous than firearms have been historically.

Finally, this begs the question whether we can, ultimately, keep AI in control. Researchers at L'Ecole Polytechnique Fédérale de Lausanne point out how learning protocols have been developed that "prevent machines from learning from interruptions and thereby becoming uncontrollable." Machines have been built to replace humans in tasks. Eventually, with AI being developed to increasingly resemble humans, who's to say it will not eventually be able to outsmart them. I feel that a sense of humility should be adhered to when dealing with the advancement of robotics, that eventually we must determine the point at which where humans have the last word.

As of today, technology has had a rampant influence on the society. With the onset of COVID-19, these advancements can be felt in our everyday lives. Although it is another step forward into a futuristic society, it is paramount that we understand the purpose and capabilities that AI presents to ensure that it does not bring about more harm than good. It is also in our interest to remember the human aspects of our lives, and that some work shouldn't be done by robots. Whether it is teaching children or understanding nature, some experiences in life just doesn't require AI, but a human touch.

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The potential of artificial intelligence in customer engagement

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Evolution in Customer Expectations

The advancement of digital technology in businesses has made customer expectations evolve. Traditionally, their expectations ranged from quality to price of a product or service. Nevertheless, modern customer expectations are much higher, involving proactive and prompt service, personalized interactions, a connected journey, data protection, and innovation across digital channels when purchasing a product or service.

Let us consider a customer experience scenario – Alex wants to repay his missed premium from last month to an insurance company and is unsure about the due-payment procedure. He calls the customer support team to inquire about the process during peak hours. As a result, he is put on hold for a long time before being connected with a support agent but ultimately receives no response from the team. The company failed to meet Alex's customer expectations and left him feeling disappointed and ignored. Therefore, it is important for businesses to consider winning customers' hearts prior to their wallets.

Role of Artificial Intelligence in Today's Customer Engagements

Meeting modern customer expectations is challenging for businesses. By opting for artificial intelligence, they are more likely to meet those expectations. Mark Tayler, states in one of his interviews that the best thing brands can do to win their customers is making their journey as convenient as possible. Basic human psychology dictates that people tend to avoid complex procedures; however; they are more likely to consider a simple one. With AI-powered technology, businesses can provide trouble-free and easy services.

Customers always want to have their needs being addressed by businesses. Tayler adds in his interview that in order to improve engagements, brands should bring utility and ever-lasting affiliation to their customer. It is by having the ambition to be useful and meaningful to customers that businesses can enhance their engagements. Thanks to AI, businesses can provide their assurance on utility by responding to customers' questions instantly. In addition, they can strengthen their affiliation with them by offering personalized experiences. Consequently, some predicts that by 2025 nearly 95 per cent of all customer engagement channels will be based on AI-enabled technology.

AI-Enabled CRM

We understand the importance of customer relationship management (CRM) platforms when it comes to engaging with customers. When these CRMs are enabled with AI, businesses can hit those major aspects of modern customer engagements, from ease and convenience to utility and affiliation. Capgemini Research Institute states that 80% of consumers are willing to pay more for businesses that provide better customer experience. The report also mentions that consumers strongly prefer mixed interactions with both AI and humans.

Customer concerns

Indeed, AI has provided businesses with a wide range of options to engage with their customers effectively but should probably not be the automatic go-to solution for businesses. Today's customers are also attached to human interactions and harbor concerns about data privacy. Some customers might not exactly feel close to a business that will only interact with them through robots, and this could lead to frustrations in the resolving of issues since AI always "work by the rule." If on top of this you add uncertainty regarding the kind of data that gets collected during these interactions, then it leads to customers not being appreciative of this new model. The Capgemini Research Institute survey says that 80% of customers want businesses to show how they use their data and 66% of consumers want to be aware when they are using AI-enabled systems.

In conclusion, there's certainly a balance to find there, but with the right approach and state-of-the-art technology, I believe that businesses can not only fulfill evolving expectations, but also generate meaningful and ever-lasting engagements with customers.

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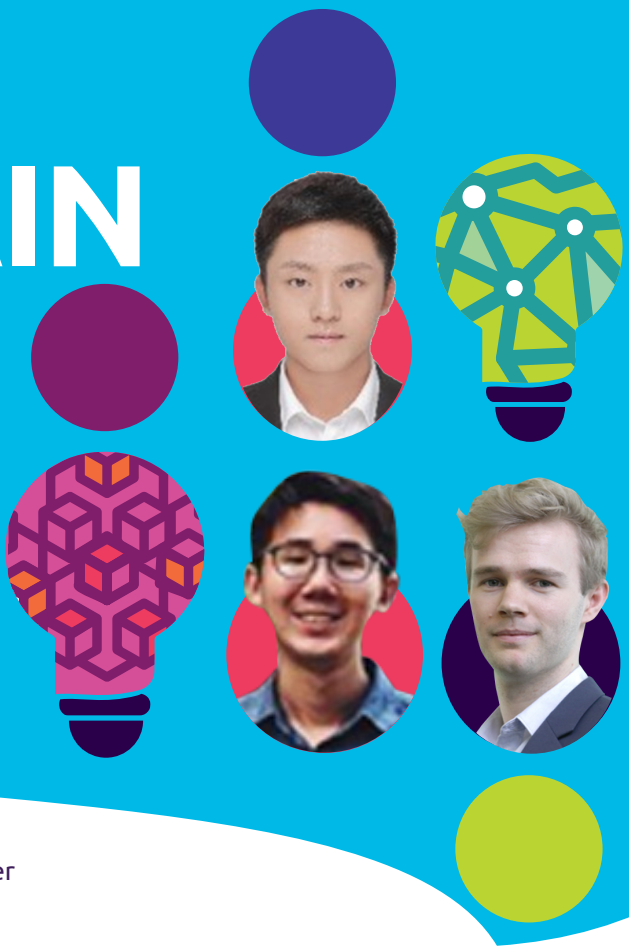
BLOCKCHAIN



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No wonder many of our junior colleagues have decided to focus on blockchain as the topic for their opinion paper, Distributed Ledgers (DLT e.g. Blockchain) has always been in the news, off late triggered by the pandemic situation. Enterprises are continuously evolving from centralized, to distributed, and ultimately to decentralized busines models to become what we refer as Portable Enterprises.

Today's CXO strategy must support the rise of decentralized ecosystems. Rather than being viewed as a standalone technology, the decentralized future should be treated as a combined and powerful evolution of distributed technology that will manifest through cloud, applications, security and open-source practices. The end goal of decentralization is the creation of a Portable Enterprise that has the agility to interoperate in a range of business and technology ecosystems, leading to new marketplaces and revenue streams.

A number of use cases have emerged like Tokenization of assets; Computable contracts for policy & claims management; Proof of Identity, Certificates, Licensing regime; Real-Time energy trading, especially renewables; Health Records sharing; Sustainability & CO^2 Tracking; Product Traceability and Supply Chain Automation… supporting the needs of distributed & decentralized business models

In the Financial Services industry, we have heard of cross-border payments, trade finance, supply chain use cases, and while these continue to surge, we have started to see a few interesting, new developments…

- Rapid rise of Tokens: A new token economy could make the financial industry more accessible, cheaper, faster and easier, thereby possibly unlocking trillions of euros in currently illiquid assets, and vastly increasing the volume of trade.
- Computable Contracts: Computable contracts (converting policies to smart contracts) are being adopted by a few insurers. This is another example of how blockchain technology can be decomposed into multiple areas and get into a mainstream adoption.
- Consortia / Partnership / Ecosystem: Consensys-Quorum, R3-Corda & Hyperledger-Fabric demonstrates rise of industry / domain led partnerships with each having a slightly different approach towards DLT & decentralization.
- Central banks: Many global central banks are independently exploring distributed ledger technology for use within their financial systems.

