THE INEVITABLE DIGITAL FUTURE

A WORLD OF SMART CITIES

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Acknowledgment

The pursuit of knowledge, continual development and professional excellence are qualities that my teachers and mentors instilled within me from a young age. I have always considered myself a student and am privileged to have met and learnt from great leaders, statesmen, technologists and businessmen the world over to whom I am ever forever grateful.
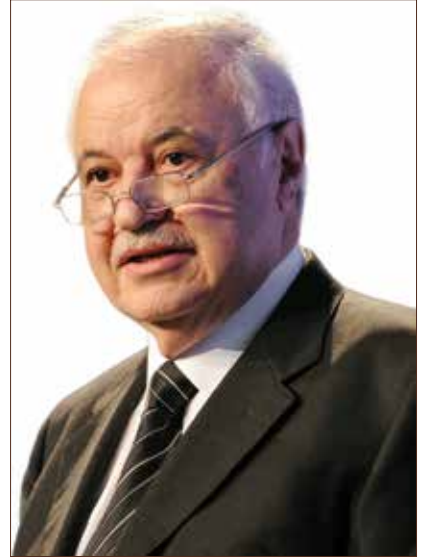
The global challenges we are currently facing are unprecedented which requires us all to introspect, analyze and question. Fortune loves the courageous and I hope this book inspire the reader to take on this important message and consider technology the pedestal from which more sustainable cities can be established.

Recognition

In preparing this book I would like to thank Dr. Hadi Eid for his editorial support and Mr. Tareq Shahwan for his input. I would particularly like to extend my special gratitude to one of my senior IT experts at Talal Abu-Ghazaleh Global, Mr. Shahid Halling, for helping me to organize the contents of this book and providing useful insights.

Talal Abu-Ghazaleh

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Mankind's Digital Future

From primitive civilizations to the modern digital world, societies have jumped in leaps and bounds driven by man's instinct to survive. Throughout history, this survival has manifested itself in many forms - from creating simple hand tools to now building intricately connected cities. Man, having been given dominion over the Earth and its resources, has been instinctually innovative to adapt to a changing environment, constantly being at the forefront of innovation.

This spirit of innovation is what fueled the industrial revolutions of the past, changing each time the course of human destiny and steering it into a new plateau of existence. These revolutions were knowledge-based in their very essence, resulting in the technological revolution we find ourselves in today where the interconnectivity of everything is the catalyst for greater achievement.

This has brought along a world of opportunities that mankind has never previously seen with an abundance of disruptive technologies changing the way we live, work and play. These technologies, along with the challenges

and opportunities they bring, were discussed in my previous book "The Brave Knowledge World" which served as an introduction to the new digital reality facing us all.

With an ever-increasing technological bombardment, it is important that we move beyond technology and ensure that our values are reflected in this new digital ecosystem so that we are not overwhelmed or controlled by it. It should be a tool, just as the axe was a tool in the hands of cave dwellers. It needs to become a part of our existential reality which we need to embrace, albeit with thought, caution and wisdom. This brings a new wave of opportunities and challenges where we need to have our sights set on innovation, moving the conversation from technology to becoming better societies and people. Technology should unite us and allow us to create a better world for future generations as the world becomes a more interconnected body.

I call this 'digital enabling', something I had called for many years in my various capacities as Chair of various UN committees related to ICT and promoting technology in a bid to achieve sustainable urbanization. The truly transformative power of technology will be realized when we start to transcend it. What we must realize is that those things that cannot be automated or digitalized will be extremely valuable in the future. Qualities such as innovation, creativity, ethics and being human will allow us to achieve such transcendence and secure our place as humans in this digital future.

Those who do not adapt and transform in light of this digital enablement will find themselves left behind, just as the Kodaks of this world found themselves out of business because they could not settle in. The same will happen with other businesses and I dare say governments and even societies that cannot successfully join this technological tsunami. This is the next step in our advancement and only those brave enough to look forward with foresight will survive.

The purpose of this book is to build on the foundation I set in the "The Brave Knowledge World" and pave a course through this technology to show which ones are now mature enough to help power our future cities. Those wanting

to work as knowledge workers would be wise to build their capacities in these technology areas that are forming the bases of Smart Cities globally.

Some have already started this journey but failed to realize the true potential of such cities. Nevertheless, they have accumulated valuable lessons for others to learn from. I discuss in this book the guidelines and key technologies that I regard as essential for those wanting to build Smart Cities from the ground up as well as the surrounding considerations that must be carefully deliberated in order to build comprehensive and robust ecosystems to power Smart Cities.

In my mind, this will be a confluence of different technologies existing within an agile ecosystem consisting of innovations such as the Internet of Things, Big Data, Robotics, all enabled by Artificial Intelligence and connected through high-speed communication channels such as 5G networks. The boundaries between these technologies are becoming increasingly blurred as they merge with one another, creating a new service layer of complementing technologies to bring about digitally empowered smart cities.

The power and domination of technology in all spheres of our lives will also see superpowers maneuvering ferociously for prime position. The one that innovates and gets its technology adopted will control and reap the rewards. This will have repercussions the world over on political relations as well as international trade and is a testament to how important technology has become.

The future of our economies is digital and those who understand this and take heed will be among those that prosper.

Talal Abu-Ghazaleh

Introduction

Technology is connecting us in unique ways through borderless, cross- sectoral ecosystems that are disrupting the world as we know it. Never before has it been possible to transact across the globe with such ease and seamlessness with digital assistance impacting the ways society lives and works, or how commerce takes place and governments operate. These areas are undergoing major reformation as digital empowerment gains momentum to replace the traditional modus operandi, now seeing the dawn of Smart Cities to help deliver sustainable urbanization.

Technology has become necessary for individuals, societies, businesses and governments to take part in the ritual of daily life. It has surpassed all predictions and is continually growing in all facets of human endeavor at a rate that I find amazing. It has become so ingrained in us that we cannot imagine life without it.

The technology we have in our midst today and the influence it has, could not have been comprehended even up until recently. The technological predictions of the past pale in comparison to what humanity has actually achieved creating a totally new upshot horizon where modern society is now emerging.

Novel networks, advanced data processing techniques, Artificial Intelligence (AI) based systems and greater computing technology are being used in order to make sense of the deluge of data systems, paving the way for the development of Smart Services. This is becoming a game changer, greatly facilitating the way we live our lives, the ways services are delivered and the manner in which cities operate.

Technologies are collectively starting to have massive cross-sectoral enabling effects. The boundaries among them are merging to bring about new technology ecosystems allowing Smart Cities to develop, affecting businesses, societies and governments.

While there have been attempts by many to develop Smart Cities in the past, they have only had somewhat limited success. This I believe can be mainly attributed to the lack or immaturity of the technology itself to deliver what was promised, along with matters related to proper governance, technology adoption and resistance to change. For many, change brings fear, which if not properly managed can halt progress in its tracks. On the technological front, technologies such as Artificial Intelligence and Internet of Things (IoT) were not really mature enough to deliver their promises in the early 2000's when the idea of Smart Cities started gaining momentum. Also, the fast networks required to facilitate communication of systems and data exchange were simply not there. With huge advances in these and other key areas, I see that Smart City implementations have a much better chance of success now and will be driven by the following primary technologies:

- Artificial Intelligence
- Internet of Things
- Robotics

These core technology areas will produce masses of Big Data and will be supported by advanced communication technologies that include:

- 5G networks
- Cloud services
- Blockchain
- Digital Identity

" Technologies are merging to bring about new ecosystems.

Talal Abu-Ghazaleh

"

This provides Smart City stakeholders a strong foundation on which to develop useful, user-centric Smart Applications.

Developing Smart Cities requires an appetite for change at all levels, coupled with a substantial investment in underlying technical infrastructures, proper governance, as well as users' acceptance and services adoption. It must be remembered here that technology is a catalyst that will automate what is currently in place. This requires a

necessary process review and improvement in order to optimize operations before digitization takes place.

The relationship between these main technologies is becoming increasingly symbiotic in nature as they intertwine to bring about new technology ecosystems. Technologies derive their value by qualifying a business or service, which in Smart Cities means delivering optimized services through a ubiquitous device such as smartphone which has become an ideal medium due to its wide adoption. Services and technologies need to be meaningful and citizen-centric in order to serve the end-user. This is the only way such digital empowerment can truly be realized to deliver tangible value.

These technological areas are geared to breakdown into further specializations and meeting specific needs of the sector they are supporting. This will happen across all the aforementioned technologies and will go on to set the foundation to generate Smart 'everything' by creating dynamic, cross-functional systems. Those systems will interact with humans in real time, culminating in the emergence of completely new value chains and experiences where everything is inter-connected. The current complexity in these areas will be reduced and simpler interfacing with them will be developed, encouraging further innovation and adoption.

Eventually, this will transform these technologies into cloud-based services allowing developers to plug and play different components on the cloud to create robust, Smart Systems on the fly. Everything as a Service (XaaS) will become widespread making these technologies ubiquitous and accessible to all.

A manufacturer, for example, will be able to link IoT (Internet of Things) based production lines to AI-based cloud services, analyze production activity and feed the data into their cloud-based ERP solution to provide predictive analysis, update stock information and reflect this in related financial accounts. This information will then be available in external systems of linked supply chains allowing them to better plan for production and deliveries.

Another case in point could be a hospital seeking to analyze results of an unusual medical case. AI-based health services on the cloud will allow doctors to upload information and have central AI machines analyze and report back to them after having referenced international medical diagnostics on the subject. Hospitals could also share information regarding patients in the case of pandemics where up-to-date information is vital to reallocate resources and provide information to central crises management teams.

The same could be done for government departments that want to go online, retailers that want to analyze customer habits, city councils that want to determine pollution levels - and everything elsewhere that requires smart processing of information collected from machines and sensors.

In Smart Cities, data is everything.

What a human mind can imagine, is achievable.

Talal Abu-Ghazaleh

Benefits of Smart Cities

Most of the required elements needed to make Smart Cities work, including supporting functions such as security, online payments, workflow operations, digital identities, AI analysis, etc., are now coming of age and much easier to access. The previous complexity of accessing and using technology has been much simplified, significantly minimizing financial and technical barriers. Technology is moving from being a closed, complex workout to one that can be easily accessible via cloud.

Using cloud services allows Smart City developers to build systems that are more elaborate, secure and available than local systems could ever be, without ever having to think about upgrading software, hardware or performing tedious administration tasks; very much akin to building structures with Lego.

Technology simplification is encouraging greater adoption allowing entities to focus on business functionality rather than being engrossed in technical issues, shortening the development curve and allowing greater value to be delivered to citizens through better analytics which I have summarized in the following diagram:

> Smart Cities must be citizen centric in order to deliver true value.
>
> *Talal Abu-Ghazaleh*
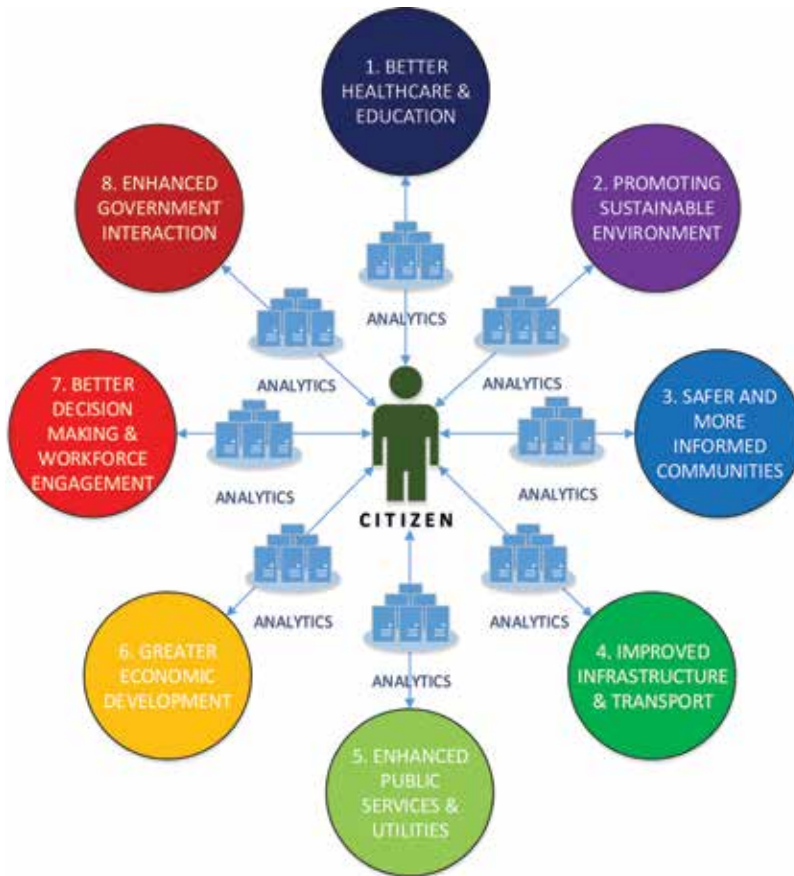
Figure 1: Citizen Centric Benefits of Smart Cities

1. Better Healthcare and Education

- **Healthcare**

The correlation of a Smart City with healthcare wearables such as intelligent health wrist bands and watches will transform the way proactive healthcare is provided. Real-time data can be provided to health institutions regarding patient health, facilitating better early detection diagnoses and allowing elderly patients to live more independent lives. All vital signs and health conditions can be monitored remotely, allowing health specialists to take action in cases of emergency. Such devices can also allow monitoring of people with certain conditions and enable epidemic control in cases of virus outbreaks, making it possible to identify an infected person in suspected contact.

Smart health devices, linked back to remote professional medical personnel who are on hand to deliver vital support and guidance, are already being tested in many capitals allowing lay people to administer basic medical treatment to those in need. Smart healthcare devices are enabling professionals to deliver proactive healthcare services to a growing population and allowing for new applications in telemedicine, remote surgery and faster drug development to come about.

- **Education**

Smart education is a vital element in the development of a Smart City. For many years, I have been calling for the education system to be reformed in order to deal with the growing number of digital natives who need schooling and for whom technology is a natural activity. This must be understood and incorporated in the way education is being delivered. As the children of today become the citizens of our cities of tomorrow, it is essential to equip them with digital proficiency in order for them to be able to actively participate in the digital economy and positively engage in Smart Cities as power users and not as mere bystanders. A robust infrastructure of connected educational institutions, up-to-date technical training centers, lifelong-learning facilities and adaptive e-learning infrastructures are the keys to success in Smart Cities and must be given high priority in such development.

2. Promoting Sustainable Environment

Through the application of new insights and analytics, city operations become more efficient. Smart buildings, pollution monitors, traffic sensors, connected weather stations and green energy production can all help to reduce emissions and allow a city to operate and deploy services at the optimal time by acting on interactive, real-time intelligence. This increases operational efficiency, helps to minimize the carbon footprint and makes the best use of limited resources, an issue facing cities all over the world in light of growing city populations.

3. Safer and More Informed Communities

The leveraging of technology across a Smart City helps it to become a safer one as intelligence authorities have access to live information from across a city's sensors, traffic information and CCTV surveillance systems, allowing

law enforcement to identify, track and respond to threats in a proactive and effective manner.

This also provides vital intelligence to services such as ambulances, civil defense and fire brigades as well as keeps citizens informed in times of need, with real-time weather, traffic warnings as well as public safety announcements, allowing citizens to live in a safer and healthier environment, empowering them with necessary information to make more informed decisions.

4. Improved Transport and Infrastructure

Issues with city infrastructure including bridges, roads, sewers, critical utility infrastructures such as water, gas and electricity can be catastrophic for a city and need to be dealt with as soon as possible in order to avoid further costly repairs and disruption to services. Roads being the critical blood vessels of a city need to be efficiently monitored and managed for proper traffic management and maintenance purposes, which can only be done effectively through digital means due to the high volume of road networks in modern cities. Information from sensors across a city can provide a predictive analysis and monitoring capability that otherwise would not be possible through traditional methods to help identify problem areas, assist with day-to-day city management and planning functions, as well as help save municipal budgets.

5. Enhanced Public Services and Utilities

The limited supply of resources to meet growing human consumption is a huge challenge facing cities. Smart applications and sensors allow them to identify issues with water supply, rapidly identify infrastructure needing maintenance and provide proactive preservation which in the long term saves money and resources. Electricity grids and gas networks can be intelligently managed as smart metering technology centralizes data collection and helps in resource allocation and rerouting, which in many cases is done automatically with the oversight of technical experts, allowing services to be maintained during peak times. Waste management can also be enhanced by

> The processing of data from across a Smart City will result in better analytics and decision making
>
> *Talal Abu-Ghazaleh*

using Smart City analytics to focus efforts in areas that need greater attention.

6. Greater Economic Development

A city equipped with a robust and smart infrastructure can function in a more agile manner and become more productive, which attracts greater business investment. This promotes the economic migration of people to the city and subsequently increases demand for auxiliary services that business and residents require, which improves the city's competitiveness as it becomes an open, transparent and desirable place to live and do business. With the services and amenities the Smart City has, residents also live more equitable lives, with their rights better protected due to Smart Services delivering greater quality coupled with more intelligent and transparent governance.

7. Better Decision Making and Workforce Management

A Smart City produces masses of big data which gives officials access to insights they never previously had. This allows for proper city planning and enables officials to identify trends and needs that otherwise would have been difficult to analyze, aiding municipalities in decision making. This provides for streamlined services being offered and achieves better forecasting and planning, as well as prioritizing resources and manpower to services that need them the most.

8. Enhanced Government Interaction

The digitizing of government services results in a range of intuitive portals, applications and websites to be developed allowing citizens to conduct all of their municipal affairs online. The transparency and accountability will improve across all governmental departments which will promote a closer relationship between the citizen and the government, thereby increasing civic engagement and public trust. Citizens with a digital identity will be able to access a spectrum of Smart Services with greater openness and transparency. Making Smart Services citizen-friendly is paramount for Smart City adoption.

