THE INTERNET OF THINGS

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Foreword: The Internet of Things in Emerging Markets

By James Barton, Editor, Developing Telecoms.

Welcome to Developing Telecoms’ Special Report on the Internet of Things in Emerging Markets. Our series of Special Reports provides expert insight and commentary on key technology trends with a focus on developing and emerging markets. This report examines the recent explosion of IoT technology and looks at the ways in which it could have an impact in developing regions.

The last few years have seen an industry-wide shift towards Internet of Things (IoT) technology, but even amid this environment connected devices are typically thought of as the preserve of more developed markets. Affordability of the technology has of course been a preventative factor for their adoption in developing regions, but perhaps more significantly it has been unclear if there are sufficient use cases for the technology to take hold in emerging markets.

However, it is becoming increasingly clear that the technology is being applied in innovative, unforeseen ways unique to emerging markets – and that the demand is very much present. The mature infrastructure and institutions typical of developed markets are seen as a secure base on which IoT technology can proliferate, but in fact the lack of these hallmarks in developing markets is proving no impediment to adoption of the technology – indeed, many operators are looking to IoT solutions as a means of providing services in emerging markets that match the standard of their developed market equivalents.
To explain more about how IoT technology is being deployed in emerging markets, our Special Report features contributions from leading analyst firms, including the Arab Advisors Group, Creative Intellect Consulting, and Ernst & Young. In addition, I’ve spoken to Orange Business Services’ Alain Chenavier, a specialist in international development, IoT and M2M, to discuss which use cases are gaining traction in emerging markets and how they differ between regions.

I would like to thank all of our contributors for providing their insight and expertise to our Special Report series, as well as extending our thanks to our sponsor Oracle, whose support has allowed us to create another extremely high-quality Special Report for our dedicated readership.
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Inventive IoT use cases can transform lives in developing markets

By Alain Chenavier - International Business Development Manager, M2M at Orange Business Services.

To provide a view of the IoT space from an operator’s perspective, DT Editor James Barton spoke with Alain Chenavier, International Business Development Manager for M2M at Orange Business Services. The interview focuses on the different use cases for IoT technology between developed and emerging markets, as well as discussing the types of services that are already available in the Africa and Middle East regions and how they might evolve in the future.

What is your role within Orange?
I am part of Orange Business Services, in a dedicated entity called Orange Applications for Business. This unit aggregates all internal entities within Orange for dealing with applications and IT integration in general. Within this unit, I am in charge of international business development especially with regard to IoT and the Smart Cities project.

What are the contrasts between the major technology trends in developed and developing markets?
I’m mainly involved in B2B/B2B2C projects, while Orange’s national units are typically involved in B2C projects. We of course work together a lot, as implementing a B2C project frequently requires a B2B aspect. My view of this market is therefore affected by the fact that we typically work with large multinational companies rather than citizens. OBS is split into global regions, and we consider emerging markets to be a full region; it mainly covers Africa and the Middle East. There is a big difference between these two regions in terms of business in general, and the scope for
IoT is similarly diverse. The Middle East is actively deploying the same kind of projects that we are seeing in developed countries; Smart Cities, connected objects, e-Health, etc. We have a lot of activity in the Emirates, Qatar and Saudi Arabia, and in these markets most IoT initiatives are connected to Smart City projects. These encompass ideas like smart parking, GSM sensors, and information collection related to things like air quality and waste management systems. These projects are growing fast – we’re involved in more than five of them in the Middle East alone – and the IoT roadmap is the same there as it is in Europe or the Americas.

If we look at what’s happening in Africa, it’s completely different. This is because the level of development across African countries is not the same, and accordingly the needs of both citizens and companies are different. Operators are trying to take advantage of IoT to make significant steps in development; typically the biggest IoT projects in Africa are related to the lives of citizens. This could be e-health, payments solutions, and – increasingly – utilities. More and more, electricity and water is metered via smart meters and solutions aimed at facilitating the payment of these bills are on the rise. This combines the concept of IoT connected meters and electronic smartphone payments.

For operators in developed nations, the primary motivation for adopting IoT technology is reducing costs. In more developing regions, it’s likely to be more related to convenience or indeed the ability to connect to customers for the first time. Is this accurate, or are there other factors driving the adoption of IoT?