Developments in a number of key technological areas will be crucial to decentralization getting into mainstream, including:

- DApps: Developing consensus for decentralized applications (DApps) and smart contracts
- Data and Security: New approaches to organizing, securing and controlling data
- Decentralized Cloud: Solving data and complexity concerns through new protocols that help to break the reliance on legacy IT
- Open-Source Enterprise: Adopting open-source culture and best practices

The very nature of this technological evolution – bottom-up, decentralized and a move away from the traditional mode of development – means many organizations and their executives might have been slow to notice that a change is happening. Yet the change is real, and every sector can expect to transform itself towards a decentralized future.

What else can we put on the internet?

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In the digital world, there is this crazy idea that blockchain networks could one day replace the need for organizations. These are called decentralized autonomous organizations (DAOs). By using smart contracts and distributed ledgers, the idea is that organizations could one day exist and operate without the need for things such as company registration, management, or even an office. What if we could run a business, not just through, but entirely by the internet and its users?

Enter blockchain

Blockchain has given us something unique. A way coordinating and agreeing on something in a trustless and even anonymous way. Blockchain enables multiple parties, who don't even know each other, to come to an agreement without having to compromise on things such as security or placing trust in a third party. This is the principle that gave rise to bitcoin.

I know when I mention bitcoin half the people reading this might switch off, but it's important to talk about it. It's a digital asset that can't be censored or modified unless agreed upon by the entire network. This is the way we can move bitcoin around.

The simplest contrast to bitcoin is our fiat currencies (AUD, USD, etc.) where we put our trust in central governments, reserve banks, and taxation policy to control our money.

So, how does blockchain fit in to this?

Well, let's start talking about what makes up an organization first.

1. Agents. An organization is a collection of agents each with their own contracts that control their relationships with the organization, each other and external parties. They have rights, they have obligations and they are subject to a governing body of law, usually the country they reside in.
2. Decision-making. We often think of decision making as a leadership function to guide strategy and long-term goals. However, every agent within an organization makes decisions daily as well. There is also an assumption here that decisions made are followed by other agents within the organization.
1. Incentivization. Anyone who engages with the organization must be incentivized to do so. This includes employees, contractors, third parties, CEOs and even shareholders. Naturally, this is usually a financial (salaries) but often there may be humanitarian incentives such as environmental change or social impact.
2. There is a fourth element here that is worth noting. Community. Collective alignment of agents via community is critical to successful organizations. Usually we use tools such as values or visions to align agents. In our case, Capgemini has had the same seven core values for over fifty years and it directly impacts how we engage with each other and external parties.

So, what if there was another way we could achieve these elements?

Many commentators recognize bitcoin as the first decentralized autonomous organization. It's run by individuals with hardware that coordinate with each other via bitcoin's public, decentralized blockchain ledger to make collective decisions. Its purpose is to secure the bitcoin network and facilitate the exchange of bitcoins.

- We have a collection of agents running nodes to support the network.
- We have nodes frequently coming together to decide on the current state of the ledger.
- Participants are incentivized via bitcoin rewards. Miners receive a reward for producing valid blocks that are used to record transactions.
- Finally, it's been able to unite strategists, economists, developers, politicians, and future thinkers. There is a community who find purpose and fulfilment in contributing to the bitcoin blockchain and challenging social norms on how we understand and use money.

What's next?

Bitcoin is just the beginning. There are many DAOs currently exploring new business models. By leveraging smart contracts these organizations can execute more complex functions such as voting, fund raising and even running peer-to-peer marketplaces.

Many DAOs are currently exploring decentralized finance and rapidly expanding into multi-billion products. For now, DAOs exist as smart contracts through the internet but rely heavily on specialist individuals or teams to perform manual tasks that cannot yet be automated. With advancements in AI and IoT however, future DAOs could even integrate smart property governance and integrate with smart vehicles, safety deposit boxes and even buildings.

The internet continues to be the most significant development of the last century. As we continue to see a convergence of physical and digital assets, perhaps the business world itself might one day become virtual.

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Why bitcoin and digital currencies are the new norm?

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Throughout history, there is not a single country that has successfully maintained its currency value. Currencies get devalued when central banks print a new supply of money for various economic, political, or strategic reasons. The outcome is always hyperinflation and a search for a new monetary system.

We have seen structural shifts in the monetary system every 30–40 years on average, with the last one being the abolishment of the gold standard in 1971. I believe the global economy is nearing the end of the long-term debt cycle and a new monetary system is due. This new narrative would be based on bitcoin and digital currencies.

In the past, civilizations always reverted to the gold standard when all else failed. But bitcoin has now emerged as a contender to gold as it fulfils the same properties of scarcity. Except it is even better than gold since bitcoin is digital, divisible, borderless, neutral, and immutable.

However, the debate of a new monetary system would not be constrained between bitcoin and gold. It would be the gold standard coinciding with a mesh of bitcoin, digital currencies, and different reserve-backed stable coins intertwined together on different blockchains.

While the internet allows for the transfer of information, blockchain enables the transfer of value without the need for any intermediaries. Bitcoin is the first digital currency that has successfully demonstrated that, but the value of transfer has since transcended beyond money.

Tokenization of assets is gaining traction as companies are tokenizing valuable assets such as gold, land, properties, and commodities on the blockchain. Since these tokenized assets hold value, it could now coexist with currencies to be used as the medium of exchange for goods and services.

Liquidity providers such as Kyber Network have made this possible by offering interoperability swaps between tokens. This would pave way for a future where a car dealer can accept fractionalized property tokens as payment or someone could pay for a cup of coffee with the mile points collected from frequent flying.

Apart from bitcoin and digital currencies, stable coins also play an important role in the ecosystem. It would be the strategic interest of governments to protect their currency by creating stable coins pegged to their reserve currencies. Stable coins also help speed up cross-border payments as the convoluted network of correspondent banks have made international transactions to be cumbersome and expensive. This is already well underway as Facebook's Libra is launching multiple digital tokens tied to the different national currencies. Xfers has launched XSGD pegged to the Singapore dollar powered by Zilliqa. China has also launched the Digital Currency Electronic Payment (DCEP) backed by the Yuan.

It would not be long before we see central banks of the US, Europe, and other major economies coming up with their version of stable coins. There would be a race for digital currency supremacy and the first mover will gain the network effect advantage.

The rise of stable coins and tokenised assets have contributed to the massive growth in Decentralized Finance (DeFi). Anyone, regardless of demographics, can borrow or loan in a borderless, trustless, and peer-to-peer way.

An unbanked individual can deposit tokenized assets (e.g., gold, commodities) as collateral on the smart contract and borrow in stable coin tether (USDT). This was not possible before as the prerequisites of accessing basic financial services is to have an identity and a bank account. But blockchain is changing that and it is accelerating financial inclusion by democratizing the banking system.

DeFi is just getting started and the total value locked up reached USD1.85 billion as of July 2020. Though it is up a staggering 300% from a year ago, this is just a microscopic fraction of the traditional lending, credit and derivatives market, estimated to be worth a notional value of $560 trillion.

Change is inevitable and we are witnessing the technology of blockchain unfolding across all sectors. Traditional finance is replicating its function and services on blockchain, stable coins are replacing physical banknotes and assets are being fractionalized into digital tokens. The world is moving on a continuum towards decentralization and this is what I believe the future will be.