> The information revolution is leading us through a knowledge revolution to the wisdom revolution.
>
> *Talal Abu-Ghazaleh*

Smart City Foundations

The previous section spoke about eight of the main benefits Smart Cities can provide if implemented correctly, which leads us to the very pertinent question of how they can be implemented effectively in light of numerous mediocre Smart City implementations we see across the globe.

> "
> Smart Cities can help to deliver sustainable urbanization.
>
> *Talal Abu-Ghazaleh*
> "

As the purpose of Smart Cities is to ultimately deliver better services and improve the lives of the citizens, this can only be done through the capturing and processing of real-time data to understand how actors in a city are performing in order to be able to make intelligent adjustments to optimize systems and achieve a greater degree of efficiency. This provides better economies of scale which in turn lowers operating costs of public services, allows better energy utilization, assists in traffic management, improves healthcare provisions and makes cities more livable and productive. This is essential in an age when urban populations are exploding and putting more strain on limited resources in countries across the world that are struggling to keep up with the growth demands of a growing population now living longer. I believe that Smart Cities will go a long way to help facilitate the implementation

of the United Nations Sustainable Development Goals (SDGs) aimed towards transforming our World in light of the continual challenges it is facing.

From my many years of work as the Chairman of the United Nations Global Alliance for ICT and Development (UNGAID), Co-Chair of the Global Network for Promoting Digital Technologies for Sustainable Urbanization and Vice-Chair of the United Nations Information and Communication Technology Task Force (UN ICT TF), I had the honor of speaking to, and working with, many international ICT experts who helped shape my understanding of how technologies can make an impact on human lives and how transformative Smart Cities can be built.

Technology, with all its benefits, cannot on its own be seen as some type of silver bullet which will somehow rectify operational inefficiencies. Streamlined operational frameworks and processes need to be in place if we are truly going to benefit from technology within Smart Cities.

Before we go on adopting more technology and launching more Smart City initiatives, it is imperative to get our houses in order and streamline what we have so that the resulting digital qualification is an effective one. Technology cannot be used as a scapegoat to forego this important exercise, as is done very often in its implementations. In fact, this is a major reason for its failed applications across the globe, and a phenomenon familiar to IT experts in my IT consultancy firm, Talal Abu-Ghazaleh Information Technology International (TAGITI), as they frequently report during their audits.

In order for proper technology development and adoption to come about, I see that the following foundations need to be in place to develop the backbone of our Smart Cities:

1. Process Improvement
The need is imminent for all society actors to streamline their processes and boost their efficiency to be ready for automation. This is a core exercise that needs to be conducted by all those wanting to go digital as technology will only digitalize what is already there. Digitalization needs a well thought out and streamlined foundation if it is to be successful.

2. Smart Technologies

Smart cities need to have a strong underlying infrastructure to sustain them. This includes:

- Fast landline and mobile networks that support high-speed internet access and more sophisticated satellite technology.
- Internet of Things (IoT) and 5G networks to facilitate communication between sensors and systems which will be widespread throughout our everyday surroundings.
- Consolidation of big data from systems and sensors in an easy, unified and commonly accepted format that can be used for further processing
- The use of XaaS cloud services providing advanced technology allowing AI systems to be developed, used and scaled easily to provide advanced analytics and decision-making capability.
- Smart-grid datacenters that can intelligently manage network traffic among themselves and provide load balancing and resilience for the massive amounts of big data that require analysis and processing coming in from across a Smart City.
- Robotic systems that augment humans to carry out complex, dangerous and tedious tasks, using AI as the intelligence to power them.

3. Smart Applications

This technology infrastructure provides a strong basis on which Smart Applications can be developed. It is only through functional, useful applications that the fruits of digitalization will be realized. Great efforts need to be devoted in developing these which are probably the most important factor in the success of Smart Cities. It is imperative that these applications provide easy-to-use, feature-rich interfaces, which citizens can easily access through a central digital identity and integrate with Smart City services and technologies.

4. Smart Government

Having governments that are fully online is essential for Smart Cities.   All governmental entities and their processes need to be fully automated, online, e-payments methods should be approved and easy to use and digital signatures and identities should be fully recognized and accepted.

Governments' functions need to be replicated digitally which requires having all the elements in place to make this happen, including a willingness to change and an acceptance of technology intervention. This can pose a challenge for entities that are people-heavy, bureaucratic in nature or resistant to change.

5. Ongoing Regulation and Governance
Smart Cities need technological systems to be developed ethically, regulated and controlled in a way that protects human health, safety and privacy, allowing citizens to live better, holistic lives.

This includes having:

- Controlled development frameworks
- Technical regulatory bodies
- International oversight committees

Entities need to be set up to oversee the development of technology in an ethical manner, ensuring that technology innovations benefit humanity and do not pose any threat, particularly in the case of Artificial Intelligence (AI).

6. Continuous Awareness and Training
If people are not equipped with the skills to use Smart City technology implementations, they simply die off. A comprehensive plan of awareness and training needs to be in place to ensure that citizens are technologically equipped to use the digital services being offered. Smart Cities can only succeed if people are empowered to become Smart Citizens in the first place. This also needs to be replicated across industries that undergo digital enabling to ensure their workforce are capable and up-to-date knowledge workers.

7. Change Management
There needs to be an appetite for change and an acceptance of technology in order for it to be embraced by society. This needs to be coupled with public awareness and technology facilitation to render citizens active members of a Smart Society. Change is never easy. Rights need to be preserved and transparency must be in place for all stakeholders to gain confidence in a

smart technology alternative. However, traditional ways of work and engagement still need to be observed until a full digital transformation is realized as there will always be citizens that are technically illiterate such as the elderly and those in rural areas who require extra support.

These seven elements which I have put into visual format in Fig. 2 are the essential building blocks that I consider fundamental to the development of holistic and comprehensive Smart Cities.
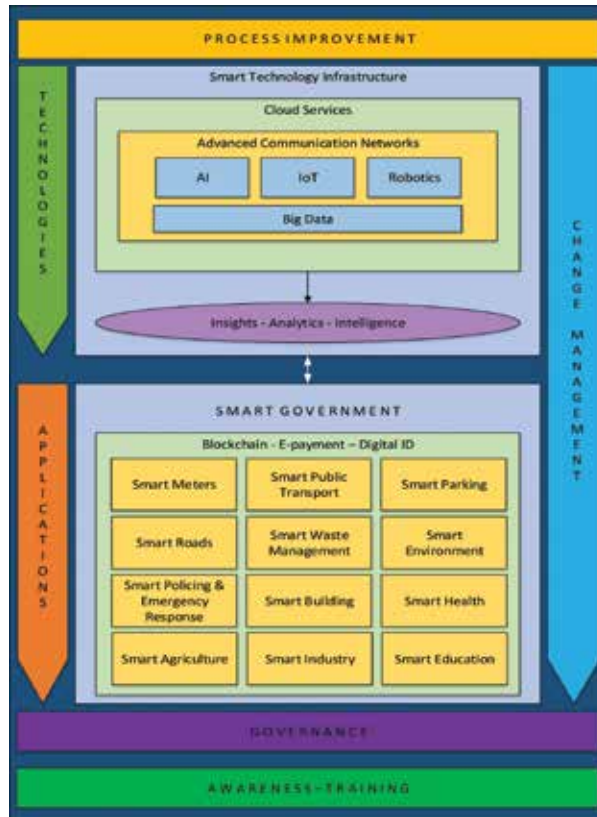
Figure 2: Building Blocks of Smart Cities

The following chapters will discuss each of the elements illustrated in figure 2 to help bring about better Smart Cities; discussing where the technologies that will make this up came from, clarifying misconceptions as well as discussing the supportive structures that will need to be in place to ensure a healthy, holistic development of an intricate Smart City ecosystem.

Artificial Intelligence

In recent years, AI has started to receive a lot of attention with many prophecies on how AI will replace workforces and ultimately becoming a threat to human existence. While it's true that some positions will be made redundant, I see as an end result that AI will create more jobs than it will replace. There has always been a fear associated with new technologies. History shows that automation leads to greater economic prosperity as people reskill and in turn provide greater value to their economies. I also don't believe that AI poses an existential threat to the human race. AI is the next generation of productivity tools that will serve to make sense of massive datasets and deliver greater value to societies at large. I believe that a lot of the fear mongering associated with AI is partially captioned in the term itself: "Artificial Intelligence", conjuring intimation that it can somehow totally replace human beings or become self-conscious. AI is simply an augmented intelligence that will aid mankind in the service of humanity.

A look into the workings of AI reveals it to be a technology based on linear algebra, calculus, probability and mathematical optimization to help recognize patterns in information being fed, nothing more. Such calculus is used to build a network of nodes attempting to replicate the function of human neurons, albeit on a much simpler level. These are developed and connected in programming code to perform various functions that make up what is known as neural networks. This is then fed with information - or trained - with specific labelled datasets

so that it may build up a representation of the data, and in turn, its detection capability. The more data is fed, the better it develops. For example, it can be fed many pictures of labelled cats and dogs and after training, will identify a cat or a dog when presented with a picture of either. Following that, the AI can be used to perform rapid functions on huge datasets, but it will only be limited to providing the function for which it has been developed. Granted that the example given is a simple one, but it serves to illustrate how AI technology works which can be extended to any sector requiring rapid data analysis.

AI has been receiving a lot of attention recently and the reason is two-fold. One is that large datasets are now available for AI systems to be trained on due to the advent of big data. Without data, such systems fall flat as they cannot be trained. Training them with big datasets provides them with enough information to push through the neural network algorithms, reducing error margin and making them more accurate. Secondly, training and processing the AI with data needs copious amounts of computing power which simply wasn't available previously. Powerful processing now allows AI algorithms to process big datasets which are ultimately complex mathematical equations.

The falling costs and availability of both of these has led to a renaissance of AI and the true value proposition of AI can now be seen. This has moved them from deterministic systems – like the AI Deep Blue that beat chess grandmaster Gary Kasparov – to ones that can conduct mathematic reasoning and infer solutions using new data, making them much more powerful than systems of the past.

AI has under it many specialties that can be applied in Smart Cities which I believe there is merit in discussing here to understand the impact this technology will have.

1. Image recognition – used to facilitate technologies such as number plate recognition, autonomous vehicles, cross reference of faces against databases to aid law enforcement, identification of threats in work places, etc.
2. Natural Language Processing (NLP) – the ability for systems to read and process written language for applications such as instant translation, convert speech to text and vice versa as well as properly understand language including semantics and context.

3. Machine Learning – used to develop systems that can learn from data and identify patterns, make correlations and assist in decision making. Machine learning consists of neural networks and deep learning. Deep learning is the area which will fundamentally drive AI innovations of the future as it has been developed to deal with unstructured data which is all around us.
4. Robotics – this is in effect the body for AI powered technology which will disrupt our lives in many ways. I will discuss more about robotics in a later chapter.

Each of these areas will serve different sectors as human analysis of all the data that will be generated in the future from sensors and systems will simply not be feasible. AI systems will develop to take this load off their human counterparts to help them perform a better job and free them to focus on innovation and delivering better service. AI is starting to intersect with a host of industries, specializations and services to provide superior augmentation and insert AI abilities in daily work.

The algorithms used to achieve different AI functions have been enhanced over the years producing now what are preferred algorithms for certain tasks. Experienced mathematicians are being lapped up by the large tech companies to perform research and development activities to gain an edge over competition through making improvements in algorithms design.

The lifespan of any technology is predicated on it achieving mass adoption and having a supportive ecosystem. In the past, this wasn't available for AI which led to it suffering from a number of 'winters' which led to its stagnation. Computing power and big data have already been mentioned as supporting technologies to AI. The third is cloud computing which will provide easy access to highly developed AI frameworks at low cost. This provides the advantage of scalability which is easily done through cloud models to provide greater resources to applications requiring them; which AI systems are becoming notorious for. This can become prohibitively expensive when trying

"
Artificial intelligence is the brain that will process big data to produce advanced analytics.

Talal Abu-Ghazaleh

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to do in-house and also calls for sophisticated technical administration to be in place. Cloud-based AI systems are starting to provide greater ease of connectivity which will push greater adoption with the backend being the remit of cloud providers to maintain and update. It is considered that large corporations will have in-house AI systems, but for the vast majority, cloud-based AI models will be the way forward.

AI is intrinsically linked to data science, a specialization which is set to explode as we generate more data which needs to be made sense of. Companies, governments and municipalities have stores of information that can be leveraged to offer new insights and deliver greater value. AI tools and algorithms will become so easy to use that non-IT people will be able to easily harness their power and build AI systems of the future quite simply, with the bulk of the work being in pre-AI implementation, in the data organization and data cleansing activities. I don't see AI systems existing on their own, rather, they will be merged as additional functions within business applications, based primarily in the cloud.

Business will be able to integrate ERP applications with cloud-based AI systems to deliver greater value. Financial auditors will be able to call on AI systems to help them identify problem areas in financial statements. Internal auditors will be able to feed corporate information to AI systems to perform rapid and in-depth risk assessments. AI will help make sense of data from IoT sensors, enabling new products and services to be innovated. This technology will free experts to perform more valuable functions and deliver greater value and will have a plethora of applications in Smart Cities. Such technology should be understood so that it can be properly adopted. Those who do will find themselves with a bright future.

The increasing reliance on AI systems to analyze and process data to deliver better and faster insights will mean that they will come under scrutiny to ensure they are functioning correctly and transparently. This poses a challenge as AI systems are complex black boxes which only a few really understand, and brings about the need to have the ability to backtrack and understand why AI systems came to the conclusion they did. This is known as explainable AI (XAI) development of which the US military agency DARPA is spearheading.

XAI will be a foremost consideration especially for those who want visibility into how the AI reached its conclusion, especially as more reliance is placed on such systems for decision support in critical Smart City environments. Such insights will also allow for better development of future AI systems to improve prediction accuracy, allowing humans to understand how decisions were made, provide traceability of actions as well as improve overall transparency. It is important that such transparency also be in place with reference to the datasets that are used to train the AI with. If such systems are fed information which is biased or contains prejudice, the resulting outcome will be a system that reflects the same bias. Checks and balances need to be in place to ensure that critical AI applications in particular are trained with vetted, unbiased information.

The level of autonomy that AI systems are given will need to be studied carefully and will vary depending on the nature of the sector it is serving and the level of service criticality. An AI intelligently controlling camera operations isn't the same as an AI system in a nuclear power plant. The former can be fully autonomous while the latter will require human intervention due to service criticality.

This brings about the need of having principles related to the development of AI in Smart Cities which I believe should include:

1. Developing AI for the purpose of extending the human capability.
2. Ensuring that humans are and remain in ultimate control of the AI at all times .
3. Guiding the adoption and usage of AI in an ethical manner to deliver better service to mankind.
4. Ensuring that the training of AI systems is done with unbiased data so that resulting conclusions are not prejudiced.
5. Having security and transparency built-in around all aspects of the AI systems so that they can be understood, audited and the results trusted.

The security of such systems is paramount to maintain in order to deliver proper and correct results. Any type of tampering with the AI system is something that specialists need to pay particular attention to as the consequences could be catastrophic. AI systems need their security to be maintained and protected

from malicious threats, vulnerabilities, bias and tampering. Smart City leaders must give due attention to these risks as blind acceptance of a technology is never a good thing. It must be considered here that AI systems are not perfect. They do and will make mistakes which presses the need for those adopting AI systems to have experts who can tame this technology, provide the necessary oversight and supervision and step in when things go wrong.

This is particularly the case as AI systems become more integrated within critical processes where any incorrect decisions could spell disaster. Organizations therefore must be ready to have an adaptive security defense mechanism as undoubtedly AI threats will evolve. The abuse of AI to produce new security threats for AI systems in the future is a distinct possibility!

In light of the many challenges associated with the development of AI, I feel that there is a need to have an international AI regulatory board overseeing all of these matters to ensure the technology enjoys proper development and support in an ecosystem that encourages active participation from all relevant stakeholders - from technology companies to policy makers. The challenges are many which need coordinated effort to be holistically resolved.

Within the context of Smart Cities, AI will provide the augmented intelligence to power the technology of the future and help to deliver breakthroughs that would have been considered impossible. As an example, it has been suggested that medical data will double every 60 days in 2020! Replicate similar increases in data in other areas and we have volumes of data at an unprecedented scale which can only be processed and analyzed using AI systems.

AI is an important consideration for Smart Cities which will be combined with other technology disciplines to deliver new value chains across the board. The current complexity of AI will disappear as it matures and branches off into services that can be retrieved via cloud. This will make it widely accessible as the intelligence that powers future Smart City innovations.

> **"**
>
> AI systems need to be fully transparent and trained with vetted, unbiased information.
>
> *Talal Abu-Ghazaleh*
>
> **"**

Internet of Things (IoT)

The need for data in order to build new services and value chains is essential as our environment becomes more connected and develops a digital nervous system using IoT devices. IoT devices in home appliances, in our environments, within factories and in everything in between is starting to bring real benefits of a Smart environment. This, in conjunction with AI systems, is being used to deliver rich insights and analytics to help decision making and aid automation.

The decrease in the cost of IoT technology, exponential gains in processing power and advanced communication networks such as 5G networks will see IoT becoming one of the most pervasive technologies in the digital future, having applications across the board in all segments of society, industries and spheres of life. This represents a massive opportunity and will see a new wave of applications and services becoming available. This has huge implications on many areas and brings its own set of challenges which will need to be given due care and consideration.

The worldwide mobile communication association, the GSMA, predicts that 25 billion IoT devices will come online and that it will be worth over $1.1 trillion by 2025. This will make up the foundation of Smart Cities and help to enable many sectors to become smart. In order for this data to be processed and analyzed to provide useful, actionable intelligence, it will need to be done in near real time in order to feed back into systems or report back to human counterparts.

Due to the sheer amount of big data that will be produced, this will be analyzed by AI systems in the cloud which are elastic and scalable, meaning that hardware computing power will never become an issue. This, however, brings about with it another complication which is the latency between sensors and the cloud-based AI processing systems. This latency will need to be reduced to a negligible amount and therefore in-country cloud implementations that have AI capabilities seem to make more sense to reduce the impact of this problem for applications that require real-time analysis. Instances where latency isn't much of a concern can be offshored to cheaper, public cloud AI offerings.