In Africa there are a lot of new projects related to the fact that a lot of citizens are not using the ‘standard’ services in the same way as users in developed markets. Energy is an example of this, but health is perhaps a clearer demonstration. There are a lot of issues around counterfeit medicine in Africa, whereas in Western Europe you’d feel fairly secure buying medicine from a pharmacy. To address this issue, there are projects where local providers such as Orange are offering solutions that allow customers to scan barcodes or labels with their smartphone in order to check and ensure that their medicine is genuine.

Problems such as this are specific to emerging markets – what other potential use cases are there to address issues endemic to these regions, but that don’t exist in developed markets?

IoT technology is mainly used to provide a shortcut from the citizen to the company. With the example of medicine, maybe around 10-20% of the population in developing countries accesses healthcare in much the same way as in a developed country. However, the majority of people do not enjoy this luxury; if they live remotely for example, they can’t see a doctor or obtain medicine easily, so they’ll often have to turn to an intermediary which isn’t ideal. Connected objects can provide authentication; the smartphone is connected to a server.

Egypt offers a good example of how the technology can be used for the benefit of citizens. The government provided an NFC tag for farmers working in remote areas which allowed them to identify distributors of key supplies such as seeds. These kind of solutions don’t exist in developed countries as the need for this kind of security essentially doesn’t exist; however in Africa these solutions are instilling greater trust in users as they can be sure that their medicine or supplies are authentic. Governments are capitalising on this trust; high levels of corruption in these regions means that end users –and indeed authorities - are often more willing to trust a connected object than an ordinary person to secure the supply chain. IoT technology can be used to identify where there is a need for supplies and also used to verify these products when they are delivered. A big part of IoT growth is overseas organisations such as UNESCO or FAO providing investment to help governments implement projects for safer ways of distributing medicine or connecting people to networks for electricity or water. This is a huge factor in emerging markets; it’s not something you see in developed countries.
Do you see this as being the trajectory that IoT technology will follow in these markets? What other use cases are there?

For these kinds of projects, the ramp-up in terms of users, business or money is very slow; first you need to implement the solution then demonstrate that it works properly, and only after this can you deploy it on a larger scale. In terms of the number of projects, we see a lot of growth on the horizon – we’ll need a year or two to see the results that these initiatives will deliver for us. We’re investing a lot in Africa in order to lead growth in the market, so we’ll see an increasing number of projects. While we’ve not yet seen the revenues, this is absolutely normal for an IoT project. These are highly technological projects; while they can easily be demonstrated in a lab or a factory, making it work in a remote part of the country miles away from a city, as well as arranging the supply chain, is a different thing altogether. The agricultural project for Egyptian farmers required more than 5 million NFC tags; it took over 18 months to deploy these across the country, so there is a big time gap between beginning a project and reaching the required volumes for generating revenue. It’s generally the same across any project, unless you’re looking at very niche markets for B2B; for instance a government-led project to improve security for transit monitoring for customs – in these cases there is a high added value but a limited volume, so it can be turned over inside six months. However, we’re more focussed on projects where the B2B aspect is leveraging high B2C activity.

Does a lack of basic connectivity in some areas inhibit the growth of IoT?

As a provider, Orange is investing a lot into projects, fostering partnerships with local start ups in its markets. At the same time, we are developing the basic connectivity in Africa – the continent’s GSM is now far better than its fixed networks, and where it’s available internet access can be better than in developed countries. We are trying to leverage this kind of network to feed the IoT project with low-cost connectivity using GSM, and we are also trying to test the LoRa network – Orange joined the LoRa Alliance very recently. We are testing with mining companies the possibility of developing interesting IoT network solutions; obviously managing a gold mine requires monitoring a lot of vehicles, machines and sensors, but it’s also very far away from any large cities. We provide local LoRa connectivity at a very low cost to be used by any sensor to get data about temperature, humidity, usage etc. This can be directly connected by for example satellite in order to consolidate data at the company level.

IoT is being used in very different ways in emerging markets compared to developed markets. Do you see the former eventually moving towards adopting deployments such as Smart Cities that are more typical to developed markets?