How blockchain can save street food

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Few Chinese people are strangers to the word "street stall." Once, it was a place for friends to drink and chat, a comfort for ordinary people on their way home from work, and even a reflection of a city's culture. However, in recent years, there seem to be fewer and fewer street stalls since many city managers believe that the existence of stalls ruins the city's appearance. Luckily, the Chinese government introduced a series of policies to legalize "street stalls" in the real sense. The introduction of these has not only provided low-income families affected by the COVID-19 with means to make a living, but also added a long-lost worldliness to the city.

Although the legalization of street stalls has been a boon to many unemployed families affected by the COVID-19, their existence can no longer be as haphazard as in the past. Among them, food hygiene should be considered as the top priority. In June this year, the food safety problem in Beijing Xinfadi market triggered a new round of intensive epidemic prevention and control work in the city. It obviously renewed previous concerns the public opinions have had recently regarding food safety in such markets. And if large markets are under scrutiny, street stalls are too – so how can they improve their sourcing to avoid the blame?

Food safety is inseparable from the openness, transparency, and traceability of its supply chain information. This is where blockchain could play a part. Blockchain technology is a shared, immutable ledger for recording transactions, tracking assets, and building trust. Since the connected systems are decentralized, there is no single organization that controls everything occurring in the digital ledger. Every time a transaction or action is made in the blockchain, another block is being added into the network. However, it quickly renders until it is officially recorded in. The information provided in each transaction may contain the time the transaction was made, who received it, who sent it, and how much was transferred. It's then not difficult to find that each attribute of blockchain technology can help resolve pain points of food safety issues: opacity, inaccuracy, and lack of traceability. Nevertheless, what benefits will blockchain bring to stall owners in terms of food safety?

Firstly, once the stall owner uploads the food information to a specific blockchain, the data will be open to everyone. the transparency of information all across the food supply chain, which includes the production link, the semi-finished product processing link, the finished product processing link, the packaging link, the transportation link, etc., can provide consumers a certain degree of confidence. Secondly, since no single player can control everything or fake something occurring in the network, the authenticity and reliability of data can be guaranteed, which means consumers are able to check the exact information of food source without overly worrying. Thirdly, a blockchain is made up of blocks, each of which stores information at a certain time according to certain rules, people can easily figure out which part turns wrong. Let's assume a scenario: a stall's owner purchases raw materials and condiments from a market, processes them and sells them to consumers via e-payment. Through blockchain technology, we can collect data and information of all links. Should there be a food safety issue, one can quickly locate where the problem happened and even track back customers who already purchased the food so as to effectively react to the situation.

Although there are still some uncertainties regarding applying blockchain technology in street stalls, for instance limited storage space within each "block" and high entry threshold for stall owners, blockchain-based solutions should be considered as a credible safety solution for street stalls. As mentioned above, the technology not only increase consumer confidence by making information transparent throughout the whole food supply chain, but also help public authorities better inspect food safety issues. Thus, with the technology maturing, we have reason to believe that blockchain will become a key enabler of a safe and resilient stall economy.

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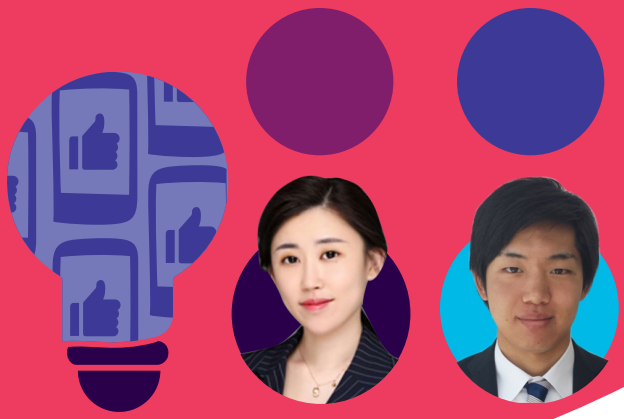
DIGITAL TRANSFORMATION



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Reading through the papers, it appears to me our junior talent took a really interesting position, where the bulk of companies are somewhat behind in the digital revolution. While It is certainly happening to them, they are not necessarily happening to it – not leading it.

The insight they have captured, suggests the revolution is happening 'to' the industry and 'to' clients rather than companies, brands and leaders of the sectors being set up to take real opportunity in the new and fast paced disruptive environment. And interestingly enough – it's not for a lack of visibility on "what could be" around the opportunities and services of the future …. Or even a lack of confidence or knowledge in what people are prepared to do, the changes they are prepared to embrace. It's more around the companies own inability to execute on their visions. To "get at" their own strategies.

Reflecting on these inputs, I believe the real question is – "what does it take for an organisation to get out in front? To get on the front foot and embrace change and win". Many other questions then arise -

Change in terms of seeking out and determining un-met customer opportunity? Change in terms of rethinking the sector and its previous boundaries and limitations to what the sector stands for and does? Or ways it goes about what it does – moving from making things to selling services? From manufacturing cars to becoming a lifelong mobility service provider. What are the fundamentals that must be revisited by companies to get at their own potential futures?

I suspect the solution to these questions lays in a rethink in and around the fundamentals of the P&L and current revenue models, a rethink on the actual strategy and speed and magnitude of change, a rethink on the organisational design, ways of working and make-up of the workforce.

Lastly, organizations may benefit from a rethink in the fundamental views and measures of success – moving towards metrics that are of the future (code releases per day, velocity of productivity, product life cycles and time to market, levels of automation, instances of RPA an AI etc). A new scorecard for a brighter tomorrow.

It seems the fundamental question is "how do we best partner with clients, to get at the new, better version of themselves?" That's worth more focus from all of us, that's what I took away from these papers.

Digital transformation? Don't forget the culture!

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The first industrial revolution in the 17th century reshaped the world. With the invention of steam-powered trains, we were suddenly able to travel vast distances in a matter of hours which brought the world closer together for the first time. Fast forward to 1983 – the invention of the internet revolutionized the world once again when it connected everyone with just a click of a button. This paved the way for a digital future and the inventions of newer digital technologies in the current age started the next industrial revolution commonly known as Industry 4.0. Comprising technologies such as big data, machine learning, automation, and artificial intelligence, the next industrial revolution seeks to accelerate how we live, work, and play in the future.

Digital transformation, where businesses are evolving digitally to better improve customer engagements and understand their company better through valuable insights and data, is at the heart of this revolution. However, a study conducted by Capgemini in 2017 reported that six out of 10 respondents in a survey considered culture as the number one hurdle to digital transformation. Many companies struggled to implement the right digital culture because of existing ingrained cultural biases that work previously or because of a lack of means for employees to explore new grounds and be compensated for such positive behavior. Digital culture can be defined as the framework at which it can reshape how we interact as humans and how we behave, think, and communicate in society using digital technologies. Therefore, it is imperative that the right culture must be created to better support digital changes in any organization.

To establish a successful digital culture in an organization, there can be a few vectors to consider to ensure that digital changes made by the organization can seamlessly integrate into its existing functional norms and processes.

One is to encourage collaborations among employees. Collaboration is the transparency and sharing mentality across business units, which is paramount in ensuring that teams will not adopt a silo mindset that impedes communications with one another. Encouraging collaborative behavior among employees would largely improve workflow productivity when implementing digital functions in the organization.

Organizations can also create digital learning spaces that promote digital learning and upskilling. These spaces can consist of an online learning portal with digital courses or workshops conducted physically to ensure that employees can better assimilate themselves into the new digital functions in the organization.