IoT is bringing an unparalleled interconnectedness which is starting to improve the efficiency of every industry it is being applied to. A challenge however, is that the many IoT technologies and protocols in existence are fighting to capture market share, each with its own merits and applications. It seems doubtful that one technology will dominate as implementations are varied and serve different requirements in terms of data throughput, sensor longevity and security. This means that there needs to be agreed-upon methods and protocols to ensure that data exchange between systems is seamless as there is no one-size-fits-all solution.

New services and value chains can only be developed if there is an efficient flow of data from IoT sensors to AI processing systems and back. Bottlenecks here will render such implementations worthless. For example, the IoT network to enable autonomous driving must be highly accurate and extremely fast for autonomous cars to function in a safe and proper manner. Any delay here would be catastrophic so the need for fast communication networks

is a paramount consideration for IoT implementations that need to perform rapid data collection and analysis. Technologies such as 5G will lay the basis for such communication.

IoT technologies will enable smart everything to come about which will become the nervous system of Smart Cities and result in many verticals in society adopting IoT to aid operational efficiency and improve workflow. This, however, brings many challenges which include:

- How can we build networks that can successfully support billions of sensors on them and the massive amount of traffic they will collectively generate?
- How can we protect these networks against infiltration and from becoming botnets that can in turn be used to launch attacks against other systems?
- How do we ensure the business continuity of our cities if such sensors go down and how can we ensure that networks are not overloaded when all of these sensors come back up online after a crash?
- How can we ensure that there is transparency and auditability of IoT sensors and the actions they perform?

These issues are easier to address when there is a single player and a single solution, but how do we do this in a multi-stakeholder, multi-product environment?

Relevant committees need to be formed in each country to tackle this and lay down an IoT implementation strategy which should be enforced by relevant regulatory authorities. This will allow for a common approach to be adopted by critical infrastructure sectors that require IoT technology such as water, electricity, oil and gas installations, help to streamline efforts, reduce the "silo" mentality and help develop talent resources that can provide cross sectoral support. Such implementations should fall under the remit of a critical national infrastructure and should be protected by national cyber defense capabilities.

> IoT sensors are the nervous system allowing our Smart Cities to 'feel' the environment around them.
>
> *Talal Abu-Ghazaleh*

IoT Protocols

Currently, there are many IoT communication technologies developed to serve different needs. The primary ones that are starting to gain ground are:

1. Low Powered Wide Area Networks (LPWAN)

This IoT technology is becoming very popular as it provides long-range communication using low-powered batteries which last for years. They have a range of industrial and commercial applications and send small amounts of data at a low rate so that high-bandwidth networks are not needed. There are many types of LPWAN's being both licensed and unlicensed with varying degrees of functionality, security and scalability, the most popular being NBIoT, Sigfox and LoRa. LPWAN technology is seeing uptake in applications such as smart metering, remote monitoring and facilities management control systems due to the long duration of the sensors and excellent battery life.

2. Cellular Networks

Cellular networks seem to be an obvious choice for IoT use considering their high bandwidth reliability and ubiquity. Two major challenges, however, related to them are power requirements and high operational costs. Cellular networks are more suitable for applications where higher-power sources are available which can take advantage of 5G bandwidth and help enable concepts such as augmented reality, autonomous vehicles and tele-health which require swift processing of large datasets.

3. Zigbee

This IoT implementation is used primarily finding adoption in home automation applications due to its short range, low power which provides higher data rates but at the cost of less power efficiency. This complements traditional WiFi configurations in order to leverage home sensor networks such as smart lighting, heating control and energy management and is ideal for medium-range home and office IoT applications.

4. Bluetooth

This is a well-established short-range communication technology having a range of IoT applications in the consumer IoT space used in medical

wearables, smart watches and many innovations in low-powered Bluetooth (BLE) technology. This technology has been around for some time and is affordable and reliable.

5. Radio Frequency Identification (RFID)

RFID has been used for quite some time for item tracking purposes and has received uptake in areas that require items and goods tracking such as in hospitals, warehouses, logistics and retail stores, allowing for better stock control and supply chain management. These continue to be a cost-effective, tested way to achieve better operational efficiency and will continue to be used.

Each of these IoT technologies has its applications which means that a variety of them will make up future IoT platforms in Smart Cities. It seems they will exist independently of one another as they serve different purposes and will allow varying degrees of security and scalability. Because of this independence, there is a fear that each IoT technology will end up living in its own silo, which will severely limit the technological benefits.

A way should be set out for these technologies to connect and talk with one another in a standard format which is technically known as an Application Program Interface (API), so that data can be shared across networks and used to provide intelligence. This will allow interconnection of IoT devices across sectors, thereby reducing the risk of IoT silos coming about and facilitating data exchange using an open data layer as shown in figure 3 below.
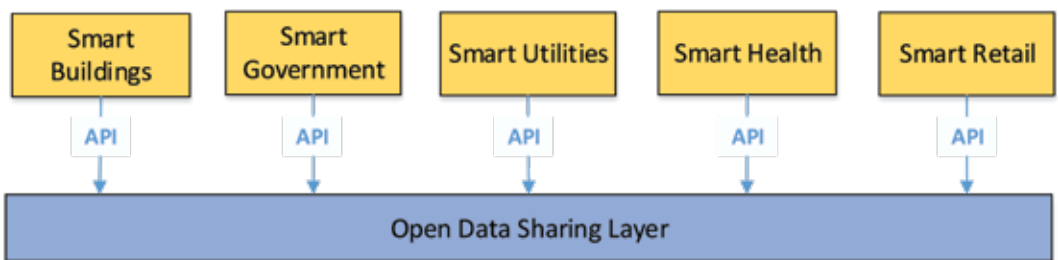
Figure 3: Open Data Sharing Layer for IoT Devices

Robotics

With AI providing the intelligence and IoT providing the sensors, many sectors will be enabled with advanced analytic capability. Some sectors, however, will need more than better intelligence and require a physical manifestation of the advancements in these fields to see benefits. This will come about through robotics.

Robots in their many forms have already transformed manufacturing, in particular car production and electronics that are now closed black-box environments having minimal human intervention. While it is true that robotization has led to the replacement of humans in the many industries,

it has only taken over repetitive, dangerous jobs or those requiring a high degree of dexterity not possible through human effort that can be achieved more efficiently and cheaply using robotic technology. This will make Smart Cities become more efficient, allowing humans to perform more valuable jobs than the traditional ones they have been doing.

The application of robots is being extended to include all aspects of manufacturing and production, effectively eliminating human intervention in industries which require a high degree of cyclic precision, or those being dangerous or hazardous to human health. In some industries collaborative robots, or cobots, are being used to augment human activity and work in close proximity of humans with the aid of AI and IoT sensors. The augmentation of human activity with cobots support seems to be the way most industries will head. Researchers from MIT have shown that environments consisting of human-machine groups work more efficiently than teams formed solely by either one.

Tedious and tiresome jobs can be easily accomplished using recurrent robotic technologies that will evolve to intricate industries such as construction being greatly aided by robotic builders. Human construction worker skills will be upgraded to deal with the finer details of building such as cabling, finishing, etc. Such technology will also be used to lift heavy objects like heavy metal beams, pillars and girders that currently requires the intervention of large, unwieldly cranes.

> Robots will become as pervasive as the Internet is today.
> *Talal Abu-Ghazaleh*

The extent of robotic application is being widened to include all aspects of manufacturing and production, allowing for more advanced Smart Industry to come about. This will eliminate human intervention in industries requiring a high degree of repetitive precision taking over heavy assembly work such as cargo handling, metal forging, product assembly, welding, painting, packing, and waste handling allowing companies to assume greater control over production quality with faster output and freeing humans to perform more valuable tasks than basic assembly.

Robots are also providing novel applications in healthcare in the form of exoskeletons allowing those with injuries and disabilities to live useful, productive lives and improve the prospects of those who have been permanently disabled. These help to mimic the body's own movements and provide essential support for human motion with a range of uses in industry and are already assisting workers in factories to lift and move loads. Such robots are on the verge of exponential growth with an expected market growth worth $2.8 billion by 2023.

Robotics will certainly see their way into a swarm of other sectors across Smart Cities such in hospitals, homes, autonomous vehicles, in construction and greatly aiding humans in dangerous jobs. This will exploit advances within the fields of IoT, Artificial Intelligence and Big Data bringing out new cross-discipline studies allowing the development of robotic services with massive processing power and access to vast amounts of information which will deliver greater value to society.

Digital Identity

A successful Smart City has to provide user-centric services with seamless access for all end users. Citizens need to have a digital identity that securely identifies them in the digital world, allowing them to engage with all smart entities with one profile in a safe and secure manner. Installing sensors, fast 5G networks and having access to cloud AI services aren't enough on their own to truly deliver smart

> Digital identities are necessary to provide Smart Services in a seamless manner.
>
> *Talal Abu-Ghazaleh*

services to all users. Unified access to them across the board could indeed provide better value through a central digital identity recognized by all smart service providers and governmental agencies.

A digital identity is a major key in a successful Smart City as it opens up all Smart Services to citizens without multiple usernames and passwords. It facilitates the transaction of information between service providers and insures a verified form of identity proof, allowing access to services that may require such verification. This, however, is a very sensitive service that must be offered in the most secure way to minimize possibilities of identity theft by using some type of biometric identification combined with a username/password or secured digital identity card.

Granting digital identities to citizens in Smart Cities will greatly increase service adoption and allow service providers to offer their services in a hassle-free manner. It also provides a means of verification so that citizens may securely access their home IoT devices, gain access to secure areas, relevant governmental e-services, health services, bank services, etc. Such a digital identity should serve as an electronic signature, valid across all Smart City entities and a total replacement for traditional verification procedures such as a physical signature.

Using digital identities will also provide authorities and law enforcement agencies with information regarding citizen behavior and geolocation tracking which will provide useful in the event of emergency.

Blockchain

The blockchain is a transparent, highly secured, distributed ledger of transactions which can independently be audited. Originally developed to store transactions related to cryptocurrency, the blockchain has become an innovative technology in its own right which is being used to enable Smart Cities in many novel ways.

IoT sensors around a city will need to be controlled to perform certain jobs at particular intervals and in accordance with certain criteria. With a horde of sensors in a Smart City, there is no way that such transactions can be controlled manually. The only feasible way is through smart contracts stored on secured sector-specific blockchains. These can only be amended by users authorized to do so, consisting of a ledger of transactions that should be executed at a certain point in time when criteria are met. As this is of great criticality, Smart Cities must adopt blockchain technologies to properly manage masses of transactions across IoT infrastructures.

The distributed aspect of blockchain technology means that no one person has control over the blockchain as copies of it are distributed across thousands of computers, all of which have to be in agreement to allow transactions to be added. These are validated and reflected in all instances at the same time in a secure, cryptographic manner, providing levels of data security, integrity and availability that simply could not be achieved prior to the advent of this technology, with no single point of failure. Such features are making it an attractive proposition for any sector that needs to store and retrieve transactional information in a secure and rapid fashion.

As well as applications in the IoT space, blockchain technology will allow Smart Cities to enable any entity that requires registration of information such as land, car and property registries to securely hold information in easy to manage blockchains. Blockchains also waive the need for third parties to cope with smart contracts that can be used within many industries, such as financial derivatives, insurance premiums, property law, legal agreements and others, to ensure that all participants know the contract terms that are implemented automatically once conditions are met.

> *Transparent, secure blockchain ledgers will be of benefit to many sectors.*
>
> *Talal Abu-Ghazaleh*

As a technology, blockchain will have far-reaching applications including being used to store passport information, birth certificates, hospital records, work records, criminal records and other information related to an individual or entity. It is providing entities with a comprehensive repository of such information, allowing them to create their own private blockchain implementations in order to offer citizens Smart Services and empowering governmental agencies with better decisions and insights. As these services are core to any city, the adoption of blockchain in Smart Cities is essential.

Advanced Communications Technologies

Together, technologies bring about a whole host of new possibilities that can only be realized if data is processed and insights and analytics are provided in a timely manner. In many applications real-time analytics are needed in order to make decisions. Any delay thereof becomes potentially catastrophic such as in the case of autonomous cars, manufacturing plants and many other real-time applications. This presses the need for having advanced communications networks that will facilitate rapid transfer of data from sensors to AI server farms and back to recipients.

5G Networks

Advanced communication technologies such as 5G networks will greatly enable Smart Cities by providing extremely fast, ultra-low latency networks which are necessary for a richer range of applications and services to be developed for the end user.

Once 5G networks are fully deployed in cities, they will deliver complete digital connectivity from carrier to customer without the need of new cables and promises to solve a number of issues traditionally associated with cable-based networks. 5G will provide the speed of fiber networks to wireless technology users enabling a multitude of new services and applications with a larger slice of the available wireless spectrum and provide massive scale with speeds up to 100 gigabits per second, 100 times faster than present 4G technology. This will be done without the need for communication cables to be installed across a city which has been a costly and lengthy activity in the rollout of new networks.

Innovation in 5G technology and adoption is contentious as those who get their technology adopted have a lot to gain. This can be seen in recent times with the USA banning Huawei 5G technology from entering the country and warning other nations of adopting Chinese technology having possible backdoors posing security threats. Communication companies stand a lot to gain and nation states are doing their utmost to ensure that their technologies get adopted first.

5G will pave the way for 6G technology to be implemented by 2030. This will provide an even faster medium through which Smart Cities can communicate, promising a speed of 1000 gigabits per second (or 1 terabyte per second), compared to the 100 gigabits per second being promised by 5G. This will make applications requiring real-time data in Smart Cities even more feasible by reducing network communication latency to one microsecond, 100 times faster than 5G.

Cloud

Robust, resilient and scalable cloud infrastructures are an essential component of Smart Cities. The offloading of AI services to the cloud will mean that developers no longer need to think about hardware or scalability issues for IoT to have access to real-time analysis from cloud servers. We conclude here that the cloud edge computing is the only viable way forward to deliver big data to servers and receive back the analysis at the required speed. Edge computing brings processing and data storage closer to the location where it is needed which means savings in both bandwidth and time.

Machine to Machine Networks (M2M)

This is a fundamentally important application in IoT for Smart Cities where systems can directly communicate with one another. As has been seen previously there are various IoT protocols in use, causing challenges when trying to achieve cross system communication. This makes the idea of having an open data layer allowing information sharing between different IoT protocols and technologies all the more necessary.

Establishing a robust M2M network, which gathers data from a wide variety of IoT sensors from across the city which business intelligence systems can then use to correlate and analyze in order to provide meaningful analytics, is essential in Smart Cities communication between devices to enable services like autonomous driving, which are reliant on cross-sensor communication in real time.

> **"** Communication networks with ultra-low latency are needed to deliver real time analytics.
>
> *Talal Abu-Ghazaleh*
> **"**

Smart Applications

The synergistic effect of technologies working together and their increasing maturity is allowing many novel citizen-centric applications to come about, providing a strong basis for Smart Cities to grow. This is allowing cities to become more efficient, greener and safer environment, democratizing access to services, as well as enabling better mobility and improved public services to ultimately enrich the citizens' lives. What follows are just some of the Smart Applications I see as being fundamental in the development of Smart Cities..

Smart Parking

Cities have been plagued with parking problems since cars have been on the roads. This has become an obstinate problem as the number of cars on our roads has increased dramatically leading to greater levels of pollution in our cities. With sensors on parking ports, a real time map of parking availability can be created and sent to drivers' smartphones, allowing them to park faster, instead of wasting time by driving around blindly to find a parking spot.

Smart Public Transport

Information from IoT sensors can help reveal patterns of how citizens use public transport that can be used to enhance public transportation services, including safety and punctuality, and assist in transportation

scheduling. By interfacing with traffic/weather information, citizens can be kept up to date with the latest travel information allowing them to make more informed decisions.

Information regarding transport usage, loading capacities, traffic delays and data regarding consumer behavior can also provide transportation authorities with the necessary analysis to better schedule and reroute public transport on a real-time basis and deliver more efficient services.

Smart Meters

With connected smart meters, the utility sectors including water, gas and electricity companies can send and receive data in order to provide reliable meter reading without having to rely on human interaction that can be costly and error-prone. Accurate readings can be easily collected freeing up employees to perform more meaningful tasks and can help to reveal consumer patterns to gain greater visibility into energy consumption, allowing utility companies to better monitor usage and reroute resources according to demand.

These devices can also provide consumers with flexible utility management, allowing them to monitor consumption, detect leakages, monitor quality and allow utility companies to remotely detect problems and engage in proactive maintenance.

Smart Roads

IoT sensors throughout road infrastructures enable applications such as autonomous vehicles that need real-time information regarding the status of roads, traffic information and obstacles in order to assist cars in making driving decisions. Such roads will also provide human drivers with intelligent, timely information and react in a smart manner. For example, roads can be intelligently lit depending on weather conditions when drivers approach, as well as warn them of oncoming traffic that may be difficult to see, or of an accident that may have occurred further along.

Roads equipped with sensors also allow for smart road lighting solutions to be developed to provide intelligent street illumination adapting to weather

conditions, daylight availability and the movement of vehicles and people. This allows road lighting to become more effective and valuable in conjunction with contextual data rather than providing a simple stream of light. As an example, road lights can be brightened when detecting pedestrians or when public transportation is approaching, or switch off when there is an excess amount of light in a particular area.

Increasing urban populations are putting greater pressure on existing road infrastructures which can only be solved using intelligent management. IoT sensors on roads coupled with city CCTV systems and GPS data from drivers' smart phones or front panel screens allow for an effective central traffic management system to be developed. This can intelligently control traffic lights and react to real-time traffic conditions to help prevent congestion. This provides for predictive and modelling capabilities that can assist in city planning and in turn help reduce pollution levels due to efficient traffic throughput.

This will allow Intelligent Transportation Systems (ITS) to become a reality through technologies such as Vehicle to Vehicle Communication (V2V), Vehicle to Infrastructure communication (V2I), and Vehicle to Everything Communication (V2X), all of which will become critical technologies in Smart City implementations. Similar technology will eventually filter its way into other transportation modes including rail and aerospace, bringing economies of scale to such industries and paving the way for other forms of autonomous transportation to gain acceptance.