Smart Cities are a very good example; if you look at what’s happening in this business in developed countries, it’s focussed on brown-field cities. Connecting and providing smart services in this kind of city is interesting but solutions need to be applied to existing buildings and infrastructure. Compared to new cities in emerging countries – and in this instance, Africa has more in common with the Middle East – it’s more green-field, which makes it easier. As city developers deploy infrastructure, for example a fibre network, they are also able to define which kind of smart services will be used. We see that the role of Smart City projects, including those using IoT technologies, is far bigger than those in ‘old-world’ countries. This doesn’t just apply to the Middle East; you see it in Kenya, Lagos, and other African cities. In South Africa, there is a lot of activity in B2B such as freight management, smart energy and smart cities. Nigeria is also a very fast-developing market for us, but countries such as Morocco and Senegal are also very active in this sphere. This is interesting as these countries are all at different stages of development; in general, less developed countries have a high demand for newer technology because it’s always in green-field – you don’t have to cope with an existing solution. It’s the same with
medicine and e-Health – less developed countries are asking for very technological solutions to provide healthcare for people who don’t have access to hospitals.

Why are developing and emerging markets so keen to adopt IoT and have Orange identified any barriers to uptake?

Getting the technology into the hands of the right people can be an issue, but it’s always the case that people are very happy to accept this technology, as in general it is a real help to their lives. It’s often less difficult to convince people to adopt new technologies in developing countries as opposed to developed markets, because they don’t have a frame of reference to an existing solution. In France, people have a perfectly effective way of paying their electricity bills via direct debit, but in Senegal people would have to go to the electricity company’s offices with cash to pay for the services in advance. They even have to wait for a few hours in order to pay, then they receive a code to enter into their electricity meters in order to enjoy the service for a few days. Compare this to what IoT technology provides them; they can scan their smart meter and pay via Orange Money, and it will take them ten minutes. There’s no issue with learning how to use the service, as it clearly delivers a benefit to them.
Capitalizing on IoT Opportunities Using Cloud-based Platforms

By Doug Suriano, Senior Vice President and General Manager, Oracle.

Business leaders and CSPs can move toward bundled IoT enablement and end-to-end IoT services using a platform foundation for IoT that addresses sharable and reusable components that help manage IoT applications, services and communications networks.

The Internet of Things (IoT) presents a huge opportunity for CSPs and enterprises exploring new business models and relationships to each other and to consumers. To capitalize fully on the potential of the IoT, stakeholders will be mindful of current and future trends and consider fully their options for how to best make a foray into this burgeoning market.

In terms of momentum, Gartner, Inc. forecasts that 6.4 billion connected things will be in use worldwide in 2016, up 30 percent from 2015. The number of connected things will reach 20.8 billion by 2020, with 5.5 million new things getting connected every day in 2016.

The IoT will support total services spending of $235 billion in 2016 (up 22 percent from 2015). Services are dominated by the professional category (in which businesses contract with external providers in order to design, install and operate IoT systems). However, connectivity services through CSPs and consumer services will grow at a faster pace.

Aside from connected cars, consumer uses will continue to account for the greatest number of connected things. Gartner estimates that 4 billion connected things will be in use in the consumer sector in 2016, and will reach 13.5 billion in 2020. In terms of hardware spending, consumer applications will amount to $546 billion in 2016.

In the enterprise space, the use of connected things will drive $868 billion in 2016. Gartner considers two classes of connected things, the first of which consists of generic or cross-industry devices that are used in multiple industries, and the other being vertical-specific devices that are found in particular industries.

Cross-industry devices include connected light bulbs, HVAC and building management systems that are mainly deployed for purposes of cost saving. The second class includes vertical-specific devices, such as specialized equipment used in hospital operating theatres, tracking devices in container ships, and many others.

While connected things for specialized use are currently the largest category, the increased use of generic devices will mean that by 2020, cross-industry devices will dominate the number of connected things used in the enterprise.