Another element that organizations should look to develop is innovation. Innovation is a productive behavior that fosters risk-taking or disruptive thinking and generates new and bold ideas that greatly shape the organization's attitude and culture towards change. Furthermore, innovation promotes creativity and problem-solving in the organization when facing bottlenecks and problems when undergoing digital transformation.

Lastly, establishing a framework that rewards employees who exhibit positive digital behavior through digital KPIs is the next step forward for an organization undergoing digital change. Traditional KPIs such as financial metrics are outdated because they hinders collaboration across various units, increasing resistance to cultural transformation. Digital KPIs are indicators that look at whether there is collaboration across business units, whether teams are engaged to the wider ecosystem and whether one team are encouraging other teams to use new behaviors. These new KPIs can help imbue the right values in creating the right digital culture in the organization.

The values that new technologies create cannot be fully realized without the right digital cultures in place to anchor it. An organization should create an ecosystem that promotes learning and growth complemented with digital technologies to achieve digital success. With the right digital culture and the invention of newer and smarter technologies, we will accelerate interconnectivity in the next industrial revolution.

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Intelligent automation – What's impeding the popularity of autonomous driving

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Don't you feel like we've been waiting for the autonomous driving car for ages now? It feels like everyone has heard about it, read about it, imagined themselves being transported in it, but only very few people have actually experienced it. Why?

Nowadays, countless car companies have been getting involved in autonomous driving. But if we take a step back, autonomous driving technology appeared in history as early as 1961, with the Stanford Cart prototype. As time goes by, there were only sporadic discussions on autonomous driving. Even the massive investments only started in the 2000s' – so what was the tipping point? I think the answer is the internet.

The internet facilitated the world-wide spread of information, which accelerated innovation and ultimately had a great impact on peoples' lives. For instance, old-school self-driving cars such as NavLab 5 or Sandstorm used a camera and simple sensors. Now we not only have more advanced sensors, powerful satellite GPS systems, but also deeper artificial intelligence and machine learning technologies. The internet facilitated the enablement of these innovations, opportunities rose, and many companies now seem confident in developing self-driving vehicles.

Consumers often don't care about what line of code is enabling the features they use in their high-tech products. What they care about the most is how technology is going to improve their lives. So, what can autonomous driving bring to us? In my opinion, the best use case for autonomous driving would be for new forms of shared transportation services. It can create more demand for the existing consumption system and may even trigger a radical change in traditional car companies. However, even if everyone can list the many benefits brought by autonomous driving, it seems like people still can't truly accept the emergence of this new technology. The essential reason for this phenomenon is the natural distrust of emerging technologies, and the fear of losing control.

A recent survey from a Capgemini Research Institute report shows that consumers' negative sentiments about self-driving cars are still prevalent – when asked about the different emotions invoked by self-driving cars, 48% of respondents mentioned fear and 43% loss of control and/or helplessness. Many people have been on airplanes, but it's interesting to note that even though existing airplanes are actually flying on autopilot most of the time, people still need a captain on board. This is not because the captain has to manually control the moment of ascent and fall, but people tend to trust the familiar.

Similarly, even though existing autonomous driving technologies have undergone several upgrades, they still face significant security challenges. According to the previously mentioned Capgemini Research Institute report, more than seven out of 10 consumers see vehicle safety and security as key barriers to adoption. For instance, there's still a strong feeling that autonomous vehicles require special environment to be fully reliable. Just like when people doubt that electric vehicle batteries can keep working in cold weather. If there's a risk of self-driving cars completely losing network signals, or to lose it in a way that would make its reading of the environment inaccurate, then people would very likely keep avoiding it. Any small construction work on a road or a neighborhood block would feel hazardous, and people would hardly risk exposition to not-under-control accident. On top of this, there is still an unaddressed legal uncertainty associated with autonomous vehicle decision making. Even if carmakers are working intensively on mitigating the risks, it is adding to the pile of challenges that self-driving cars have to face before being widely accepted.

Therefore, I think the main challenge for autonomous driving is not only technological innovation, but how to build customers trust and improve user experience. If companies only bet on tech and don't take consumers' perception seriously enough, self-driving car will hardly become popular in the short term.

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Why banks should reinvent themselves

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In recent years, the development of digital technology and the surging increase in customer demand for convenience have been forcing traditional financial institutions to transform. The transformation of the branches, which have been the core of banking operations, is one example. For banks, the days when locating branches and forming an extensive network of them helped foster trust with customers and ensure steadily solid profits are a thing of the past. Mobile app and websites have replaced the role and function of branches, self-service is becoming more common, while costs associated with physical assets have become a burden on banks' revenues. In the future, most of the services provided by branches will be consolidated in non-face-to-face channels. It is expected that the number of manned stores, which have been central to the maintenance and expansion of the customer base, will not only be reduced and streamlined, but will also welcome more digitization, so that banks can minimize operation costs.

Changes of customer

Moving from physical to Digital channels, it has been pointed out that consumers are welcoming the change, with an ecosystem they now find more open and accessible. The World Retail Banking Report 2020, published by Capgemini and Efma, notes that customers who were once willing to do branch-based transactions, are beginning to accept more digital and virtual transactions since COVID-19. For example, 57% of customers prefer internet banking, and 55% of consumers are expected that they prefer to use actively bank-provided mobile applications. Such changes in consumer needs are having a significant impact on store operations.

Changes of branch

Examples of branch transformation include changes in infrastructure, resources, and operations. In terms of infrastructure, banks restructured and consolidated their stores, as well as converted their low counters to private consultation rooms, and the opening of micro branches that specialize in functions for which there is a high need for face-to-face interaction, such as asset management and inheritance. In addition, while optimizing allocation of staffing and teller in the stores, by reallocating the extra staff to the sales staff, the bank tries to efficiently improve its resources allocation. In terms of operations, the introduction of self-service terminals has reduced the workload of counter and teller operations. In the mid to long term, effective digitization will also reduce the number of staff across the different functions, from tellers to consultants.

Challenges to achieve

However, despite these external pressures to change, traditional organizational culture makes the transformation slower, and a lot of banks are still articulating their operations around face-to-face services. In Japan, the mainstream management style has been to have each branch compete in terms of business performance, and this has led to an increase in the number of branch managers at the top, which tends to promote a non-optimal system. For them, since performance appraisal for each branch office is the norm, they have a conservative approach to the conduct of operations, probably not wanting to face risks associated with such disruption. However, given the situation that banking industry is in, it needs to take a more resolute approach. Specifically, banks need to achieve a sustainable business model through lower investments in branches combined with improved service quality and invest more aggressively into non-face-to-face channels, even if there is a temporary customer defection. In order to achieve this goal, a major issue would be whether the banks will be able to change the mindset of those in the field, from top to down.

Digitization and new consumer habits has changed branches' added value within the Banking industry, and players are now in a process of trial and error. Meanwhile, technology has eased access to information, and a lot of competitive financial services are now available online. The differentiation has shifted from "number of stores" to "quality and ease of use of digital channels" and fintech companies and other tech companies, including GAFA, are now proposing financial services that are rapidly beginning to win the hearts and minds of their customers. In order to meet these changing customer needs, they must embark boldly into a non-face-to-face-centric transformation. The existing banks need to choose either to conquer back the customer acquired by fintech companies or leverage their own strengths to collaborate with their new competitors. Whatever choice they make, they will have to work on their internal culture and probably prepare for some customer defection while reforming their branches. At the end, benefits will be worth the efforts, and only through transformation they will guarantee the sustainability of their operations.