With automated technology, safety will improve manyfold thus reducing insurance premiums that vehicle owners pay. Insurance companies will need to be innovative in how to offer insurance for such vehicles as car insurance premiums could be standardized due to the high safety features of autonomous vehicles and the elimination of human error.

Smart Waste Management
Sensors around a city and in waste container bins allow for smart waste management to be implemented in a more efficient way than having

predefined, scheduled waste management patrols. Waste levels are tracked in real time, providing route optimization allowing for waste disposal resources to be deployed to areas that really need them. This allows waste management services to save on petrol and collecting bins that still have storage capacity. Such information can be fed to the smartphone of the driver prompting better waste management to take place, letting municipal authorities control and dispose of waste in a much more efficient manner than the traditional checking of communal waste bins.

The same can be done for waste water management activities through sensors in the waste water pipes, allowing for better waste water management to occur.

Smart Environment
A healthy environment is of vital importance in any city and striking a balance between delivering services and the impact these have on the environment becomes a key concern for cities around the world. It is an area of particular interest especially with the growing concern to reduce carbon emissions under the initiatives of such entities as the United Nations Carbon Offset Platform and the 'Paris agreement' where major countries of the world convened to combat climate change.

The only intelligent way this can be achieved is through the use of AI and IoT technology which intelligently monitors pollution levels in water, air, soil as well from roads and factories. This allows for an accurate, real-time analysis of the pollution at any given time, providing vital information for decision makers.

Such technology can also be used to build and monitor green energy installations as data becomes available to help decide the best location to generate such technology, based on the amount of light a particular area receives or the throughput of water in a particular locality.

Smart Policing and Emergency Response

Public safety is a primary concern for any municipality. IoT technology offering real-time monitoring and analytics combining sensors with CCTV and data from other intelligence sources including social media permits building safety solutions to create predictive capability and proactive law enforcement.

CCTV footage along with audio can help identify areas that have detected gun crime and then used by enforcement agencies to deploy resources to identified high-risk areas and provide actual crime mapping for law enforcement officers.

Such analyses can also be used to help pinpoint and track criminals and aid police officers in decision making through mobile applications integrated with intelligence databases to bring about applications such as predictive policing and assist greatly with crowd management. Through the use of body cameras, law enforcers can stream back live images of crime scenes for prompt decisions to be made with more transparency into their work and offering the opportunity to learn from historical situations.

The power of AI, big data and IoT can also help to release similar early warning signals in cases of disaster such as freak weather conditions and help civil defense in times of crises to deploy resources where they may be needed. This can also aid in tourist surveillance especially in the case of hikers that go to remote locations and need to be monitored from a safe proximity.

Smart Buildings

Intelligent building management systems (BMS) allow complete control of a building and all the facilities and offer to better control usage, improve efficiency and respond to changing needs. These include having an integrated, intelligent systems for facilities, including air conditioning, electricity, water, telecommunications, CCTV, smoke and fire detection, access control and IT systems, that can communicate to improve safety and usability as well as lower costs through automatic monitoring and adjustment in addition to the use of smart meters and other IoT sensors.

Sensors around the building feed into a central BMS allowing new efficiencies to be realized by intelligently monitoring and adjusting temperatures, closing windows, improving building air flow, etc. making them more durable and functional, automatically monitoring and controlling key systems as well as reporting on issues that may require attention.

This leads to optimized consumption and self-regulation of the building allowing it to become carbon-friendly, self-contained ecosystem, easing building management and, in turn, improving efficiency and lowering its carbon footprint. Such technology can be extended to build smart homes, albeit on a smaller scale, where all appliances and home services can be controlled and monitored remotely.

As buildings are the most prevalent structure in any modern city, converting them to intelligent buildings adds great value and is an essential element of any Smart City as it impacts the lives of its citizens in a major way.

Smart Health

Digital health is a new area that can be rolled out in Smart Cities powered by wearables such as watches, bracelets and other health monitors to aggregate data and provide proactive health services as well as assist in the allocation of resources to the most needed health services.

Clinics and hospitals powered with IoT can provide a greater level of preemptive healthcare such as being able to remotely monitor the health of patients through wearable devices, track drug delivery, monitor medication stocks in real time, identify the precise location of physicians within hospitals in case of emergencies and track hospital asset inventory with accuracy.

This can also facilitate telemedicine links between hospitals, allowing surgeons to provide consultations to patients based on biodata from their wearable IoT healthcare device and by cross-referencing and analysis with

thousands of health databases around the world. This provides the foundation of smart medicine where drugs will be developed faster with the availability of big data and better AI processing.

This will make epidemics much more manageable and potentially allow for vaccines against new viruses to be found much faster, and permits HAZMAT teams to focus their efforts in areas that pose the most risk to contain such outbreaks, rather than relying on generic monitoring of the population.

IoT-based remote health monitoring is an interesting concept that has the potential to make a huge difference in the lives of people with chronic diseases and the elderly people living in homes where their vital signs can be monitored, allowing proactive, tailored healthcare to be provided based on live data.

Smart Agriculture

The challenge of feeding a growing a population is now facing cities across the globe. This can only be done through the implementation of smart agricultural technologies to help improve crop yields and make barren areas of land fertile once again. IoT sensors embedded within the farm land can be used to monitor factors such as water availability, soil moisture and atmospheric conditions for crops, plants, and wildlife. This aids greatly in planning and managing crops giving farmers access to vital information to yield larger and better harvests. This is essential with the rapidly growing world population which is set to reach 10 billion by 2050. Farmers need to be able to do more with less, and with greater efficiency.

The increased flow of geospatial information, quality of crops and access to weather data will see more farmers adopting autonomous

> "
> Human experience throughout the ages has been enhanced through learning, information and communication.
>
> *Talal Abu-Ghazaleh*
> "

technology to irrigate land as well, harvest crops in the most efficient way possible and use drone technology to rapidly survey and analyze large plots of farming land. IoT sensors can also be embedded into livestock feeding troughs, milk producing facilities and many other kinds of farming infrastructure, bringing the benefits of Smart City technology to rural farming lands.

Smart Industry

IoT is already being used in many manufacturing and industrial sectors to monitor machines, assembly lines and analyze production data. This will increase with the falling cost of technology and allow even small companies to benefit from IoT by using cloud-based AI systems to help provide them with business analytics to aid decision making rather than using in-house business intelligence systems. This will allow manufacturers to become more agile, reduce machinery downtime, decrease operational costs, shorten time to market with greater efficiency, improve worker safety thanks to better environmental information as well as improve inventory control and manufacturing supply chains.

Smart Education

The development of education is key to the prosperity of any economy   and with the coming of digital natives, education can no longer afford to be an archaic activity. Education systems in their present form were created to meet the needs of the industrial revolution. The demand for skills in today's workplace is very different and must focus on developing a highly digitally literate workforce from day one and synergies must be created between education, training and the labor market.

Citizens need to be empowered with digital literacy so that they may play their role in the digital economy. It is imperative for the longevity of any population to produce a set of highly qualified, employable citizens who are technologically savvy which makes them more employable and arms them with the skills to access and make the most of services within a Smart City.

Smart City Development

Over the last twenty or so years, there has been a trend for governments to start Smart City initiatives in order to deliver more efficient, equitable services to their citizens. These initiatives have seen varying degrees of success with some countries taking the bull by its horns and implementing the Smart City concept head on, while others having very limited success and making marginal progress at best, despite having started their journey at a similar time. What started off as a utopia prophesized by many technocrats has actually been a difficult concept to materialize at the grass roots level.

Preceding chapters of this book dealt with the technology, people, processes and considerations I feel are needed to ensure proper Smart City development which is an expensive and lengthy affair. While a critical analysis of each Smart City implementation is well beyond the scope of this book, I thought it prudent to at least highlight issues that Smart Cities that are not in good shape have suffered from, so that lessons may be learned moving forward.

Digital Strategy
It is vitally important to have a comprehensive Smart City strategy at the start of a Smart City project in order to properly assess the needs of a city, data sharing needs between entities to facilitate Smart City services and applications, as well as the infrastructure and governance needed to support them.

There should be an independent team responsible for managing Smart City strategy and implementation which should be set up as a body autonomous from the government in power, ideally as a separate unit in its own right. This will ensure sustainability of the Smart City project and warrant a consistent improvement in its overall goals. In many cases, this is an attractive proposition as private funding may be required to complete technology projects. Private entities want the assurance that their investment won't go to waste when the next government comes into power.

As well as having a clear direction, this unit should consist of a project management team with experience in tackling governmental and private entities, a strong technical team that understands technology with skilled contract negotiators, experienced finance and legal teams, individuals well-versed in change management, marketing experts as well as specialists in delivering awareness and education.

Initially, a thorough assessment of the services being offered and what technology projects are needed to bring these into the digital world should be conducted. There must be a clear message to all stakeholders from the top that digitalization is the strategic direction of the city in order to bring all entities in line with the overall vision.

The underlying technology infrastructure projects that are needed as the core of the Smart City, such as IoT sensors, 5G technology network, AI systems, Digital Identity, and others, need to be identified and implemented as a matter of priority. The resulting applications from each of these implementations should also be clearly defined with user experience as a major consideration.

> A comprehensive digital strategy is essential for the success and longevity of any Smart City.
>
> *Talal Abu-Ghazaleh*

Once the technology projects have been identified, they should be prioritized for implementation along with budgetary costing,

as well as skillsets required and the interactions with other systems and entities. This should consist of technology RFP's in order to solicit proposals from technology vendors. As well as this, funding options should be explored as implementations are notoriously expensive. The technology implementations must also be fully supervised in order to ensure they meet the needs in a comprehensive manner. Advice from legal teams and governance specialists is also required to ensure relevant legal structures are in place and that governance mechanisms are established.

Smart Services need to be developed in a manner that takes into consideration process optimization as there is no point in automating manual services which are in bad shape or inefficient. Successful automation and service uptake relies on improving underlying service processes to maximize the value to citizens through smart services and applications.

Municipalities looking to go smart need to have cross-functional teams in place that can work with specialists to put down a blueprint for the Smart City covering data, applications and infrastructure, as well as the supportive elements required, such as public awareness and training. This can only be done if there is an effective stakeholder management and buy-in from all concerned parties, including governmental entities, citizens and private sector service providers. Planning is essential as the establishment of a Smart City is very complex and needs the support and buy-in of all city stakeholders in order to put down a robust infrastructure on which it can be built.

In the development of Smart Cities there must be a pool of technology subject matter experts and business analysts working with municipalities and technology vendors to:

• Identify a clear list of Smart City projects and prioritization for their implementation

- Ensure needs and dependencies have been adequately identified
- Identify data to be generated by systems and shared between entities
- Secure input and buy-in from all stakeholders
- Identify a portfolio of skills, interactions and infrastructure needed for implementation and operation
- Determine how current systems need to be modified to make them Smart City-compatible
- Ensure final technology implementations meet the actual defined needs
- Ensure supportive structures are in place for Smart City longevity

A comprehensive Smart City Digital Strategy must be readily available and revisited regularly as a haphazard approach will result in implementations that are deficient in their coverage.

Data Considerations

The most fundamental element that powers Smart Cities is data. All other elements are supporting structures, allowing data to be gathered, processed and acted upon by the various ecosystems in a Smart City to deliver Smart Services. This comes at a price and requires significant investment in identifying and classifying data, categorizing the legal implications of data ownership and developing underlying AI and IoT technology infrastructures that can only be recouped over time.

Smart Services also take time to develop, test and implement, which means there will not be an immediate improvement in city services, but in the long term, cities will become more responsive to change and use analytics to drive their decisions, leading to improved city planning and a better citizen experience. In order to facilitate data sharing, this must be done in its own layer as I have alluded to earlier to promote a spirit of sharing data in an open manner to ensure that it is not monopolized by a single entity. Data must be a core consideration around which services are built and technology is chosen.

As data is key to any Smart City, information must be initially cleansed, normalized and classified so that it can be properly analyzed by AI systems to deliver value. A major concern that has been raised with all this data being available is that personal privacy is under threat. Governments need to put prudent safeguards in place in order to ensure that personal data is collected, shared, processed and stored in a safe manner across all Smart City entities, especially given the growing cybercrime threat. The IoT, for example, provides a completely new attack vector for hackers to exploit.

Standards such as GDPR related to the protection of citizens' information are now very much in force and must be adopted by Smart Cities globally. This is further complicated by the exchange of information between public and private entities which needs to be governed in a framework that provides adequate access without compromising privacy. Another major concern is the amount of storage space that big data requires and the length such data should be stored. This requires a great amount of planning and thought, however, as such storage should be kept to a minimum in order to reduce the carbon footprint of Smart Cities. The privacy of information and data has been a concern recently especially in the light of data protection regulations such as GDPR in the EU and incidents surrounding data leakage such as the Facebook/Cambridge Analytics debacle in 2019.

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Data is the fuel that powers Smart Cities.

Talal Abu-Ghazaleh

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Moving forward it is apparent that our data, which reflects our likes/opinions/user behavior and more, is extremely valuable to companies that use it to develop new user-centric goods and services, which means we will need to relinquish some control of it. This doesn't absolve technology companies from treating and using such data ethically, but does have implications on our expectation of maintaining complete control and privacy over our data.

With all this data exchange taking place, the following poignant questions arise:

1. How much of our information do we want to keep available online?
2. Should we be relinquishing freedom and control of our lives which humanity has fought so long for, just to have a new master take control?
3. What effect is all this technology having on us - socially, morally and ethically?

This revolution comes with an ethically loaded gun that raises very important questions and requires debate between experts, governments and relevant stakeholders to develop pragmatic solutions.

Financing

As we know, municipal budgets are dedicated to providing essential services and quite often the money isn't there to invest in technological infrastructure required for Smart Cities to be established. This is where the private sector comes in as entities that bring in private equity, have the needed technical expertise, are faster to change than governmental entities, and ready to invest in new revenue streams to increase profits. Public-private partnerships are therefore important to Smart City programs. In such instances, the role of government moves to a regulatory one, bringing together different parties forming a dynamic partnership to help push mutually beneficial agendas keeping the delivery of quality services to citizens at the forefront.

Equitable Services

If implemented and managed correctly, smart technology can go a long way to deliver equitable, more efficient services to the public which must be the prime focus for any such implementations. Technology for the sake of technology serves little purpose so it is always important for Smart City initiatives to regularly receive feedback from its citizens to help improve services. This is essential as without an active user base, Smart Cities fall dead

and defeat the purpose of their very establishment. Transparent, accountable and equitable services need to be provided through easy-to-use smart phone applications which must be user-centric adding value to citizens' lives. This helps to build greater trust between the public and the government.

To transact effectively in this new ecosystem, central management and provisioning of services is key, as well as providing users with a digital identity through which citizens can engage with all smart services. This includes technical factors such as the implementation of single sign-on (SSO) to provide a seamless experience for citizens where all their transactions can be logged and tracked with ease. This requires service integration between providers in order to enable such functionality, as well as hosting the services through a secure network that accepts popular forms of e-payment as well as cash.

Citizen's Engagement
Municipalities need to be the focal point for offering support for those who need such assistance, particularly the elderly. This can be done by offering manned computer stations which should be spread across the city at convenient locations such as public libraries, community centers and post offices, with officers that know how to access services. Putting people at the center of Smart Cities is essential to build a strong user base which uses technology to unite the city. There needs to be a high degree of awareness and training so that citizens have the literacy and confidence to use online services.

This is even more important in rural areas where access to governmental services may already be in worse shape than within the city. Rural communities are largely those suffering most from a lack of access to such services. Any Smart City should serve to redress this imbalance by focusing more on ensuring that such communities have equal and fair access to Smart Services through local Smart City service centers and support groups.

Cyber Security

Smart Cities need to be protected by rigorous cyber defense systems and municipalities need to be empowered with the tools, systems and personnel who can actively defend the Smart City's electronic borders. Proper planning of how to deal with such instances and relevant business continuity and disaster plans need to be fully poised and tested to ensure that a Smart City doesn't grind to a halt if systems become unavailable due to malicious hacking.

Connected entities and Smart Services need to be thoroughly tested for functionality and secured within a private network that enforces the highest degree of cyber security standards, ensuring that citizens and service providers are thoroughly protected and that data is totally secured whilst in use, in transit and at rest.

Maintaining the security of such an ecosystem is indeed a complex affair that will need sophisticated IT security infrastructure, thorough policies and procedures, as well as capable specialists and managers to effectively administer and manage such an infrastructure. Cyber security needs to be an ongoing process in light of constantly evolving cyber threats that must be met head-on.

Policy Development

The introduction of new Smart Services requires a detailed review of current policies and inevitably the implementation of new ones to cover advancements in IoT, AI and other fields which power Smart Cities. Cutting-edge areas such as AI or autonomous vehicles will require feedback of experts in order to understand the implications of such technology and how this can be effectively steered. Policy development requires input from multiple stakeholders and cross-disciplinary experts as services become dependent on one another to

> "
> Proper governance must be in place to manage and control Smart Cities.
>
> *Talal Abu-Ghazaleh*
> "

work in a symbiotic fashion to deliver the improvement in services promised. Policies need to be developed prior to any implementation to ensure that effective governance and transparency are in place.

Capacity Building and Awareness

Any Smart City must have a comprehensive awareness program to inform citizens about the smart services available. Registration for these services should be easy and training should be provided to citizens through a mixture of television advertisements, online social media campaigns and short videos demonstrating how services can be accessed. Citizens are core to the success of Smart Cities as they are both users of its services as well as the workforce that develop, run and offer Smart Services.

Smart Cities and companies that offer Smart Services should ensure they have well-trained staff who can assist citizens whether online, on the telephone or in person to access the services. While walk-in sites for services may well be reduced in Smart Cities, it is important to still offer such physical locations for those who cannot access Smart Services with employees who are well trained.