As these changes occur, CSPs and the enterprise customers they serve will be thinking about how to get a piece of this pie. Today, only a few are moving aggressively. For example, Vodafone, Telefónica, Deutsche Telekom, AT&T, Verizon and Orange are some of the leaders exploring different monetization models for IoT, including:

1. Selling connectivity
2. Selling bundled IoT enablement
3. Selling IoT services

Each of these models reflects a different level of maturity, the most basic of which is connectivity, requiring only that the service providers leverage their communications networks, connectivity management and other pieces already in their possession for IoT and M2M.

While connectivity is a good starting point, it represents only 10 percent or less of IoT revenues.

As the number of startups providing IoT services comes into the fray, and as enterprises leverage IoT services, more CSPs will likely evolve toward bundled IoT enablement, which will include connectivity bundled with IaaS (storage, computing cloud services, IoT enablement platforms).

It may even make sense to go into full-blown IoT services, for enterprises and for consumers, so that revenues can be generated from such services as:

- Telematics services to automakers
- Fleet Management services to enterprises
- Asset tracking and monitoring
- Connected building and security

As these services become more common, IoT will play a bigger role in the enterprise, as it represents a chance to innovate and generate new revenues; retain and acquire customers, and optimize and reduce costs. For those reasons, IDC believes 60 percent of Global 1000 companies will integrate information technology and operational technology at the process, security and organization levels to fully realize the value of their IoT investments by 2018.

For enterprises and consumers to fully realize that value, it is important that their CSPs first evaluate the best investments for building out IoT services — whether they are to be built internally or with the help of hosted solutions that offer some initial cost- and risk protection.

Components of a Solid IoT Platform

The specialized systems and esoteric knowledge, as well as the initial cost and risk of building out IoT platforms, remain a daunting challenge for the vast majority of CSPs. These complications are deterring many from going into more sophisticated IoT models, with most opting at this time to
provide M2M connectivity, as opposed to a bundled IoT enablement or end-to-end IoT service. That can change, however, once business leaders get their brains around the different IoT domains they must address.

The three domains defined by ETSI architecture for M2M or IoT are device, network and application. Service providers should try to establish re-use and modularization across these domains so that common services can be shared across multiple IoT applications and their underlying infrastructures.

By having common services shared across multiple IoT applications and their underlying infrastructures, a CSP or enterprise can leverage what Oracle Communications defines as a “platform foundation for IoT.”

This foundation should address all sharable and reusable components, including:

- Common building blocks used to enable the IoT applications
- Services needed to manage the business and operations associated with IoT applications
- Services needed to manage the connectivity and the impact that the IoT applications have on the communications network

Oracle Communications has worked with CSPs and enterprises building real-world IoT strategies and services to create its Platform Foundation for IoT, which provides:

- IoT Platforms that handle customer and partner care, as well as revenue management
- IoT Applications such as M2M applications, application-specific analytics
- Device management and management of the software running on different devices
- Integrated solutions for hardware and software
- Business and Operations management, monitoring and reporting
- Network policy management
The platform enables organizations to connect to all parties germane to different monetization models: any OEM, any partner, any developer, any end user — and across all channels.

It also enables organizations to leverage COTS applications and productized solutions whenever possible so as to reduce cost and risk.

The importance of Cloud in IoT

For CSPs and enterprises that want to capitalize on IoT in today’s instant-information Now Economy, the cloud will become invaluable for mitigating complexity in creating and managing services. Through the cloud, it becomes possible for service providers and enterprises to rapidly brand and customize white-labeled managed IoT Services.

For example, Oracle Communications has partnered with Tata Consultancy Services (TCS) to create a Private Cloud Offering of Managed IoT Services. That means enterprises and CSPs leverage IoT applications across a hybrid cloud computing environment connecting Tata data centers to 20 Oracle data centers distributed around the globe for cloud services.

The point is that enterprises can use white-label hosted offerings to run in a private cloud the applications they want to quickly launch under their brands, and in relevant areas such as:


Being able to run those application services in a platform-as-a-service (PaaS) environment provides enterprises the connectivity management, device management, event processing, and device software integration they need to drive IoT applications at scale. In the case of Oracle Communications, we allow enterprises to leverage Oracle Communications Rapid Offer Design and Order Delivery (RODOD), Oracle Fusion Middleware, and Oracle Communications Billing and Revenue Management software through the PaaS environment.