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Why retailers should elevate personalization

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Personalization is here to stay. Consumers' expectations are evolving, with a study by Evergage revealing that 92% of marketers agreed that consumers expect a personal experience. However, a survey by Segment shows that brands, especially larger retailers, are struggling to meet consumers' expectations of personalized experiences. As consumer needs and preferences evolve, brands too must constantly evolve to elevate and cater to its customer. It is crucial for companies to recognize the value of personalized consumer experiences in today's world, with a report by Econsultancy showing that 80% of businesses saw an improvement after implementing personalization. On the other hand, companies failing to advance in this aspect will likely result in a loss in customer loyalty.

In today's market, it is evident that companies have to further step up personalization strategies to build stronger customer relationships. The E-commerce industry is already making headways in bringing this customer experience to another level. In the early stages of utilizing data, the focus was on categorizing their consumers through segmentation – grouping individuals into clusters representing a mix of metrices ranging from pre-determined interests to demographics. Today, many E-commerce platforms engage in hyper-personalization, which identifies consumers at the individual level in real time, leveraging big data and artificial intelligence. This allows for the content delivered to the individual to be more relevant, thus yielding a higher conversion rate. One example of this is Amazon. The platform creates a customized homepage for each of its consumer based on their individual shopping habits – anticipating the needs and preferences of the individual. The result of Amazon's investment in hyper-personalization is reflected in the conversion rate of its on-site recommendations being 60% higher than other E-commerce brands.

While many brands use personalization in their online engagement with consumers, very few extend this to create an omnichannel experience. A study by Harvard Business Review revealed that 73% of shoppers used multiple channels for their shopping. Personalization through physical interactions is a new area for businesses to advance customer relationships from different touchpoints. An example of this personalized omnichannel experience is NomadX, a multi-label retail store in Singapore. Their interactive gamified onboarding process incorporates facial recognition technology and data collection which then provides consumers with recommended shopping routes based on their preferences. It also provides a convenient and seamless process for consumers to have interactions recorded and be rewarded with individualized deals. This will hopefully be the future direction for more retailers, to have personalization strategies across multiple sales channels to create a more targeted end-to-end consumer experience.

While seamless data collection provides access to an unprecedented amount of data and numerous opportunities for businesses, it is important for this to be done transparently. There is also a need to act on the insights gained in a non-intrusive manner. Research by Salesforce showed that 57% of consumers are apprehensive about how companies are using their information. An instance which showed one pitfall of being too invasive to achieve data-driven outcomes would be Target Corporation's predictive analytics algorithm. This gained heavy media coverage when it figured out a teen's pregnancy before her family did. While such predictive algorithms made way for increased relevance in promotions for consumers, many saw this as an invasion of their privacy. This highlights the importance of the subtlety and awareness required from companies when acting on the insights gained from their customers' data. In this example, what Target eventually did was to mix in random and unrelated coupons together with pregnancy related ones to make the suggested coupons seem random.

Consumers' expectations are always changing, and businesses need to keep advancing in order to stay relevant. At the end of the day, companies need to embrace the future of providing seamless and personalized consumer experiences but be balanced in their attempt to do so.

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SMART CITIES

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In July 2020, Capgemini published a report on Smart Cities – Street Smart, Putting the Citizen at the Centre of Smart City Initiatives. One of the key conclusions from the research was that many felt frustrated by the lack of progress in digital initiatives and nearly one third of people surveyed were thinking about leaving the city due to the challenges in their daily life, including:

- the time it takes to commute to work;
- lack of job opportunities and a high cost of living;
- a lack of local community or sense of belonging;
- pollution and sustainability issues; and
- feeling unsafe at night.

The report goes on to discuss what people really want from a smart city. It also describes how progressive city officials are responding and planning initiatives which create loyalty, resilience, sustainability and collaboration amongst its people. We also present a framework which will help city officials accelerate smart initiatives and has at its core the concepts of Trust, Innovation and Data.

Of course, since this research commenced the world has changed dramatically. However, the report is more important than ever as we discuss what life will be like living with a global pandemic. Maybe the concept of a daily commute will seem strange as we continue to work from home or, perhaps, replace redundant office space in our cities with exercise areas, collaboration space and new gardens.

In this report, we have two new contributors to the Smart City debate and I would like to congratulate Vivianne and Julia for their excellent opinion pieces. One opinion piece focuses on how intelligent technology and new partnerships will help create safer spaces and a new urban resilience in response to the global pandemic. The other challenges us to think about how we create an environment where social innovation and exploration are at the heart of tackling the most challenging problems faced by cities.

Both are thought provoking. Both create a chance to further the debate as we seize an opportunity to define the future of smart cities and smarter spaces for future generations. Let's stop referring to a "new normal". I challenge us all to stop looking backwards and yearning for things to get back to how they used to be. Let's start talking about what's next and creating our future. Please enjoy.

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With or without vaccines, we are coming to terms with a new reality in which the onset of COVID-19 pandemic has fundamentally changed the global economy, businesses, and our way of life. While the immediate future and economy look bleak, the pandemic has brought about opportunities for smart cities worldwide to adopt an agile approach in overcoming unprecedented challenges posed by this public health crisis.

In retrospect, "smart cities" has long been a fashionable policy research area with multiple cities collaborating with the private sectors to apply the use of technology across public infrastructures. However, the previous self-paced digital transformation pursued as part of the different government and business initiatives has taken on a new turn. In fact, navigating the "new normal" has prompted the acceleration of partnerships between the public and private sectors to co-create innovative solutions powered by technologies. By adopting or reinventing digital platforms, these smart cities are determined to stay one step ahead of the virus. According to a July 2020 Capgemini Research Institute Report entitled "Fast-forward to the future: Defining and winning the post-COVID new normal," the pandemic "has cemented technology's role at the heart of transformation, driving new ways of interaction, sharing, engaging and decision making." To not only ensure that we survive but thrive in times of pandemic, has since created an ever more urgent impetus for us to rethink our current mode of living while pushing the frontiers of the "smart cities" paradigm.

Unfazed by COVID-19, cities have been actively exploring the possibilities of deploying a plethora of smart city solutions to drive greater urban resilience during critical times like this. In Singapore, the government has recognized the importance to speed up the whole-of-nation level digitalization across industries. Smart facility management, internet of things (IoT), surveillance and security are becoming the hallmarks of smart cities as they create technologically advanced, safe, and livable urban environments despite times of pandemic. Now, apart from enhancing residents' quality of living and performances of public services, these smart city solutions also double up as preventive efforts to curb the contagion.

No doubt, before reaching the year 2030 mark we have already witnessed how connected digital platforms have enabled authorities to manage the community and their data in ways never imagined before. The use of aerial surveillance to monitor movements of suspected COVID-19 cases is one such example. According to the Capgemini Sustainable Business Revolution 2030 Report, smart city development is denoted by a shift in how cities use technology to collect and analyze data. Cities have also demonstrated the value of smart technologies to collect insights on rapidly changing events in real time. Technology-based smart city initiatives, such as the contract tracing platform, require citizens to volunteer data in order to coordinate responses during emergencies. However, in tandem with the rapid rise of smart city high-tech solutions, we need to think through data governance, especially when data is aggregated from diverse sources within the new urban ecosystem. For instance, Capgemini offers a full suite of privacy-preserving solutions for digital contact tracing as well as data analysis to assess the impact of containment measures. It is imperative for these cities to work alongside compliant service providers that balance privacy concerns of citizens and efficacy of smart city initiatives.