> Smart cities must actively engage with citizens in order for everyone to be benefit from its services, regardless of computer literacy.
>
> *Talal Abu-Ghazaleh*

Under Smart Cities, continued population migration and economic growth, combined with a growing demand for services will result in overall job growth. The types of jobs however, that humans will end up performing will fundamentally shift. On a macro scale, technology may render some jobs redundant and result in unemployment. However, other technology- oriented jobs will be created in Smart Cities in lieu of these and will continue increasing at a dramatic pace, resulting in a permanent shift in skills requirements prompting knowledge workers to reskill in order to secure employment.

In order to plan for this shift, Smart Cities need to ensure they have the needed training and reskilling plans readily available to upgrade

the abilities of their workers in order to provide Smart Government services effectively to citizens.

Implementing Smart City technologies is a complex issue requiring a thorough strategic implementation plan to identify all relevant parties, sectors, stakeholders and interactions, as well as to prioritize projects and their implementation timelines. It is the duty of those in charge of such projects on a governmental level to ensure they have the required technical experts on their teams to carefully select appropriate technologies, choose reputable vendors, supervise implementations and ensure that resulting systems are compatible with the rest of the Smart City ecosystem. The reimplementation of Smart City projects has occurred in a number of countries because proper planning was not carried out in the first place - a huge waste of time, money and other resources as well as a huge letdown in confidence in the concept of a Smart City which can affect future implementation efforts.

Robust infrastructure
Smart Cities require strong technical infrastructures to be in place from the onset in order to be able to shift huge amounts of data to and from sensors and servers as well as deliver real value to the citizen. Implementing technology for the sake of technology should be avoided at all costs as this doesn't help anyone and lessons should be learned from those who successfully implemented Smart City projects. Many a time, there is no need to reinvent the wheel as expertise and lessons can be obtained from countries that have had success in developing such ecosystems.

5G networks are a key infrastructure that must be available to provide a strong basis for the millions of Smart City interactions to occur. In Smart City implementations to date, network capacity has been a huge issue that has hampered efforts resulting in little value being derived from implementations.

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Robust technical infrastructures are needed upon which Smart Cities can be established.

Talal Abu-Ghazaleh

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Applications and Interfaces

A Smart City is no good if the interfaces into it are poorly designed, do not deliver value to the citizen, are not friendly to use and are not available across all platforms and browsers. User experience and seamlessness are key to user adoption of Smart Services and therefore the end applications cannot be an afterthought. Users should be able to log into all services through a central digital identity that keeps a secure, current record of all transactions the user has performed in an independent blockchain to provide greater robustness, transparency and auditability. Such digital identities must be issued in a secure manner and be recognized across the board as a valid, legal form of identification amongst all governmental departments and other Smart City service providers.

Machine to machine (M2M) services and interactions should also be developed in a similar manner so that efficient communication can occur across sensors, devices and systems in a secure environment where no tampering of instructions or communications can occur.

Change Resistance

With all the good will in the world, change resistance has been an issue for both citizens and Smart City service providers. Change brings with it the unknown which needs to be managed in a sensitive and proper way. People are used to doing things in a certain manner and build up cultures around the way services are offered and consumed. If users and the end service providers are kept out of the loop of Smart City services, they typically develop a resistance to a new change which they understand little about. End user awareness, training as well as facilitating access to basic services such as internet connectivity and the availability of smart devices are key issues that need more focus. This includes subsidizing access to internet services as well as smart devices and providing proper awareness and training, as well as having functional central units all citizens can approach for technical support.

Smart City service providers and their relevant departments must be considered carefully so that they feel part and parcel of Smart City projects. Having the

buy in of executive management, who fully back such projects and actively support them, is essential. Alienation of such providers and their employees, especially those in governmental settings, can lead them to developing strong change resistance, resentment and becoming uncooperative. Often, status quos are challenged in technology applications and internal cultures must be addressed. Some may simply not want to cooperate as technology increases transparency into their daily operations which they may not want.

This has been faced by my own IT auditors when engaging in technology projects where written processes say one thing, and what happens on the ground is actually something quite different. The reasons for this could be many, including an appetite to keep things as they are as certain individuals may be benefitting financially or otherwise. Such situations must be handled with due care and it is especially important change is pushed from the top to ensure it filters throughout such entities.

Privacy Concerns

Civil liberty organizations have been at the forefront of data protection in the growing light of large social media companies sharing more data between them and with law enforcement agencies without the consent of end users. It is inevitable that there will be interest from law enforcement with such massive growth of data from sensors, applications and systems regarding user habits and activities. Such information provides rich pickings in order to draw intelligence from and is essential in the fight against crime and terrorism. This fear of 'big brother' constantly hovering with an unrestricted power must be addressed through proper legislation and independent oversight.

Such legislation has been lacking in many existing Smart City initiatives leading to public fear of such projects.

> Feature rich applications are essential for Smart City adoption.
>
> *Talal Abu-Ghazaleh*

Smart Cities and Pandemics

If nations weren't thinking about adopting Smart City technology prior to 2020, the global virus pandemic which has hit the world is testament to the fact that this is prime time to adopt technology to help deal with such pandemics. The effects of this pandemic have been widespread and hard hitting, affecting poor and rich alike in a manner no one would have imagined. The financial and political impacts of this will be seen for some time and will inevitably change the way we live and work, with this being possibly the greatest depression mankind will have faced. With the evolution of the biological world, it is only a matter of time until the next pandemic comes along which we must be better prepared for by leveraging Smart City technologies. Communities have also come together in unique ways during this period which Smart City initiatives would help to better support.

Contact Tracing

This is an essential activity Smart Cities can greatly support through the availability of GPS tracking and smart applications or health care wearable devices monitoring citizen movement. Having such information about citizens makes it much easier to track those who may have been in contact with an infected person and help to massively speed up quarantine procedures to isolate those who could be potentially affected.

Improved Analytics

Having open data in Smart Cities will help health institutions better understand outbreaks in their locality and better share infection data with one another. This information is vital for central health authorities to make informed decisions regarding where staff are most needed, which areas are in need of disinfection, where more medical equipment is required to better deal with the health crisis, as well as having real-time rates of infection that are all-important when trying to develop a comprehensive response.

Enforcing Regulations

CCTV installations along with thermal cameras and Smart AI systems can help identify individuals that are potentially affected by monitoring their temperatures in a non-intrusive manner. These can be supplemented by roaming robots to give health advice to the public regarding the use of masks and proper social distancing measures. Such systems can be used to deal with those who may be flouting the law and provide a greater degree of enforcement especially during times of curfew and lockdown.

> Smart Cities must be protected with the latest in cyber security defense mechanisms.
>
> *Talal Abu-Ghazaleh*

Disease Tracking

The fight against pandemic spread can only be effectively achieved if there is proper data sharing between health, government and law enforcement agencies. Smart City AI technologies can assist in disease surveillance by analyzing huge sets of information supplied through various feeds across the Smart City to deliver better analytics and discover novel patterns and anomalies. These help to build predictive models allowing a better plan of response to be developed by all parties, saving money, time and effort.

Timely information regarding pandemics is also required by pharmaceutical research and development teams to faster develop appropriate drugs through   allowing better sharing of information between such institutions and health agencies in Smart Cities. This is critical in order to monitor the spread of the pandemic and the morphology of the virus, identify sectors of society that are most likely affected in order to rapidly develop drugs through better modelling and simulation based on real-time data. This process can be exponentially accelerated by comprehensive data collection from IoT sensors, 5G networks, AI systems as well as collaboration on the cloud which are the essence of Smart Cities as I have previously laid out.

Better Citizen Awareness

Using data from various sources allows municipalities to develop health information to help increase public awareness of a pandemic. This allows a visual representation of pandemic information to be developed showing numbers affected, their gender, infection hotspots, areas declared infection-free, details of pertinent health care centers that can assist citizens, as well as the dissemination of up-to-date public health advice. This is essential in

order to keep people calm during such events which can develop into mass hysteria and panic if they are not kept well informed.

Improved Community Responses

During pandemic lockdowns and curfews, the most vulnerable are usually the most affected with limited access to services. The use of Smart Applications to bring communities together provides additional help essential during such times in order to ensure a continuation of services, especially to the elderly. Smart Cities can be used to develop local community applications to help with shopping, deliveries, medication, as well as allowing communities to source goods and produce from suppliers that are limited in supply as well as receive requests from citizens regarding items they require.

Local crowdfunding initiatives can also be set up to help raise funds to address issues affecting particular localities, including financial relief for those most hit and keeping small local businesses afloat. Generating good community spirit is essential to dealing with pandemics where citizens may be under curfew or lockdown and help those isolated to fulfil their day–to-day necessities.

Community-based applications can also be developed to help public sector entities deal with issues and shortages they may be facing in terms of manpower and equipment, especially in the case of hospitals, as has been seen in the recent COVID 19 pandemic in 2020.

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IT Auditing & IT Security

CYBER

Ransom-ware

+4,000 ransomware attacks every day

197 days

It takes most businesses about 197 days to detect a breach on their network

SECURITY

Cyber-crime Damage

Cybercrime damage cost to hit $6 trillion annually by 2021

Cyber Incident

It takes years to build a reputation and few minutes of cyber-incident to ruin it

COMPROMISED

Attak

54% of companies experienced one or more successful cyber security attack that compromised data and/or IT infrastructure

Cyber Security

Cyber security is a business risk, not just an IT problem

BENEFITS

Strengthens organization controls and improves security

Assists in aligning business with IT

Provides management with valuable reporting

Identifies key business systems and their value to the organization

Helps to comply with regulatory requirements

Allows for better planning and resource allocation

Independently reviews IT risks and controls

Audits people, processes and technology

SERVICES

- IT Assurance (Including IT Governance Audit and general computer controls audit)
- Penetration Test and Vulnerability Assessment
- Secure Code Review (Web and Mobile)
- Cyber Security Audit (Including DOS and DDOS)
- Application Systems Audit
- Digital Forensics
- ERP Audit

+30 Tools Employed

+2000 Reports

+500 Client

Talal Abu-Ghazaleh Organizations' Knowledge Initiatives

1. Talal Abu-Ghazaleh for Technologies (TAG-Tech)

About TAGTech

Talal Abu- Ghazaleh Global, is the brainchild of HE Dr. Talal Abu-Ghazaleh who saw an urgent need to establish an entity that would adopt the latest technological advancement and present it to the global society at affordable prices.

TAGTech specializes in developing, designing, manufacturing and producing latest personal and business devices tailored to the knowledge citizens of the world at the fraction of the prices of other brands.

Enjoy our latest products TAG-DC, TAGITOP Plus and TAGITOP Multi which carry the highest specs and the most affordable prices in the world.

Our Mission

TAGTech seeks to facilitate access to the latest technology and place it in the hands of the global knowledge citizens.

2. Corporate Digital Inclusion *

Golf may be dying, but the camaraderie developed on its courses need not. A startup has the answer to Google's quest to build the perfect team: Zanie. It is is a cross-generational, cross-cultural, cross-disciplinary female team on a mission to boost productivity and innovation by pioneering business golf for the 21st century.

Human beings have long relied on dialogue and small talk to get to know each other and build interpersonal understanding and collegiality. And though technology-enabled collaboration and distributed workgroups have been a boon to productivity and innovation, their inherent focus on efficiency is under-leveraging the personal aspect of working relationships.

Consider this: Google conducted a multiyear, multimillion-dollar investigation of what makes its most effective teams tick. They found that their best teams

*Zanie: Zanie.app

tended to share one trait that was absent in less effective teams: a sense of "psychological safety" defined as the mutual understanding that a working relationship is safe for a margin of interpersonal risk-taking. Members of psychologically safe teams feel accepted and respected both personally and professionally. Collaboration feels more rewarding…and innovation goes through the roof.

Existing digital collaboration tools help us communicate and transfer data more efficiently, but it's what they don't do that matters: getting to know someone without the benefit of a shared meal, a shared drink, a round of golf or simply a handshake. Zanie.app believes opportunity lies in recognizing that constant connectivity is not true connection and that communication is not the same as conversation. What has yet to be digitized is what IRL interaction and networking is designed to do: build trust and rapport. To develop trust across space and time, we need technology that can capture more than what we do via CVs, shared calendars and project management software -we need technology that can reflect who we are, in the right way, to the right people.

For three years a startup called Zanie.app has quietly but passionately been developing a method for instilling psychological safety into digital workgroups - they are taking the water-cooler to the cloud, where the bulk of modern business is conducted. The company is a virtual conversation engine designed to foster the kind of dialogue and person-to-person engagement that helps professionals develop the deeper, more meaningful relationships leading to higher work satisfaction and increased productivity and innovation. Zanie.app is business golf for the 21st century - a proprietary technology solution that draws on time-tested principles of sociology, psychology and philosophy to help people get to know one another and bond wherever they are already working (like in the insanely popular instant messaging and collaboration platform Slack for example).

3. Talal Abu-Ghazaleh Electronic Arabic Encyclopedia (TAGEPEDIA)

TAGEPEDIA is the first system of its kind on the internet to present verified and documented Arabic content, covering a variety of areas including science, literature, economy, arts, sports, culture, knowledge-based fields, business and professional services, intellectual property rights, media, accounting, financial administration, consulting services, translation, law, banking activities and vocational training, as well as information technology consultancies and any other relevant fields in the area of scientific and professional knowledge.

The encyclopedia engine was developed by E-Solutions experts at Talal Abu-Ghazaleh Information Technology International.

TAGEPEDIA seeks to become a comprehensive knowledge reference for digital content in Arabic language available for internet users and specialists interested in all aspects of knowledge in Arabic. Its content has been classified into four main fields, which are the General Knowledge, Personalities, Historical events, and Regions of the World.

TAGEPEDIA welcomes the participation of scientists, literary people, experts, advisors, and specialists to enrich the Arabic knowledge content on the Internet and improve its quality and accuracy while protecting the copyrights of the original author and other affiliated rights.

Talal Abu-Ghazaleh Global has worked on this project for five years, and assigned for this purpose three teams of technical specialists as follows: the first team being responsible to explore specific information, while the second responsible for examining and verifying the accuracy of each entry and detecting the reliability of its source, and the third responsible for examining the usefulness of the entry and ensuring it is not offensive or harmful. Talal Abu-Ghazaleh Global shall ensure the sustainability of this encyclopedia and shall continue to enrich it incessantly.

We are pleased to announce that we have so far verified, edited and posted in TAGEPEDIA one million and two hundred thousand entries in the Arabic language, and once launched, the Arabic content on the Internet will rank the fifth.

Compared to Wikipedia which currently contains 540 thousand NON-verified entries, and contrary to Wikipedia where entries can be posted by anyone, TAGEPEDIA is open for free use by the public at large and information items cannot be posted unless subjected to examination, verification and approval to befit a trusted knowledge encyclopedia.

4. The Arab International Society for Management Technology (AIMICT)

The Arab International Society for Management Technology (AIMICT) is a non-profit organization founded on August 29, 1989, in Buffalo, New York, United States of America and officially registered in Amman on October 10, 1990.

AIMICT provides unique professional services through its representatives in 20 Arab countries and liaison offices around the world. Its programs and plans are developed by a board of trustees chaired by HE Dr. Talal Abu-Ghazaleh. The Board includes experts in different fields of management and information technology. It seeks to promote the communication and exchange experiences at individual and institutional levels by holding conferences, workshops and specialized professional programs.

1. **Professional Programs:**
- Professional Quality Manager (PQM)
- Human Resource Manager (HRM)
- Training of Trainers (TOT)
- Advanced Certificate in Leadership
- Six Sigma

2. **ISO Training Programs:**
- ISO 27001 Lead Auditor/Implementer
- ISO 22301 Lead Auditor/Implementer
- ISO 9001 Lead Auditor/Implementer

3. Publish, Upgrade, develop and promote recognized high-quality researches, dictionaries and guides in the ICT and Management fields.

5. Arab Organization for Quality Assurance in Education (AROQA)

The Arab Organization for Quality Assurance in Education (AROQA) is an international non-profit independent association established in Belgium in July 2007 with the fundamental objective of raising the quality of education in the Arab world.

To this end, AROQA will engage in:

1. **Quality assurance**
- Advising and capacity-building programs in quality education.
- Managing quality in education according to national and international standards.

2. **Accreditation**
- Accreditation services.
- Accreditation and evaluation standards according to international best practices.
- Comprehensive evaluation and periodic review to ensure adherence to quality standards and continuous improvement.

3. **Awareness**
- Dissemination of educational quality and accreditation culture.
- Organizing specialized annual conferences in quality and accreditation.
- Holding specialized workshops and training programs.
- Issuing the Arab Journal of Quality in Education as a biannual peer-reviewed and indexed journal.

6. Arab States Research and Education Networks (ASREN)

ASREN is a non-profit company with limited liability (GmbH) and is officially registered in Germany, under the umbrella of the League of Arab States. ASREN is the association of the Arab region National Research and Education Networks (NRENs), as well as their strategic partners. The main goal is to connect Arab institutions among themselves and to the globe through high-speed data communications networks.

Such networks will enable sharing and access to a variety of R&E services and applications in addition to utilization of highly sophisticated and technologically advanced computing resources available only at very few institutions in the world. We aim to boost pan-Arab collaborative R&E projects and activities, contribute to promote scientific research, innovation and education across the Arab region.

The ASREN Network sets out to connect NRENs across the Arab region through a high-quality network with several points of presence (PoP) in a number of Arab cities. Selection of PoPs depends on the availability and routing of regional optical fibers. ASREN is a partner in the EUMEDCONNECT3 and AfricaConnect2 programs, which have connected the Arab Mediterranean countries: Algeria, Egypt, Jordan, Morocco, Palestine, Syria and Tunisia since 2004. In the current phases, connections are being re-established, initially with Algeria, Jordan, Morocco, Lebanon, and Egypt, with additional countries eligible for EC funding support. With its direct links to GÉANT, the pan-European R&E network, EUMEDCONNECT3 and AfricaConnect2 provide access to over 40 million users at over 8000 R&E establishments across Europe.

Services:
- Setup international connections with high capacity.
- Link NREN network to ASREN PoP and peering to GÉANT, Internet2, and other regional R&E networks.
- Setup Eduroam and Science Gateway Services.
- Provide specialized training to technical staff.
- Miscellaneous Services.