It is important to build out private cloud offerings in critical areas like telematics and different IoT domains. For example, at Oracle we have four services related to telematics:

- Connected Car
- Fleet management
- Usage-Based Insurance
- Passenger or Vehicle Tracking for taxis, ride sharing, and Uber-type services

And then we have four IoT-related services:

- Smart building
- Video Surveillance
- Asset Monitoring
- Connected health

By leveraging a PaaS environment, enterprises and CSPs can first evaluate whether IoT applications add value to further determine if it’s worth building a more customized environment. PaaS also enables organizations to wait for further evolution of things like prescriptive analytics applications, which will help them optimize IoT processes at levels of global scale. The sensitivity of the data involved in IoT applications will warrant the use of a private cloud, whether managed by an internal IT organization or an external resource.
Regardless of whether organizations go with a hosted cloud solution or prefer to build something more customized right off the bat, there are three key areas on which enterprises and their service providers must focus:

IoT Thing to Person, which includes unified communications and WebRTC session controllers to facilitate communications among the devices and people using “things.” It can use email, instant messaging and video-conferencing to communicate with people for alerts, updates, and reports, remote monitoring and maintenance.

IoT Concept to Cash, which should encompass customer and partner management, revenue management and offer and order Management to resolve some of the complex requirements CSPs would otherwise have to figure out on their own. It should also expedite deployment of white-label managed IoT services, branded and tailored to the organization so as to reduce cost and risk.

IoT Policy Management, which manage the impact the IoT applications will have on communications networks, thus helping to adhere to SLA requirements and expectations. That will be critical as IoT spurs of small-payload messages come in from billion of devices, or as large data for software upgrades go to devices and connected things. Because some IoT applications will be critical, affecting security or human lives, this issue is paramount. Additionally, off-time software upgrades for maintenance and quota management for prepaid services will also need to be managed.

It is possible to integrate the three areas described above into the aforementioned platform foundation for IoT if there exists a common foundation of services that securely connect, analyze, and integrate real-time IoT data. At Oracle, we have ensured our IoT solutions work in concert with Oracle Fusion Middleware Group’s IoT Cloud Service for application enablement, which offers the scale...
to accommodate the large number of devices and large volumes of data CSPs and enterprises expect with IoT.

Regardless of the approach taken, it is important that organizations strive to achieve the following:

- Connect and control IoT devices
- Rapidly deploy IoT-focused preventive and predictive analytics
- Optimize business processes with process automation and pre-built integrations across multiple enterprise applications.

Finding Your Way in IoT

The business and operational challenges of IoT services will push CSPs and their enterprise customers to consider requirements that were not innate in traditional telecommunications services.

Business leaders’ mindsets are expanding as business models change in the NOW Economy, of which IoT is a major component.

They have to figure out how to offer, manage, and monetize IoT services, which Oracle Communications customers are doing for telematics, smart-home, telemedicine and other services that transported these providers into new business models and new comfort zones.

Regardless of the company or the IoT service, the basic functional requirements have to be met for: customer, partner and channel management; order management and activation; service monetization; service exposure and delivery; billing and revenue management.

There also has to be consideration for how these functions change as services and relationships change: B2B, B2C, B2B2C. There has to be flexibility in how to work with partners, how to bundle options, how to support pre-paid, post-paid and convergent models, as well as split billing and other considerations not typical with traditional services.

In order to offer a compelling and perhaps comprehensive portfolio of connectivity solutions and more evolved IoT solutions, that are right first time and agile enough to support innovative business models, multiple partner systems, and multiple M2M network domains across geographies.

Oracle Communications is working to abstract the complexity through its hosted cloud offerings, which not only buffer organizations from the up-front risks of IoT investments, but establish a solid foundation for a CSPs or enterprise’s future in IoT—whether through customized in-house infrastructure or continued use of hosted solutions and infrastructure.

i European Telecommunications Standards Institute, www.etsi.org
AUTHOR BIO

As senior vice president and general manager of Oracle Communications, Doug Suriano is responsible for managing strategic planning, product development, sales, service, and support for Oracle Communications products.