The steep digital adoption by smart cities represents a step forward in fortifying urban resilience which will have far-reaching impacts for them coming out of the COVID-19 pandemic. While nobody knows how the world will look like after COVID-19, these future 'smarter and better cities' anchored by high-tech strategies will ultimately stand them in good stead in the long run.

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The future of a smart city starts from its people, not technology

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"If you look at history, innovation doesn't come just from giving people incentives; it comes creating environments where their ideas can connect." – **Steve Jobs.**

Innovation must be fostered by providing an inclusive environment, where no idea is pushed down and thoughts and opinions are shared openly. In fact, every person is creative, we all have our own ways of thinking based on our values, culture, and social environment. But how do we make our society, and the individuals within it, truly believe all of us are valuable? How would any city foster an environment that creates a safe space for everyone's ideas to be heard? This is particularly important because the successful future of smart cities requires our society to be agile, innovative, technologically enabled, and resilient to change. This type of city will need people who are able to think positively, recognize opportunities, be flexible and adaptive.

Smart cities require two things:

A smart city is a resilient city – one that is not only technologically enabled and connected but promotes an agile way of tackling environmental, societal and economic challenges.

Education – promote a lifelong learning mindset, a way to breakdown stereotypes through positive psychology

Did you know that the first three years of your life are the most important years of your learning? It is when you first explore the world and discover things for the first time. Are you provided with an environment that urges you to explore new things, try and fail? Or instead, are you told no about the things you are exploring the first time? Creating a positive environment that fosters curiosity and encourages exploring the unknown is one of the first key steps for a person to develop into someone that can resist change, tackle the unknow and hold on to opportunities.

A future towards smart cities starts by providing children with the opportunities to develop, supporting them, and helping struggling families with the assistance tailored to their needs. Even small measures such as providing families with social groups, expert advice and helping them stay connected.

When children begin schooling, they should be encouraged to explore both their strengths and weaknesses, without setting a certain expectation. It is important for schools to break down stereotypes and explain to children that if you are not as good as someone at one particular task or activity, it does not classify you as a failure. Instead, emphasise learning on how to develop and ask for help. This type of environment should be supported all the way until the end of their learning journey and continue into the professional working years.

It is necessary to continue to apply this logic into adulthood, ensuring that a smart city truly embraces mistakes and associated growth. In today's world, many of us remain silent because we are afraid of making mistakes, meaning that we never truly left our comfort zone.

Social innovation – providing opportunities and solving societal problems

Smart cities should embed social innovation into their way of operating. I had the chance to travel to Indonesia, to study social entrepreneurship, and what I found was that many of the world's "wicked" problems (problems that have no straightforward solution, such as homelessness), are relieved by creating a social enterprise. These consist entirely of non-for-profit businesses and are identified by trying to address a societal issue. For example, Eregano is a social business in Indonesia that educates local farmers on beneficial farming methods so that they can sell more, provide a platform for wider distribution chains, and lift some of these farmers out of poverty.

This concept could also be used, for example, during the COVID-19 lockdown, where scores of people have become unemployed. Using this concept, individuals could obtain employment and become responsible for addressing a societal need within the community, potentially delivering an end product that could be sold to the market. Remaining employed during this time, community members receive an income, used for food and rent while maintaining connections and relevant skills to remain in the workforce.

When society has fostered a mindset through positive psychology and continual growth, individuals are more open-minded to share ideas, create new concepts and explore the unknown by taking more risk to try out something different. This would lead to startups prospering as well as an enhanced business sector with a continual drive. It would make the city more competitive in global markets and grow investment. By encouraging local communities to tackle societal problems, inclusivity and connectedness will be an evident way towards the future of smart cities.

Sustainability & CSR

Shobha Meera
Chief CSR Officer,
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On Being A Responsible Business

We are all responsible for creating an inclusive and sustainable world

We are at a critical time in history. 2020 was set to be the start of a decade of urgent climate action, requiring a mass mobilization across sectors to address climate change. Then COVID struck, causing economic and social devastation. It accelerated, almost overnight, a global digital transformation of society, as technology became the critical way to educate, buy and receive services., bringing into focus the realities for those not able to access this new digital world. Racial injustice also kicked into motion a global societal shift against everyday racism.

As a company, through our CSR strategy, we have been committed to tackling these issues, focusing on climate change and digital exclusion as well as working to ensure we have a truly diverse and inclusive work culture. This year we have strengthened our action across these areas, announcing a bold ambition to be a net zero business by 2030, committing to our own business transformation and ways of working. Through our Social Response Unit, formed to address the impacts of COVID-19, we have touched more than 1 million lives through our wide-ranging actions. We are stepping up our actions on diversity, most recently joining The Valuable 500 – the global movement of leading businesses putting disability on the business agenda.

It is against this backdrop, that I am delighted to see our young talent taking on these issues and questioning how we can better use our capabilities and technological expertise to make a difference.

- Michelle Ou thoughtfully puts understanding barriers to technology at the heart of our thinking for inclusive design,
- Deepak Kumar calls for innovation in finding much needed energy solutions,
- Ryan Chong focuses on how problem solving at global scale can lead to new ways of working to address social issues and,
- Rhea Cai addresses the importance of organizations, particularly technology businesses like ours, to have a deeper understanding of their purpose and the value they can bring to society as a whole.

We have called on our people to be Architects of Positive Futures, and I am delighted to see this spreading well beyond the boardroom, through the business lines and across our countries to give a platform to all our people to create positive impact. As a business we believe that technology and innovation powered by individuals such as these featured here, are critical to finding the solutions need for a truly sustainable and inclusive world.

How inclusive design can bridge the great digital divide

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Why starting with people and considering the full range of human diversity is more imperative than ever.

The reality today is that not everyone can access, use, and enjoy digital products and services to connect with their loved ones, organize their finances, manage their wellbeing, or receive an education.

Capgemini's recent report "The Great Digital Divide: Why bringing the digitally excluded online should be a global priority," called on the global community to take urgent action on digital inclusion.

Why now, more than ever?

The internet has become a "must-have" societal necessity. COVID-19 has rapidly accelerated digital transformation in organizations from all sectors, with more and more essential services moving online.

However, many people still experience barriers to online participation and can't experience the benefits of the digital economy. This means that the most vulnerable members of our global community may not be able to receive the support they need from essential services because they remain offline.

The digital divide has widened, magnifying the impact digital exclusion has on quality of life, including social exclusion, limited career mobility, and difficulty in accessing public services.

So how can inclusive design help bridge the digital divide?

Inclusive design "considers the full range of human diversity, including ability, language, culture, gender, age and other forms of human difference." One of the core principles of inclusive design is that exclusion can occur to everyone, not only the vulnerable. Depending on context, anyone can experience a temporary impairment. For example, when you are holding bags of groceries, you are less coordinated to get your car keys to unlock your car.

Inclusive design is a human-centered design methodology that learns from diversity and uses exclusion as opportunities for innovation. We can apply this mindset to reframe the obstacles that prevent the offline population from going online into opportunities to innovate more inclusive and accessible digital products and services.

Different sociodemographic groups have different barriers to going online which span across accessibility, affordability, and digital ability. For the elderly and those who hadn't completed secondary school, a key obstacle is perception. They believe the internet is complex and difficult to use or have a perceived "lack of interest" stemming from fear or lack of confidence, skills or experience with the internet. Digital natives don't realize this, but in fact, there's no user manual for the internet.

Let's reframe this obstacle into an opportunity: How can we improve digital confidence in our new users?