7. Talal Abu-Ghazaleh International University (TAGI-UNI)

Talal Abu-Ghazaleh International University (TAGI-UNI) is an education service provider that offers academic degrees, language and arts training, professional certificates and continuous education through strategic alliances with globally accredited partner institutions. We believe that education is no longer for the few who are able to afford the costs of the traditional university setting. We have taken advantage of the latest developments in digital information technology to bring quality education to you, wherever you may be.

Talal Abu-Ghazaleh International University (TAGI-UNI) is based on the belief that democratization of knowledge is a key to economic growth, social development, cultural enrichment and political empowerment. We also believe that creation, acquisition, preservation, transmission and application of knowledge is the foundation of societal transformation.

TAGI-UNI offers accredited multidisciplinary education and is a quality global e-campus university, providing digital classroom education for every student, wherever he or she may be.

TAGI-UNI adheres to the philosophy of cooperation and collaboration not only with other educational institutions but also with public and private sector organizations. We have cemented partnerships with accredited universities and educational institutions to make programs available that were previously only available to the few.

Our mission is to make accredited educational programs accessible to everyone, everywhere.

Please take a look through our programs and do not hesitate to contact TAGI-UNI for any additional information you may require.

Let me personally invite you to TAGI-UNI, the digital university of the world.

8. Talal Abu-Ghazaleh University College for Innovation (TAGUCI)

Talal Abu-Ghazaleh University College for Innovation (TAGUCI) is a unique college specializing in preparing the young Arab generations for the required skills to become leaders in the new world of information technology.

Established in 2018 as an independent college in Jordan, TAGUCI offers the programs that have been developed with the advancement in communication and information technologies in mind by the most respected and renowned figures in academia. All programs have been designed to bolster the advancement of technical knowledge with practical real-world applications.

The College will instill in students a solid foundation in the most recent academic and practical knowledge in the ever-changing field of information technology focusing on artificial intelligence and other newly emerging world changers.

To help achieve our goal of encouraging innovation, TAGUCI will offer any student who develops an innovative project that is patentable a grant that covers the cost of their tuition once over. Furthermore, Abu-Ghazaleh Intellectual Property (AGIP), the largest Intellectual Property company in the world, will assist in registering their patent for them.

Our priorities and objectives highlight our commitment to admitting the high-caliber students and provide them with the highest possible quality of education. We offer students an unmatched educational experience with access to renowned faculty and thought leaders, outstanding research facilities, internship programs at Talal Abu-Ghazaleh Global and infinite opportunities for academic and personal growth.

Finally, we want to nurture our students to become accomplished, innovative and entrepreneurial global citizens. We are committed to always develop new programs that help our students meet the demands of the ever-changing global economy.

9. Talal Abu-Ghazaleh International Diploma in IT Skills (TAG-DIT)

The workplace is increasingly requiring employees with adequate information technology skills. Our objective is to prepare applicants for employment with diplomas evidencing their possession of the required skills sought by their employers. We offer our services worldwide through our 100 offices located in several countries.

How do we do it?

We offer diplomas at the Foundation or Standard levels in different information technology skills. Candidates seeking specific diplomas are assessed for their ability to use the software applications for those specific skills. Candidates are required to enter and manage data under given specifications and to successfully complete a range of tasks required for the specific skills required for the diploma they seek.

Our Diploma

Between 2001and 2017, TAG-DIT offered its diploma in partnership with Cambridge International Examinations in the UK. We had exclusivity in all the countries of the Arab League, whereas other partnerships had exclusivities in other regions. We owned all the intellectual property rights to the diploma skills and the role of Cambridge was to validate the diplomas and add its name to our name on the diploma. In 2017 for strategic reasons, Cambridge International Examinations discontinued its service to validate their worldwide partners' qualifications. At that point we made a decision to continue with offering our quality qualifications which are presently accredited by:
- The Ministry of Education in Jordan
- The Central Agency for Information Technology in Kuwait
- The Ministry of Education in Libya

We are continuing to seek other international accreditations.

Track Record:
Since the inception of our program, we have issued over 2 million diplomas to candidates worldwide.

Modules Offered
We provide examinations at the Foundation and Standard levels for the following areas of skills:
- Module 1: Introduction to Information Technology
- Module 2: Using PC and Managing Files using MS Windows
- Module 3: Word Processing using MS Word
- Module 4: Spreadsheets using MS Excel
- Module 5: Electronic Communication using MS Internet Explorer
- Module 6: Database Management using MS Access
- Module 7: Electronic Presentations using MS PowerPoint

Special Features
We offer the following features:
1. Candidates have the choice of taking the exam in either English or Arabic.
2. The exams are corrected electronically without human interference and the results are reported immediately on the candidate's screen.
3. There are no specific examination dates. Candidates can choose to sit for the examination at any time and in any accredited center.
4. All examinations are held at Proctored Testing Centers that follow a globally recognized examination process called TAGIMETRIC.
5. The diplomas offered are designed to meet the various candidates' needs at the level of their choice.
6. Diplomas are mailed to successful candidates and are printed on special paper with security features in order to avoid any forgery.

10. Talal Abu-Ghazaleh Academy (TAG-Academy)

Talal Abu-Ghazaleh Academy (TAG-Academy) aims at building capacities in all sectors by providing human resources with the needed knowledge, skills and attitudes that would raise their level of performance and develop the trainee's professional practices according to the latest updates in the training field. TAG-Academy looks forward to expanding professional cooperation relationships with international institutions involved in training and human resources development. It also aims at promoting effective leadership in building capacities locally and internationally.

Our Goals
- Provide human resources with the knowledge, skills and trends that enhance   performance.
- Develop the professional practices of trainees in alignment with the latest professional developments in the field of training. Increase the number of training centers worldwide.
- Expand professional cooperation relations with the international institutions concerned with training and human resources development.
- Seek to obtain international professional accreditation for the training programs.
- Continue to be an active leader in capacity building at both the regional and international levels.

Our Policy
- Great emphasis on result orientation of training and cost effectiveness of training investment for the recipients of training services.
- Focusing on the use and application of modern training methods.
- Enhancing the use of advanced techniques and training aids in applying the training process.
- Selecting trainers with high academic levels, distinguished achievements and real-life experience.
- Creating an appropriate training environment and providing logistics for the success of training programs.
- Establishing associations with only the most reputable and renowned education and training institutions worldwide.

Our Values
Service quality, Continuous improvement, Fruitful cooperation, Credibility and commitment, Transparency and accountability.

Our Methodology

TAG-Academy adopts an integrated and inclusive approach to the techniques of presentation, delivery, assessment and adaptation to the environment circumstances and the party requesting training services.

Certificates

TAG-Academy grants a certificate of participation for each course to those who effectively participate. The participants' attendance at the training sessions is a prerequisite for obtaining this certificate. In addition, other certifications are granted depending on programs designed with associates.

Our Training Programs

In order to achieve the goals of TAG-Academy, the training activity is not limited to one type of training programs, it rather includes a variety of programs that cover all specializations in science, humanities, management, finance, economics, law and e-knowledge.

TAG-Academy Cambridge Assessment English Authorized Center

Talal Abu-Ghazaleh Academy signed an agreement with Cambridge Assessment English, part of University of Cambridge, to become an authorized center for examinations and assessment. The Academy has started receiving applications for the Cambridge Assessment English training courses.

The Academy began hosting the exams as an authorized center since October 2017 whereby successful candidates receive a certificate issued by Cambridge Assessment English, part of University of Cambridge.

The Academy will offer training courses and examinations through a select highly trained team of trainers and examiners.

A few facts about Talal Abu-Ghazaleh Academy (TAG-Academy)
- Professionals trained at TAG-Academy: more than 500,000
- Professional certificates granted by TAG-Academy: more than 500,000
- Contracted trainers on the training database: more than 10,000
- TAG-Academy Affiliated Training Centers: more than 1,000

11. Talal Abu-Ghazaleh Knowledge Society (TAG-KS)

The Talal Abu-Ghazaleh Knowledge Society embodies the vision of its founder HE Dr. Talal Abu-Ghazaleh in providing a suitable environment for all youths who are capable of becoming the next generation of leaders in a world that depends on knowledge and technology.

Our comprehensive strategy is focused on fulfilling the dreams of young generations in having a source of knowledge and information wherever they are.

Vision and mission
TAG-KS Stations seek to empower youths with the required skills to become the leaders of tomorrow.

Objective
TAG-KS Stations aim at supporting the youth communities in developing their skills and capabilities and preparing them for the future, in addition to speeding up the process of transforming the new generation into a digital one, the E-Generation, who will utilize the latest technology tools in developing their skills to meet the requirements of the world of E-knowledge with confidence.

TAG Knowledge Stations offer
- Training courses, programs and diplomas.
- Digital learning.
- Management of small, micro and medium-sized enterprises (SMEs).
- Training in the use of computers and the internet in scientific research and innovation.
- Recruitment consulting.
- Awareness workshops in all fields.
- Voluntary work.

Training Materials and Trainers
TAG-KS provides other partners with the training materials and trainers for all courses. We can also provide training to employees of ourpartners to enable them to give certain courses to replace our trainers.

12. Arab Center for Dispute Resolution (ACDR)

The Board of Directors of the Arab Intellectual Property Mediation and Arbitration Society (AIPMAS) held its extraordinary meeting chaired by AIPMAS president HE Dr. Talal Abu-Ghazaleh.

The meeting was inaugurated by the General Assembly's discussion of Article (4), Paragraph E "Society's Purposes" which stipulates that supervising the procedures of settling intellectual property-related disputes shall be done through mediation or arbitration, or through any other means to settle disputes, by establishing a center specialized in intellectual property-related disputes, in accordance with the regulating rules and basics and adoption of the mediation and arbitration rules.

The General Assembly unanimously agreed to establish the Arab Center for Dispute Resolution (ACDR). The Legal Department at Talal Abu-Ghazaleh Global was entrusted to take necessary actions for this purpose, provided that the Center will be totally owned by the Society.

It was agreed to translate this decision to attach it to the registration certificate upon the issuance of its translated version to send it to the Internet Corporation for Assigned Names and Numbers (ICANN) and to register the Center's name (ACDR) as a trademark and to register the Center's domain name. Thus, the Arab Center for Dispute Resolution (ACDR) was established to provide up-to-date information, transparent, reliable professional services in the area of Domain Name Dispute Resolution and expertise in the area of dispute settlement with a view to advancing the most relevant jurisprudence and international legal trends, furthering the most advanced practices in the field of Intellectual Property.

Concerning the establishment of ACDR, Dr. Abu-Ghazaleh said that this was the fifth accredited center in the world, and being in the Arab region it had a special importance by focusing on the domain name-related disputes especially with the existence of arbitrators from all over the world capable to settle the domain name disputes in many languages. Dr. Abu-Ghazaleh expressed his hope for the Center to undertake its duties and properly play its role to serve the region.

Dr. Abu-Ghazaleh pointed out that he dedicated his efforts and the experience of Talal Abu-Ghazaleh Global to have this center come into existence since he believes in the importance of arbitration as the best way to settle disputes outside courts, as it is of the most common methods to settle disputes.

An Overview of the Arab Center for Dispute Resolution

The Arab Center for Dispute Resolution (ACDR) has received accreditation from ICANN (the Internet Corporation for Assigned Names and Numbers). ICANN has developed an extremely useful procedure for dispute resolution to handle domain name holder problems. The ACDR is the central entity enabling the support and management of a diverse array of Internet concerns in the Arab world. Its importance and mission is centered on organizing and promoting development of predictable rules-based guidance for a more secure and stable Internet. With this in view, following in-depth consultations with ICANN on a wide array of IP issues, as well as on the requirements for effective dispute settlement, the ACDR has adopted the Uniform Dispute Resolution Policy (UDRP) Rules and its own Supplemental Rules. These rules govern the administration of domain name dispute resolution to better address the concerns of domain name holders.

ACDR has an excellent base of Intellectual Property professionals who are renowned in this field. The Center has chosen those with accredited memberships in their relevant associations and with proven track records in dispute settlement. We have confidence in their ability to achieve settlements while addressing the most salient concerns of IP law.

Some services provided by the Arab Center for Dispute Resolution include:
- Provide and facilitate smooth interactions to reach a resolution of legal processes.
- Develop program implementation strategies to support adequate application of legal standards in a just, even-handed manner.
- Research and develop program processes that ensure the most up-to-date applications.
- Facilitate sufficient communication and training on most relevant domain name and dispute resolution methods and issues.

TAG.Global: a Global Provider of Smart Services

Our International Status
- Total clients in all services and activities: more than 1,000,000
- Trademarks we registered around the world: more than 500,000
- Intellectual property rights we managed: more than 100,000
- Annual increase in the number of clients: more than 25,000
- Our auditing company is among global top 20
- Best IP Firm Award (Middle East) for 10 Years
- Inducted to the IP Hall of Fame, Chicago 2007

Our Consulting Services
- Archived documents by TAG.Global: more than 150,000,000
- Trademarks in our IPPR database: more than 2,000,000
- Articles in TAGEPEDIA: more than 1,000,000
- Conducted consulting assignments: more than 100,000
- Qualified organizations to receive ISO certificates: more than 400
- Members of the ISO Technical Committee since 1995

Talal Abu-Ghazaleh Foundation (CSR)
- Our knowledge stations serving communities: 200
- Our fully operated and funded capacity building institutions: 50
- Talal Abu-Ghazaleh Global allocates 50% of its annual profits to Talal Abu-Ghazaleh Foundation and invests the other half in developing the Organization's capacities and expanding activities

Our Leadership in Capacity Building
- Translated pages in different languages: more than 10,000,000
- Professional reports issued: more than 1,000,000
- Professionals trained: more than 500,000
- Professional certificates we granted: more than 500,000
- ICT skills certificates issued: more than 250,000
- Contracted advisers on the tenders database: more than 50,000
- Contracted trainers on the training database: more than 10,000
- Affiliated Training Centers: more than 1,000

Our Knowledge-based Achievements
- Annual global online outreach: more than 30,000,000
- 150 databases with classified records: more than 500,000
- Developed E-Software solutions to serve clients: 100
- TAG.Global's websites for our services and activities: 60
- TAG.Global has its own Internet line: TAG-ISP
- Constructed and own TAG-Computing Cloud
- 1st Global Accredited Domain Name Registrar

About the Author

- Founder and Chairman of the Talal Abu-Ghazaleh Global (TAG.Global).
- Chairman of the Consortium for Sustainable Urbanization, New York.
- Bachelor of Science in Business Administration, The American University of Beirut, Lebanon (1960).

Honorary Degrees
- Ph.D. in Humane Letters, Lebanese American University, Lebanon (2018).
- Ph.D. in Management and Economics, Jerash University, Jordan (2016).
- Ph.D. in Business Administration, Mutah University, Jordan (2015).
- Ph.D. in Human Arts, Bethlehem University, Palestine (2014).
- Ph.D. in Arts, Canisius College, Buffalo, USA (1988).

Recognitions
- Senator, Jordanian Upper House, The Hashemite Kingdom of Jordan (2016-2019).
- Senator, Jordanian Upper House, The Hashemite Kingdom of Jordan (2010-2011).

Selected ICT-Related Roles
- Chair of the United Nations Global Alliance for ICT and Development (UNGAID), USA (2009- 2010).
- Co-chair of the Global Network (on SDG 11) for Promoting Digital Technologies for Sustainable Urbanization UN-HABITAT (2015 - present).
- Founding Chair of Internet Governance Forum (UN-IGF)
- Chair of the Arab World of Internet Institute, USA (2008).
- Co-Chair of the UN Global Compact (UNGC), USA (2006-2008).
- Vice-Chair of the United Nations Information and Communication Technologies Task Force (UN ICT TF), New York (2006-2010).
- Chair of the Arab Regional Network of the United Nations Information and Communication Technologies Task Force (UN ICT TF), USA (2001-2004).
- Chair of the Working Group on Human Resources and Capacity Building (HRCB) of the United Nations Information and Communications Technologies Task Force (UN ICT TF), USA (2001-2002).
- Member of World Trade Organization (WTO) Panel on Defining the Future of Trade, Switzerland (2012-present).

- Chair, Network 11 (Digital Technologies for Sustainable Urbanization Network)-UNSDG 11 (2008).
- Chair of the Arab Internet Names Consortium (AINC), The Hashemite Kingdom of Jordan (2001).
- Founder and Chair of the Internet Governance Forum, United Nations Information and Communication Technologies Task Force (UN ICT TF), USA (2003-2004).
- Chair of the Commission on E-Business, Information Technologies and Telecoms, International Chamber of Commerce (ICC), France (2001-2008).
- UNDP High-Level Advisory Board Member on Social Impact, USA (2017 - present).
- UNWTO Tourism Ambassador, USA (2016-2019).
- Member of Public Sector Consultative Group, International Federation of Accountants (IFAC), USA (2003- 2006).
- Chair of the International Chamber of Commerce Task Force (ICC TF) on Internet Governance, France (2003-2004).
- Member of the Board, International Financial Reporting Standards (IFRS)

Selected Decorations
- Decoration of Independence of the First Order by His Majesty King Abdullah II bin Al-Hussein, The Hashemite Kingdom of Jordan (2016).
- Decoration of Independence of the Hashemite Kingdom of Jordan from His Majesty the Late King Hussein Bin Talal, The Hashemite Kingdom of Jordan (1967).
- "Commendatore dell' Ordine della Stella d'Italia" (Commander in the Order of the Star of Italy) from HE Mr. Sergio Mattarella, President of the Republic of Italy (2019).
- Order of Civil Merit, His Majesty King Philip VI, King of Spain, (2018).
- Decoration of Enhancing the Sino-Arab Relations from HE Mr. Xi Jinping, President of the People's Republic of China (2016).
- Decoration of Creativity in Innovation and Digital Transformation from Regional Donor Organizations, Bahrain (2016).
- Prince Sultan bin Abd-Alaziz's decoration for Business Youth (2012).
- Presidential decoration presented by President of the Republic of Lebanon General Emile Lahoud, Lebanon (2001).
- Chevalier de la Légion d'Honneur, France (1985).
- Decoration of the Republic of Tunisia, Republic of Tunisia (1985).
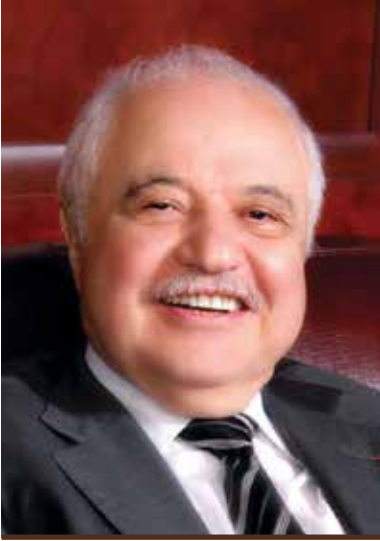
HE Dr. Talal Abu-Ghazaleh

Chair of the Consortium for Sustainable Urbanization, New York.

Talal Abu Ghazaleh is the Chairman and founder of the Jordan-based international organization, Talal Abu-Ghazaleh Global (TAG-Global). He has been called the godfather of Arab accounting and been credited with promoting the importance of Intellectual Property in the Arab region.

Dr. Abu-Ghazaleh designed and produced TAGTech– a top of the line range of laptops, tablets and other devices. His Knowledge Society is one of the foremost initiatives by HE Senator Talal Abu-Ghazaleh that empowers young Arabs under the TAG-Org's corporate responsibility. He has published multiple dictionaries: Abu-Ghazaleh ICT Directory (2008), The Abu-Ghazaleh Accountancy & Business Dictionary (2001), The Abu-Ghazaleh IP Dictionary (2000), and The Abu-Ghazaleh English-Arabic Dictionary of Accounting (1975).

Dr. Abu-Ghazaleh has received many honors, including: Social responsibility awards launched by CSR Regional Network for his work in social initiatives (Kingdom of Bahrain, 2014), Man of the Year Award from Palestine

International Institute (Amman, 2012), Honorary Award from the Arab Federation for the Protection of Intellectual Property Rights (Jordan, 2009), The International Lifetime Achievement Award (Dubai, 2008), IP Hall of Fame Inductee in the IP Hall of Fame Academy (Chicago, USA, 2007), Honorary Doctor of humane Letters (Canisius College, New York, 1988), Decoration of the Republic of Tunisia (1985), Chevalier de la Legion d'honneur (France, 1985), etc.

Besides being the Chair of the Honorary Council Members of the Consortium of Sustainable Development, Dr. Abu-Ghazaleh has been chair of Global Alliance for ICT and Development (2009-2010), Vice Chairman Board of Directors of UN Global Compact (2007-2008), Vice Chair of the UN Information and Communication Technologies Task Force (2001-2004), and many others.

What they said about the author

The Arab Businessman- the Role Model
HRH Prince Hassan Bin Talal

Nations tend to be proud of their creative sons and entrepreneurs and based on this, I appreciate the positive attitude of Talal Abu-Ghazaleh, who chose the path of institutions and harnessed the potential of his Organization and its expertise towards the minds in the third space, governmental, private and civil.

We need a forward-looking process alternate evaluation which is based on expertise of different knowledge fields, and this cannot be achieved through distance learning only, there is a need to meet and share ideas and opinions and this is what Abu-Ghazaleh always tries to do through his work.

The Arab knowledge communication needs to deepen relations between experiences in various fields in our region, such as Intellectual Property, management, accounting, information technology and communications.

And from this path I call upon the good Arab businessmen, and they are many, to offer initiatives at home and abroad, and I am sure that their capabilities are beyond the capabilities of their respective governments.

What distinguishes the life of Abu-Ghazaleh is his deep and strong belief in learning and capacity building to our sons and daughters.

Congratulation on his success and initiatives and wish him all the best

The Excellent Student
Dr. Selim Al Hoss
National thinker and former Lebanese prime minister

I am proud that Talal Abu-Ghazaleh was one of my students when I was a professor at the American University of Beirut. He was, and the truth is told, one of the most outstanding students. He kept in touch for many years and I continued

to follow all his work as he became very successful professionally. Today, he is heading the Talal Abu-Ghazaleh & Co., one of those leading the accounting and auditing sector in Lebanon, and indeed in the entire Arab Mashreq.

Born in Palestine, the home of all struggles and hope of all Arabs. It is the area that gave birth to a distinguished people known for their sacrifice, courage and struggle. Among them some of the most prominent symbols of the Arab struggle against the criminal Zionism were born who took a stand against the most extreme circumstances that surrounded the Arab nation.

Out of this good earth he was born, and his destiny was the same as that of all his people: displacement by the crimes of the Zionists, he and his family were displaced in Lebanon, where he completed his primary education and his university studies. He was one of the most brilliant students who did not forget all through the stages, that one day he will serve his Arab nation. He decided to serve his Arab nation in his own way dedicating his services to the accounting and auditing sector amassing long experience in this field through his active and professional companies that enjoy a competitive advantage in Lebanon and in a number of Arab countries.

I am very proud that Talal was one of my students and that special period in my life as a professor is considered the most fruitful stage.

I am thrilled of such a publication "from suffering to globalism" which I hope it will do fair to this good man as he deserves it and more.

Best regards to my dear brother and friend Talal Abu-Ghazaleh and to all good people who worked on such a publication honoring him.

A leader in his initiatives and an initiator in his leadership
Taher Al Masri
Former Prime Minister of Jordan and former Speaker of the Senate

The life journey of brother and friend Talal Abu-Ghazaleh deserves to be studied by the generations, in order to learn from the story of the self-made man who has embraced hardships and determination to achieve and build an

extraordinary personality capable of imposing its active presence in more than one field at a time.

This is the son of Jaffa, where he was born, witnessed exile and lived wars and calamities. He left Palestine and chose the profession of accounting. He was a pioneer in the field of auditing until he became a pioneer in the field of finance and economy. He became a great benefactor in supporting science and education. He donated large sums to the university he graduated from.

Many challenges interfered in his life but he managed to conquer these challenges and come out stronger. His work was done in the face of the results of wars and vicissitudes of the region and the territory, but as an entrepreneur, experienced, knowledgeable and determined, he has overcome difficulties with great success, and has become a well-known pioneer in terms of Intellectual Property, not only at the level of the Arab countries, but also on a global level. His international standing in this field has become well known and recognized by the United Nations and its Ssecretary-General, especially in this regard, in recognition of the effectiveness of his knowledge and excellence in his universality. In this respect, he represents the personality of the distinguished Arab man who deserves appreciation, praise and respect.

Talal is haunted by the concerns of his Arab nation and its issues, specifically the question of Palestine, which is the owner of a mature nationalist thinker with remarkable activity for Palestine and its just cause, especially in supporting the sectors of culture, health and education. He has very strong political relations in various parts of the world, which he is never hesitant to employ them in support of the Palestinian issue and Arab issues in general, and obviously his knowledge and high political culture serve this lofty goal with remarkable efficiency. His positive impact here, in Jordan, has many beneficial effects, particularly in the fields of education, accounting, finance, economy and investment, as well as his broad and influential social presence.

Despite his many accounting, academic and political concerns, he is fond of music and art in general, and he never hesitates to support high art, both Arab

and European, and has many contributions in support of festivals and works of art, especially in Austria (Salzburg).

That is Talal Abu-Ghazaleh, whom I know very well, self-made man, a pioneer in his initiatives and an innovator in his leadership, a loyal and active Arab. He is a human being charged with wonderful humanity of his movements and calmness, and behavior, and a heightened sense never confused by hatreds, spites and grudges, a respectable family man, and a good citizen who prays in giving, his citizenship and loyalty to life, defending his convictions and not eliminating the other opinion from his interests.

In brief, he is a human being with the experience to be read, and achievements to be respected.

Aspirations are Realized
José María Figueres
Former President of Costa Rica

There are three dimensions to the Abu-Ghazaleh International Group. The first dimension is the work that I expect to be grown, progressed and developed on the basis of rationales and well-known principles, especially in the tertiary sector provided by the Group.

The second dimension, which is to employ growth and progress to achieve this man's aspirations for universality, it has become apparent in the success of his group worldwide. The third dimension is my personal vision of the Group's services and business, which has become an important part of the components and development of the economic area, where it contributed positively, benefiting and benefiting from it. The Group has continuously kept abreast of everything new in the field of professional services and information, while keen to take advantage of everything that is new and developed in all scopes and fields related to its work in the world.

Ambassador of the Arabs
Sir Jeremy Hanley
Former UK Minister of Foreign Affairs, former UK Minister of State for the Armed Forces and former member of the British Cabinet of Ministers

Talal Abu-Ghazaleh is a distinguished man world-wide and is known for his ability to communicate with the outside world with remarkable efficiency and distinction. He is one of the most prominent and intelligent Arab personalities I have ever known in my life during my tenure as Minister of Foreign Affairs and Armed Forces and a member of the Cabinet of Ministers.

In my opinion, Talal is an ambassador to the Arabs and known throughout the world as a Palestinian personality who believes in, respects and abides by the laws. He works to develop and consolidate laws and standards related to the accounting profession, which are fundamental to the economy and development in all fields.

In this context, I would like to point out that I have recognized from Talal Abu-Ghazaleh on the issues and aspirations of the Arab peoples, and I thank him for this. He has been able to describe to us the issues of the Arab region in a clear and transparent manner, especially those crucial issues that concern many zonal states. I mention here the Palestinian issue, which is an important part of the life of the Arab Ambassador Talal Abu-Ghazaleh.

I learned from him working hard
Sergio Marchi
Former Minister of International Trade of Canada

When we have a personality with as unique and diverse abilities as Talal Abu-Ghazaleh, it is a source of pride not only for its success in work, but also for being an Arab person and a leader in the field of professional services and business.

I do not exaggerate his description of the leader and pioneer. Abu- Ghazaleh was able by his struggle, strong faith and unique determination to make his institution a prestigious pyramid cherished by the entire Arab region.

Talal Abu-Ghazaleh Global (TAG.Global) operates under the leadership of this man, who works tirelessly throughout the day, with a high ability to withstand, in order to keep his group at the forefront.

Talal Abu-Ghazaleh always works to reach the services of his group to other regions around the world, and does not stop at a certain point or area, and his permanent slogan is "continuous and orderly work" to achieve development and progress in all areas and domains, so that his group will remain in the forefront led by this personality, which I repeat my pride in knowing this personality and friendship, which added to me more and I learned from him the hard work and sincere for the benefit of the nation and its development.

Attention to International cooperation
Abdul Hamid Mamdouh
Director of Trade in Services and Investment (WTO)

Talal Abu-Ghazaleh is very interested in international cooperation because the areas in which he works in are related to the implementation of international agreements in the field of Intellectual Property protection and international standards and norms in accounting.

Talal Abu-Ghazaleh, who represents a public figure, has a direct impact on the direction of Talal Abu-Ghazaleh Global (TAG.Global). Talal has established a number of important non-governmental organizations that have played a role in raising awareness of the employment services and important departments in the Arab countries with different rights, raising the awareness of information technology and in many areas of interest and attention to the institution in general. It established the first Arabic-language website of the World Trade Organization (WTO), one of the most important international organizations with a direct policy impact.

A Self-Made Man
Professor John Small
Former president of the Association of Chartered Certified Accountants-UK

The Talal Abu-Ghazaleh Organization is one of the largest organizations in the world in the field of professional services, and the individual behind this organization works hard around the clock. Talal Abu-Ghazaleh as a person I know and proud of his friendship is a man and an intelligent chairman who can easily and always convince you to present good work and special services to the world and not only in the Arab region. He is a very well-known Arab character in the western world, and his good nature reflects on the good nature of all Arabs. He is capable of conveying the Arab voice to the Western world, and he is known for his loyalty to his family, his work and the staff of his group. His employees are treated as members of the family.

My personal relation with Talal started 20 years ago and I am proud of such friendship with this man who is dedicated towards the path of success, his organization strives to provide high quality services and qualify its employees to reach the highest levels and contribute in developing the economic, social and cultural level in the Arab world in the global framework.

Talal Abu-Ghazaleh is one of the best Arab personalities I have even known, this man hates problems and stays away from anything that causes hurt to him and to others, this character demands respect of all.

We cannot limit his good and positive qualities in words as talking about this man takes long dialogue especially regarding his humanity.

A tribute to this wonderful man who with his self-made attitude became a symbol for struggle and success.

A leading figure

Dr. Ali Ahmad Atiqa

Former secretary-general of the Arab Thought Forum and former Secretary-General of the Organization of Arab Petroleum Exporting Countries (OAPEC)

With a light-hearted personality, a string and optimistic will and leadership skills, Dr. Talal Abu-Ghazaleh, the well-known businessman, combines between seriousness and excitement, confidence and ambition, and recognizes the role of public relations and the importance of the human element in all the leading work and initiatives.

I have known my friend "Abu Lo'ay" for nearly 40 years, when he made a working visit to Tripoli, I began to admire his personality since then, our common knowledge grew and our family relations developed after I moved with the family to Kuwait to assume the position of Secretary General of the Organization of Arab Petroleum Exporting Countries (1973-1987).

I followed up with admiration, his ability to meet the challenges he had to overcome. I have followed up his abilities to establish Talal Abu- Ghazaleh Global (TAG.Global) as we know it today, as well as his humanitarian connection with staff who decided to move and work with him, I was impressed by their loyalty and willingness to contribute in building a new institution in difficult circumstances and limited financing, the confidence of businessmen and the economy in his personality and dealing with his new institution, due to their great confidence in his ability to succeed and excel.

Today, we witness the works of Talal Abu-Ghazaleh Global (TAG.Global) and its pioneering initiatives in education, and in developing the skills of Arab youth in accounting, Intellectual Property, and information technology and computer science. He believes in investing in human beings through education and rehabilitation, and supports his faith in constructive work with the participation of his staff and employees who I wish them all success in serving the Arab world through this pioneering institution.

Faith in Education
Dr. Edward Grace
Head of Accounting and Auditing Department, University of Canisius, Buffalo, USA

Talal Abu-Ghazaleh is taking steady steps in the field of education, which is an important pillar in the priorities of this man who is always trying to harness most of his plans and programs to serve education, he has established Talal Abu-Ghazaleh Center for Research and Studies at the university where I have been a professor of accounting and auditing since 1988 in New York, with the aim of contributing to the development of accounting profession in the Arab world by providing research and information.

Talal Abu-Ghazaleh personalizes the importance of consolidating and strengthening the accounting profession in the Arab region as a fundamental factor towards growth, development and progress, we have worked together to establish the Talal Abu-Ghazaleh Graduate School of Business in Jordan, where the materials are taught in English. This college will be a pioneer in the Middle East, not only in its curriculum but in its evolving manner, where the graduate student will be able to enter the field directly without the years of experience that are the main obstacle to most newly graduated students.

Sindbad without borders
Ghada Fouad Al Samman
A Lebanese Author

Many shorten their history with a checkbook. Many decorate their chests with elegant ties to look like honorary medals and many of whom carry "their forearms" as a panel for a broad heading that only the shortsighted read.

In honor of the specificity of the word and the sanctity of the interpretation according to the sources of jurisprudence, I say: It is the chance that allowed me to meet him but destiny. A few years ago and during a short visit to Jordan, there was a prominent headline "Talal Abu-Ghazaleh" and

I did not have the intention to ask who he was at that time but the cheer mention of him was an urge and each person who knew him talked about his love and greatness.

I was amazed and obsessed by all of their words, one said: He is the teacher. another: he is a Professor. And the third said: he is a wise man. And the fourth said: He is the friend. And others said: he is the passionate ... and others said and said ...

I said: What is this uniqueness, how would you describe him with all these words?! They said: do you know him?! I said no. they said: Then your opinions are not correct, and your discontent charges falsely. I said: Where is the way? They said: A step!

That day, I did not understand what does this Sindbad gain from his continuous roaming across the planet, and I did not understand how he could become a glowing flame in the size of the knowledge lines, and I was not aware of his remarkable pivotal role in each forum, platform and lexicon! I just understood that thanks to his extra activity, more than a thousand employees and their families make a living ... ... I understood that he is very keen to support each learner and help him to qualify to study and gain knowledge ... I understood that despite all the certificates that collected from here and there, only one certificate is recognized, which is the testimony of the right to every position and every time ... I understood that he only boasts about his Palestinian identity, making it superior above all privileges, and that he signs with his pride and admiration the hope he seeks, and that he commiserates with his optimism the martyrs of the homeland ... I understand that his spontaneity is above every protocol and his higher bow for each simplicity and everything simple.

In me, Talal Abu-Ghazaleh forms a special exception to a great respect, and because respect is a demand, religion, approach, rank and concern, he is truly unique man.

For what he has achieved, Congratulations and we are blessed with his presence
Hassan Abu Ne'ma
Member of the Jordanian Senate and former Ambassador to United Nations

I have known Talal Abu-Ghazaleh, the brother and companion, since we sat together studying at the American University of Beirut in the mid-fifties of the last century, when I say that our close contact has not been interrupted for more than half a century, it is based on the foundations on which this calm and humble man built the greatest achievement, not only in the fields of auditing, but also in the remarkable ability to anticipate the right prospects of economic and political work at the international level, to the extent that it became the United Nations, for its greatness and extraordinary capabilities, which benefit from his outstanding capabilities in performing its most precise tasks.

Talal has not changed during the six decades that linked us with close relationship, he is the same person whose extraordinary personality and the ability of leadership and determination could not deviate his focus to reach the goal and the clear vision of what he wanted to achieve from his first years of his life, the self-confidence and deep belief in the principles of self-image related to his homeland, his profession, and his family, his community, and his friends; and courage that stood firm against harsh circumstances, and extreme crises he faced and was able to emerge each time stronger than ever. At best, and in the darkest, Talal kept his light-hearted spirit and address the most difficult issues calmly and with confidence.