Recently, IDEO released "Digital Confidence Design Tools," in collaboration with Google's Next Billion Users team and the Bill & Melinda Gates Foundation. The tools can be used by anyone (e.g., product manager, developer or designer) to ensure that common obstacles faced by new internet users are surfaced and addressed. The outcome is a product that works for everyone, regardless of location, language, or device.

More broadly, Idean also created "Cards for Humanity," a set of cards that encourage product teams to consider a diverse range of needs and different perspectives during the design and development process. Have you considered whether a new immigrant with poor digital literacy would be able to easily manage their finances online?7

Research from the Centre for Inclusive Design has found that when designing products or services with edge users in mind, there is potential to reach and benefit four times the intended audience.

Take the example of the electric toothbrush – originally invented for those affected by motor skill impairments. Now everyone is benefiting from the convenience of this inclusively designed tool.

The electric toothbrush embodies the inclusive design principle "solve for one, and extend to many" – solving problems for edge users, which in turn, actually benefits the majority. By designing to address the offline population's concerns, the online population can also benefit from more accessible and intuitive digital experiences.

The digital divide affects millions of people around the globe. Therefore, the solution should start with the people at stake. Inclusive design is a mindset and methodology that can help us bridge the digital divide. We can co-create a world in which everyone can access, use, and enjoy digital products and services to connect, grow, and thrive.

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Innovation and sustainability in the energy ecosystem

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Energy is the engine that fuels our economies and modern human activity. Global energy needs are ever increasing; we would need twice as much energy in 2040 as we produce today if not for the era of sustainability in the energy mix. We need innovations to accelerate development and deployment and improve cost while enabling integration of the current renewable energy technology.

Governments worldwide are allotting trillions of dollars to the climate change movement. They seem to agree on one major solution – renewable energy. I wouldn't blame them. I, too, considered renewable energy as the most obvious solution – solar panels, electric cars, wind turbines, etc. However, what seems ideal in theory may not necessarily be feasible, especially when implemented on a national scale. It is important to take into consideration the interdependence of the energy sector across other sectors.

Germany is the perfect example of the impossibility of shifting to a purely renewable energy source. The country was the first to jump on the renewable energy train, investing a total of USD580 billion in the Energiewende project. A 2019 article published in Der Spiegel, the largest German news magazine, showcased broken wind turbines and barely completed transition towers on its cover and showed that the dream was based more on creative guesses rather than facts. If that's not obvious enough, the article itself was entitled "A botched job in Germany."

When we speak about transformation, energy players are strategically looking for new revenue streams, as traditional business models in the sector are under pressure. In order to deal with the spike in demand, SEA is transforming its energy systems and introducing smart grid frameworks with a vision of energy efficiency. Without a sustainable energy solution, we are at risk of becoming a civilization of stasis, a state wherein government would be forced to control consumption. This dilemma would thus require innovation as the key solution to creating a sustainable energy ecosystem.

Innovation and sustainability are terms that are often associated with one another. When faced with the demand for sustainable, albeit limited resources, people have often turned to innovation for building solutions. For example, when the US-China trade war was affecting supply chains all over the world. Tencent decided to invest in research and development to create its own components instead of relying on Western suppliers. It enables companies to be more self-reliant.

One other example will be on the long-term battery storage – lithium-ion batteries are great but are limited (four to five hours only). What the market needs is the ability for the battery to work if the sun doesn't shine and wind doesn't blow. This is where innovation is called into the picture, and it indicates how important sustainability and innovations are as they are inextricably intertwined. It is also clear that if long-term energy storage works then the prices will reduce significantly.

The difference in resources and geography also calls for innovative solutions that fit the capabilities of a specific country. In Singapore, a nation with close to no natural resources, we face a greater challenge, although the government's first step might be to diversify its sources, we will need to look beyond and introduce technologies into the energy ecosystem such as smart grid, analytics, and artificial intelligence – to name a few. Innovation and sustainability are of paramount importance when it comes to the energy transformation. The time has come for alternative innovation solutions for the energy market beyond renewable energy.

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Why innovation is crucial during a crisis

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The word "crisis" originates from the Greek word "krisis" – which means "decisive moment." It is a moment that is critical, especially now. Yet, it presents us with a choice.

COVID-19 has brought about an unprecedented period of uncertainty in our lives, from how we live and work, to how organizations interact with their clients. The way consumers purchase goods and services and how supply chains deliver them have also changed drastically.

In our research note, Fast-Forward to the Future, 42% of organizations were adversely affected by falling customer demand due to the pandemic, and more than half of the organizations have started to prioritize digitization as a competitive advantage.

In response to the pandemic, we have seen several innovations: new medical devices, telehealth technologies, improved healthcare processes, and novel ways to collaborate remotely. How then can we turn crises into fertile innovation momentums?

Focus on problem solving

Innovation is the act of creating immense value. At the heart of innovation, it must focus on solving a problem. Innovators in a crisis look to bettering the lives of others, connecting with other people, and being part of the solution when the going gets tough.

The nature of this crisis is more than an opportunity to make a difference or be part of the solution. It brings us closer towards the lean methodology of build, measure, and learn at a rapid pace with greater impact. This environment allows for growth not only at the leadership level, but also for our teams to perform their most innovative work in service of the organization.

Drive a purpose-led organization

One of the challenges in organizational leadership is employee engagement and inspiring new ideas from the ground-up towards the vision of the organization.

In a crisis, employees' role in generating new ideas should not be underestimated. Leaders who can inspire a growth mindset towards managing and innovating in a crisis will typically find fresh perspectives and new-found energy in staff, as people feel more compelled to offer insights they normally would not.

For instance, the CEO at Zoom, Eric Yuan, was able to rally 40 Cisco engineers to join his team at Zoom during the Global Financial Crisis in 2008. When Zoom finally launched in 2013, it reached a million users within a few months, 10 million users in a year, and 40 million by February 2015. The 40 Cisco engineers believed in Yuan, and more importantly, the purpose of building a video-first, cloud-based, and user-centric platform which is worth more than USD70 billion today.

Crises can create opportunities for an organization to work together towards a purpose-led initiative, with the organizational courage to support a belief that would otherwise be unlikely in times of calm.

Adopt open innovation processes

Leaders often leverage upon open innovation processes to get fresh perspectives on their organizations to innovate.

Scale will be needed to draw the wisdom of the crowd – a large number of participants will often come up with many more, high quality ideas than a small team of smart people.

Coming back to problem solving, organizations can also create innovation challenges for its participants. These challenges create a safe environment for anyone, anywhere to generate more ideas to solve a challenge meaningfully. What Capgemini has achieved with the Architects for Positive Futures program is a great manifestation of that.

Evaluation of these ideas then becomes essential. In the Applied Innovation Exchange (AIE), we thrive on the Discover, Devise, Deploy, and Sustain framework. In deploying ideas, it is a cycle of Test, Measure, and Iterate. Leaders can use this feedback loop for any innovative solution participants co-develop.

Diversity is key in open innovation – we'd expect business analysts to understand problems best. We're often wrong. It takes contributions from the entire organization, especially staff who experience these problems first hand.

Innovate to drive creative destruction

In a crisis, we can leverage ideas that solve salient problems, rally teams towards a common purpose, and adopt open innovation to drive creative destruction. Only then, we can think about how better we can move the organization forward, together.