Talal's difficult journey has been characterized by rare qualities and unprecedented abilities to successfully combine the opposites. His solid character was not to hold on to the national principles in particular, a reason to abandon the civility, flexibility and friendly companionship in cooperating, and the requirements to adhere to the utmost seriousness in order to achieve the great goals did not force him to lose the most beautiful aspects of his character. The great achievements he established did not change his commitment to the

rules of hard work and follow on every small and large issue and continue work day and night, not for material gain- and that was not difficult if he wanted - but for aspirations he had seen since childhood. So, congratulations to him to it prosper in the best years of his life; witness the high monument rise; and the many parts of the goal has been achieved , but without what is greater which is the liberation of the homeland from occupation; and the family has grown and flourished and health is still well and morale is high and giving is still alive, and the future is bright. Congratulations to Talal Abu-Ghazaleh for his achievements and we are blessed with his presence.

A Journey Crowned with Successes
Thabet Al Taher
A former Jordanian Minister and former director general of Abdul Hameed Shoman Foundation

Dear Dr. Talal Abu-Ghazaleh, this great man whose personal and professional biography is a success story to be followed and this country has the right to be proud of and speak about it. His Excellency Senator Abu-Ghazaleh's journey started from Jaffa, his birthplace in Palestine in 1938, to Amman, a journey crowned with successes and coupled with the hard work, perseverance, intelligence and diligence which he has placed at the head of one of the world's leading institutions offering a full range of high quality professional services , and constantly working to qualify the employees in accordance with the highest international standards to contribute to the economic, social and cultural development of the Arab world within the framework of the global economy.

Since taking over the Shoman Forum in late 2003, the Forum has hosted Talal Abu-Ghazaleh four times to give lectures on public affairs. When I reviewed these lectures, and during the preparation to write these words, I had two important observations that needed to be mentioned, the first observation is that Abu-Ghazaleh is keen to renew and diversify his lectures; in 2004, Abu-Ghazaleh told us about "The New in the New World Order", in 2007, his address was "Higher Education and the Challenges of Quality Control and Recognition" , in 2008, he talked about "The Arab and World Economy

at a Crossroads" and finally "Jordan and the Region: Where are we heading Geo-Economics."

The second observation that stopped me while writing was his autobiography, every time he speaks to us, I discover that his status has increased with the prestigious positions and the great tasks he handles and undertakes at the Arab, regional and international levels, and this is reflected in the honorary certificates and decorations presented to him, and the positions, chairmanships and titles on various boards of directors, and the publications books and dictionaries he issues , and the awards such as the honorary award he received from the Arab Union for the Protection of Intellectual Property Rights. And his election in Geneva as Co-Chair of the Global Challenges Forum, a high- profile organization of think tanks, research centers and academic institutions, non-stop achievements.

This is Talal Abu-Ghazaleh who received the confidence of His Majesty King Abdullah II, and was appointed a member of the Jordanian Senate . What a journey of successes he is enjoying ...

An encyclopedic Scientist
Dr. Saleh Hashem
Former Secretary-General of the Association of Arab Universities

I have known Dr. Talal Abu-Ghazaleh since I was president of Ain Shams University at the beginning of the third millennium. This relationship was strengthened when I assumed the duties of the Secretary General of the Association of Arab Universities at the permanent headquarters in the Jordanian capital of Amman. He was the best supporter of this important Arab civilized work.

In Talal, I knew a trustful Arab who cares about Arab causes especially the quality of education as a base for building generations capable of holding responsibilities and develop nations as the right for education is the locomotive of development and I allow myself to call Talal the encyclopedic Scientist, he is a scientific institution always on the move.

I knew in him a loving and devoted person to his original nation, helping the weak and small before the strong whenever he is able to do so part of his beginning since his youth ... whoever reads his life journey discovers the size of struggle he lived since he was a child, youth and until he established his global professional group.

Talal managed armed with his effort, patience and struggle, and continuous hard work to transform suffering into blessing and from that he was able to assume leadership positions in regional and Arab establishments to become an Arab and global personality.

Then Talal was launched to globalism and was selected by the United Nations Secretary General to lead a vital international position and he assume duties of the Global Compact for ICT.

Before this and that we need to point out that the high status of Talal Abu-Ghazaleh in the Intellectual property and selecting him as a member of the IP Hall of Fame and many important scientific and professional organizations and these were highlighted through many medals, certificates and shields from world leaders.

The Creative Organizer
Dr. Jawad Anani
Former Jordanian Deputy Prime Minister

The life of Talal Abu-Ghazaleh deserves an in-depth study and an analytical scientific book to learn from. The life of the great men is always a source of experiences and lessons. Their brains store wisdom, experience and useful knowledge, which is a "vision for the people" as stated in the verse. In their life there are success and failures, ups and downs and tests and we as students should consider.

The life of my brother Dr. Talal Abu-Ghazaleh might have a special feature that I have learned from my experience with him, which began in the late 1970s. I accompanied him in many journeys: to Doha, Abu Dhabi, London and Davos and participated with him in many seminars and conferences and have been

with him in forums and serious efforts to serve our nation in the last years. I used to ask: who is this stubborn man who challenged the Greater Amman Municipality for many years because it wanted to place its hand on one of his buildings under the pretext of public benefit, and he finally won? How did he manage to overcome the crisis in the 70s and 80s? How did he develop his business from one context to another? How did he renew the life of his institutions and remained a permanent leader? And where does he come with insight to see what people will need and benefit before it is too late?

These questions and others makes me go back in time to our traditional stories about jinn and mankind and I say that this man has a partner who sees things that we cannot see. Is not this the definition of creative organizer?

And finally, what distinguishes Talal Abu-Ghazaleh is that he did not remain in the framework from which he started.

A Man with Determination is worth a Nation
Mazen Al-Hasasneh
Chairman of the Board of Directors of the Palestinian Turkish Businessmen Union

In the presence of dignitaries and achievers, we stand in front of a man proud and honored of his distinguished journey and great history who stood tall despite the challenges and struggle. This is what moves me the jubilation of a Palestinian Arab-Jordanian pride who we are proud of. Dr. Talal Abu-Ghazaleh is one of those who reshaped the model born from the womb of a refuge and deprivation into a sun that lives in the sky as a symbol of victory, a slogan for an amazing success.

It is my right and the right of all Palestinian businessmen in Turkey and to all members of the community as we honor this man to be proud of him, he who represents the real Palestinian who struggled for his national identity, Talal Abu-Ghazaleh became the miracle of the Palestinian Diaspora and a Palestinian icon that proved that we are a mighty people that do not die easily, but live and excel and move forward despite the attempts to wipe us out.

This honor presented to Abu-Ghazaleh is a simple part compared to what he presented to his people, nation and cause and from here we launched in Turkey A Man with Determination is worth a Nation and this man is Talal Abu-Ghazaleh with his history, cognitive, academic, economic and social path. He is one of the most influential people in the economic field in the region. He is one of the most creative people in the science of knowledge, a national symbol and registered trademark of struggle whose rights belong to the Palestinian, Jordanian and Arab people.

A Passionate for everything Palestine
Archbishop Sebastia Atallah Hanna
Archbishop of Sebastia

From Jerusalem we deliver a message of loyalty, respect and appreciation to Dr. Talal Abu-Ghazaleh who we consider a personality of our Arab nation.

There is a verse in the Holy Bible that says:" For all those who exalt themselves will be humbled, and those who humble themselves will be exalted." This verse clearly specify that the greatness of man is in his modesty, the more man is modest the greater he is in front of God and people.

Our dear friend Dr. Talal Abu-Ghazaleh is great in his modesty, humanity, Ethics, principles and values that he has advocated and continues to advocate.

I proudly describe Dr. Talal Abu-Ghazaleh and from the heart of the city of Jerusalem where I am based that he is a Passionate for everything Palestine and we are proud of Dr. Talal Abu-Ghazaleh who is always proud of his origin and roots and he never forgets that the Palestinian issue is our issue wherever we are and it is our duty to defend this case.

I met him several times and I found in his words the wisdom, Consciousness and Commitment to Humanity First and Arabs secondly.

An educated man means exactly what the word educated means and there are many people with degrees but when we talk to them we discover they are far away from culture and thought.

Dr. Talal Abu-Ghazaleh carries a humanitarian, intellectual and cultural message and the remarkable successes achieved in his projects, ambitious and programs are the main reasons behind being an owner of a moral thought and noble human spirit.

The symbol placed on the entrance of his office (God is Love) and how beautiful are these words which embodies the values our dear friend Dr. Talal Abu-Ghazaleh was raised by.

He defended Palestine in all places he existed in and he used to travel from one capital to another and from one country to another not only to promote his successful programs and projects but also to preach about the justice of the Palestinian issue.

I would like to say to Dr. Talal Abu-Ghazaleh from the heart of Palestine which he loves that Palestine loves you and it is proud of you and with all your gifts to humanity and to the Arab world and to Jordan, which you love and belong to as you love Palestine and belong to it.

You have received many awards and decorations and those who visit your office can witness the walls full of pictures with world leaders and also full with medals and shields honoring you.

We believe that honoring you is not only a tribute to your honorable person, but a tribute to Jordan, a tribute to Palestine and a tribute to the noble human and ethical and attitudes that you have carried in your heart for decades.

Meanwhile your elegant Christian presence in this Arab Mashreq you have always been keen to show its originality everywhere you go. You have always said that Christianity was born here and Christ was born in our country, and the Arab Christians are genuine in their belonging to the Arab nation and the Arab Mashreq and its national issues headed by the issue of Palestine.

We need your words during this difficult time and we need more your united stands in these tragic circumstances that are afflicting our Arab Mashreq, where the enemies of the Arab nation are seeking to separate us and provoke hatred among us. They have created tools for us to serve them and they are the other side of Zionism, with the aim of taking our societies apart and turning us into rival sects and tribes instead of becoming one nation and one family.

How much we need you and those who are similar to you who call for tolerance, unity, and union between man and his fellow man? and how much do we need those intellectuals, thinkers and innovators who are working to unify the ranks and thwart all conspiracies and plots that surround us and target our national issues, foremost of which is a just cause known to modern human history, namely the issue of Palestine.

Arabs, in all their sects, appreciate your positions and the Christians in Palestine and in the Arab Mashreq are proud of you as a personality of our Arab nation and our Jordan and Palestine, which is always dear to your heart. We always consider you as a personality full of unity and tolerance and love between man and his fellow man.

We pray for your health, you are one of the wise, intellectual and educated people in our nation, who we are proud of and their achievements, their giving and their success.

I am proud of being one of your friends and proud of meeting you always and in each meeting I become prouder of you and our brotherly friendship.

From Jerusalem, the capital of Palestine, we bless you with the message of loyalty and pride. We are with you and we will remain in every good work and in every meaningful activity to serve our society and our nation and our just national causes, foremost of which is the issue of Palestine.

Blankets Become Jackets

The author with his colleagues at
Al-Makassed School – Beirut

The author speaks at the American
University of Beirut

The author with Mr. Bill Gates
(center), Lubna Alqasimi, Ali Saleh
Alsalehi and Dr. Ahmad Nazif at
Microsoft's Government Leadership
Forum Arabia in Cairo

The author on the UN Podium

The author with Mr. Ban Ki-moon
– UN

The author with Mr. Kofi Annan at
UN Headquarters - New York

The author with His Majesty King
Felipe VI of Spain

The author with HE Ms. Irina
Bokova, UNESCO Director-
General at UNESCO Headquarters
in Paris, France

The author with US President Jimmy
Carter

His Majesty King Abdullah II awards
the author the Order of Independence
of the First Class-Jordan 2016

The author honored by HE Mr. Xi Jinping, President of the People's Republic of China for his role in enhancing the Sino-Arab relations

The author with HE President Abdullah Gul, Turkey

The author with His Holiness Pope Francis

The author with HE Rafiq Al-Hariri, Prime Minister of Lebanon

The author with HE President Yaser Arafat, Palestine

The author with US Secretary of States, Henry Kissinger

The author with HM King Abdullah II and HM King Hamad bin Issa Al Khalifah

The author with Mr. Edward Heath, Prime Minister of Britain

The author with HE President Francois Mitterrand, France

The author with His Majesty King Simeon II of Bulgaria

The author with HM King Hussein bin Talal

The author receives an honorary doctorate in Humane Letters from Lebanese American University

The author (middle), Archbishop of Canterbury, UK (right) and Evelyn de Rothschild (left) at Saint James Palace during the launching of Code of Ethics based on the three main religions


The author with the Custodian of the Two Holy Mosques King Salman bin Abdulaziz, and Crown Prince HRH Mohammad bin Salman bin Abdulaziz

The author with His Majesty King Abdullah II

The author with His Highness Sheikh Sabah Al-Ahmad Al-Jaber Al-Sabah, Kuwaiti Minister of Foreign Affairs and current Prince of Kuwait, and Mr. Yousef Ibrahim Al-Ghanem. Kuwait - March 26, 1978
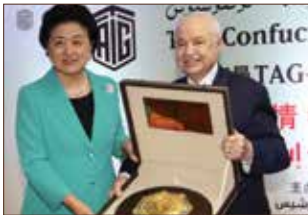
The author with Vice Premier of the People's Republic of China, HE Ms. Liu Yandong

The author with Her Majesty Queen Rania Al Abdullah of Jordan

The author with Sheikh Mohammed bin Rashid Al Maktoum, Vice President of the UAE, Prime Minister and Ruler of Dubai

The author with His Highness Sheikh Nahyan bin Mubarak Al Nahyan, UAE Minister of Higher Education and Scientific Research

The author with CEO-Managing Partner for Abu-Ghazaleh Intellectual Property (AGIP), Mr. Luay T. Abu-Ghazaleh.

The author with Chairman of the Joint Chiefs of Staff of the Jordanian Armed Forces, Lieutenant General Mahmoud Freihat.

The author with Chairman of the Joint Chiefs of Staff of the Jordanian Armed Forces, Lieutenant General Mahmoud Freihat and a group of high ranking officers

The author with high-ranking military officers of the Egyptian Armed Forces

This is to Certify that....

TALAL ABU GHAZALEH

HAS BEEN APPOINTED AN HONORARY DEPUTY
SHERIFF IN HARRIS COUNTY, TEXAS, AND IS
ENTITLED TO RECEIVE ALL THE PRIVILEGES
AND BENEFITS OF THIS DEPARTMENT.

GIVEN UNDER MY HAND THIS

22ND DAY OF JANUARY ,19 79

JACK HEARD, SHERIFF

GOLD MERCURY
INTERNATIONAL AWARD
assigned to

Talal Abughazaleh & Co.
State of Kuwait

For the productive development
and international co-operation

Bahrain 1978

WORLD EDUCATION CONGRESS
ASIA AWARDS

Award for Best Educational Institute in
Management
Presented to

Talal Abu-Ghazaleh School of
Business

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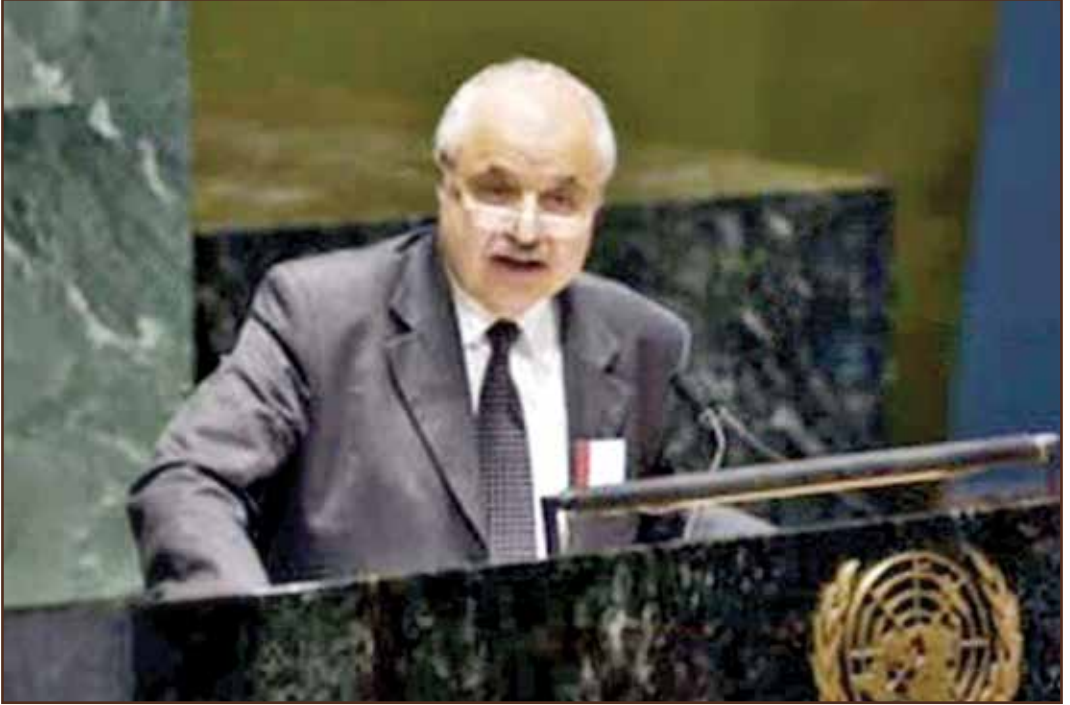**96. Hanoi**
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Talal Abu-Ghazaleh: 10 Prescriptions for Success

1. Hope brings luck: **Be hopeful, always**.
2. Happiness is an enabler: **Be happy, always.**
3. The objective of education is innovation: **Invent.**
4. Be a natural and perpetual student: **Never stop studying.**
5. Look for the first mover advantage: **Resist the herd instinct.**
6. Just like your non-stop heart, rest is bad for you: **Work and work.**
7. In Arabic, retired (متقاعد) means "die-seated" "مت – قاعد"!: **Never retire.**
8. Your adversaries help protect you from yourself: **Love and love everybody.**
9. Welcome adversities and failures: **Turn them into blessings and successes.**
10. At school, you learn and sit for exams: **After School, you face exams and learn.**

Talal Abu-Ghazaleh

THE INEVITABLE
DIGITAL FUTURE

A WORLD OF SMART CITIES

DR. TALAL ABU-GHAZALEH