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Why purpose, profit and people are now inseparable

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Traditionally, for-profit corporations have aligned themselves to the idea that generating revenue and creating social impact are two separate goals. However, it's clear that this is no longer the case. From Apple's Zero Waste Program to Nike's pledge to invest 1.5% of its annual income into communities, consumers – particularly millennial consumers – are now increasingly attracted to purpose-led organizations. This sentiment has only been bolstered by the COVID-19 pandemic, which has demonstrated the need for companies to translate their social impact statements into tangible action. The pandemic has not only transformed the way we live, work, and interact, but has also brought underlying social, economic, and racial inequalities into stark relief. For organizations to respond to these global issues responsibly, meaningfully, and authentically, they must realize that businesses – particularly technology businesses – are not neutral parties to such issues.

According to Gartner, 70% of enterprises will be experimenting with immersive technologies for consumer use, with 25% of them deployed by 2022. In the same year, it is predicted that 75% of enterprise-generated data will be created and processed on the distributed cloud. The pandemic has accelerated this change and necessitated a movement towards a technology-led, agile workforce for many businesses. In a world where technology will transform all aspects of human life, it is more vital than ever for companies to embrace sustainable and socially responsible business models.

Beyond the ethical implications for businesses to become more purpose-driven, consumers are also increasingly evaluating companies based on their environmental, social, and corporate governance factors. In a survey conducted by the Capgemini Research Institute in June 2020, it was found that 78% of 7,009 consumers across seven countries believe "companies have a larger role to play in society." With the rise of impact investing, social entrepreneurship and corporate social responsibility, consumers are influenced to purchase more from organizations that have a strong vision for people and society. According to a study by Forrester, 31% of 4,818 US online adults say that a company's social responsibility reputation influences their purchasing behavior.

Corporate social responsibility also intersects with an organization's values and identity. Not only does a robust and consistent company brand increase the loyalty of its stakeholders, investors, and clients, but also, the happiness and productivity of its employee base. A study of 100 Fortune 500 companies demonstrated that there is a correlation between a company's profit margin and CSR, with the biggest factor coming from how much employees resonate with their organization's dedication to social and environmental causes. Seventy-five percent of millennials, a key demographic estimated to inherit USD30 trillion of wealth over the next 30 to 40 years, have said that it's important or very important for a company to give back to society.

There is no doubt that technology in the twenty-first century is under scrutiny. The potential for technology to disrupt democracy, encroach on privacy and inflict large-scale harm is a pain point for many of its users. Yet technology is also uniquely positioned to provide accelerated solutions for positive change, with its ability to facilitate cross-sector collaboration, streamline business processes, and democratize access to information. Tech companies need to be mindful of this balancing act and organize their business according to wider societal implications. They need to find – and define – a strong purpose which considers the impact of their business on people and the environment. The criticality of this focus is even more pronounced in 2020 and in the post-COVID-19 era, where only volatility is certain.

Creating a purpose-driven culture across all levels of an organization begins with recognizing that social impact and profitability are far from mutually exclusive concepts. Rather, people, purpose and profit are intertwined in ways which allow for companies to become significant drivers of positive change, while also driving performance and growth.

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Why sustainability as a business motive isn't enough

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We live in an ever-evolving world driven by megatrends. From leaders at Fortune 500 companies to young startups, an important question we all start by asking ourselves is... how?

How do we cope with a changing landscape? What does it mean for businesses operating in this new reality?

With infinite information at our fingertips, the unimaginable now seems possible.

This technological era has placed business transformation at the center stage. Digital disruption is quickly followed by a newfound focus on sustainability – the societal and environmental impact of businesses itself.

The ease of access to information, political shifts, changing public perception, and climate change are driving forces of this shift towards sustainability. Suddenly, organizations are measured beyond profits.

From pollution prevention to the emphasis on sustainable behavior and cutting emissions, customers and employees are holding organizations accountable; forcing them to recognize the importance of sustainability.

Recent studies found that over two-thirds of customers prefer sustainable products and are willing to spend more. Furthermore, employees are demanding that businesses place more emphasis on sustainability as an organizational value.

Today, the adoption of sustainability takes place at varying degrees. Some organizations have made genuine shifts towards sustainable business practices. However, many have also taken reactionary and ad-hoc initiatives simply to obtain "green" credentials.

This brings us to the next question. Is sustainability as a "business motive" enough?

Merely making marginal improvements in business practices to "follow a megatrend" won't help to save the planet.

Organizations need to assess for potential problems before creating a sustainable business model, grounded in long-term strategies with sustainability as their foundation.

Whether it is the innovation of a new product, design strategy, or purpose – this transformation requires organizations to look beyond the short-term financial performance to allow for maturation into long term value creation.

Besides helping the world meet environmental and social challenges, a business model grounded on sustainability can drive businesses further.

One such example adopted by social enterprises is Michael Porter's Corporate Shared Value – a concept that allows businesses to create business models built on sustainability to gain a competitive edge whilst contributing positively to the community.

Some examples of Porter's CSV include:

- Integrating sustainability into your business goals can give you a competitive boost by attracting and retaining a motivated workforce, translating into profit.

  Recent findings show that 89% of executives believe that employee satisfaction is synonymous with having a shared purpose. Moreover, 85% agree that they are more likely to refer an organization with a strong purpose to others.

- Sustainable business practices can protect your organization's brand and mitigate risks.

  Every CEO's worst nightmare? Waking up to breaking news of a scandal. From pollution to employees working in unsafe conditions, an organization's reputation is not only blemished, but dealing with a public relations crisis is also extremely costly.

- Sustainability is creating new market segments, such as novel service offerings and innovative products.

  Sustainable production practices now underpin a range of consumer products, from clothing to recycled toilet tissue. Sensefolio – a data provider – has emerged by using artificial intelligence to rate companies based on their commitment to social, environmental, and corporate governance values.

Prioritizing sustainability doesn't mean that an organization's profit is placed on the backburner. On the contrary, it has evolved into being pivotal for business strategy.

As we face one of the pressing problems of the twenty-first century, large corporations are glorified for their motives at saving the environment.

But can we really trust them to meet sustainability targets? What is authentic, and what is greenwashing?

With the pace of change continuously accelerating, simply having sustainability as a business motive has lost its intrinsic value and is no longer enough.

Whether or not these "business motives" are translated into stronger purposes, more sustainable business practices, and measurable outcomes – holds a far greater weight.

Savvy organizations that strike a balance between profitability and purpose, rather than just being a place that provides a paycheck, have realized that sustainability is beyond an act of philanthropy.

Sustainability has opened our eyes to an entire world of opportunities. It is the answer for enduring growth, profit, and the key to a future-proof business.

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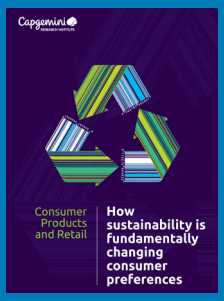

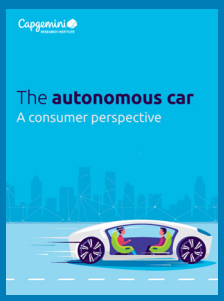

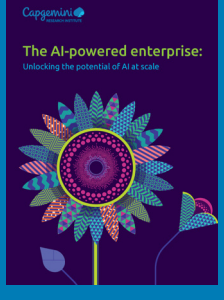

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Capgemini is a global leader in consulting, digital transformation, technology, and engineering services. The Group is at the forefront of innovation to address the entire breadth of clients' opportunities in the evolving world of cloud, digital and platforms. Building on its strong 50-year heritage and deep industry-specific expertise, Capgemini enables organizations to realize their business ambitions through an array of services from strategy to operations. A responsible and multicultural company of 265,000 people in nearly 50 countries, Capgemini's purpose is to unleash human energy through technology for an inclusive and sustainable future. With Altran, the Group reported 2019 combined global revenues of €17 billion.

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