He joined Oracle in 2013 as vice president of products for Oracle Communications following the Tekelec acquisition. In this role, Suriano oversaw product development and product management for the network signaling and policy management product portfolio. At Tekelec, he served as chief technology officer and vice president of engineering. In these capacities he focused on developing Tekelec’s solutions for the mobile broadband era. During his ten-year tenure, Suriano was responsible for product innovation, leadership in standards bodies and industry forums, and advocacy for innovative mobile data solutions. He successfully led initiatives to transition Tekelec from hardware-centric products to software-centric applications and to expand the market share of the company’s data and voice solutions. Suriano also headed the development of Tekelec’s Diameter Signaling Router (DSR), the first product of its kind sold to LTE network operators.

Prior to Tekelec, Suriano was the vice president of engineering at dynamicsoft, Inc. and chief information officer for QAD, Inc. Before QAD, he managed the information technology division for the United States Marine Corps.

Suriano earned an MS in information technology at the US Naval Postgraduate School and a BS at the US Naval Academy.
The tide of the IoT is approaching the MENA region rapidly… Although the region has been slower to start adopting IoT services than other, more developed parts of the world, it is now evident that the connected devices will be one of the major drivers of change within the coming few years.

However, the patterns of this change will take different forms across the region. The MENA region is a widely diverse one, with countries that range from resource-rich gulf countries, to lesser developed states. This variance in state will translate into different adoption purposes of IoT applications; some applications considered to be avoidable luxuries in some countries might be seen as “unnecessary necessities” in others. The gulf countries, with their residents having that extra dollar to spend, will witness high demand on all forms of connected devices across all spectrums and applications, while the demand in countries that have been less lucky financially will shift towards a need-oriented pattern; in which health-related IoT applications will play a leading role.

However, another important ingredient of the “IoT adoption formula” comes in the shape of an “unfortunate opportunity”… Political instabilities taking place across the MENA region have caused the demise, injury and displacement of thousands. These turbulences pose great pressure on security, tracking and health applications in the affected countries, in addition to the refugee-host ones. This change of priorities and the need for reliable, real time security applications represents a new massive vertical for the adoption of IoT. Countries now need to keep their eyes
wide open to guard their borders as well as their cities, driven by the huge influx of refugees. These factors lead to IoT-based security and tracking solutions emerging among the most important pillars on which IoT adoption will build up in the future.

Border control systems will definitely be among the high risers among IoT applications. In countries that neighbor hot zones, the matter of securing the borders could mean the difference between the life and death of innocent civilians. This can be seen in countries such as Jordan, Lebanon and Egypt; all of which are adjacent to instable neighbors, and all of which have a large number of interceptions of illegal intruders occurring every month. Deployment of smart, real-time security solutions can aid the security forces in these countries in facing the grave danger of slipping. Monitoring solutions that rely on multiple channels for communications can represent a needed push forward for the security personnel in these countries.

Other incidents around the Arab World have also shed the light on the need to secure not only borders, but also infrastructure located in remote areas. As an example, the continuous blasts that targeted the Arab Gas Pipeline have shown that advanced, real-time monitoring solutions are a key ingredient in the sustainability and security of remote locations.

The huge influx of refugees has also created challenges on many other levels for host countries. At the end of the day, refugees represent additional residents to these countries, and smart management of resources can prove crucial to countries hoping to withstand this pressure. Leveraging IoT in health, energy and resource management can ensure continuous stability of the host countries.

In a nutshell, the MENA region has seen better days. And although IoT applications might not change that, these applications can at least provide the region with better ways to cope with the ongoing turmoil. Hopefully, the adoption that was spurred by instabilities across the region will expand into brighter areas in the future.

**AUTHOR BIO**

Mohammed Al Shawwa leads the team of analysts at Arab Advisors, participating in the Group’s custom consulting and research projects. He has extensive speaking experience having chaired Arab Advisors Group Convergence summits in 2014 and 2015, the Electronic Mobile Payments sessions at the Arab World Conference and represented the Arab Advisors Group as a speaker and a panellist in other local and regional conferences.

Prior to joining Arab Advisors Group in 2011 Mohammed Al Shawwa was an Associate at Synergy Consulting Group and a Technology Associate with Ernst & Young. Mohammed Al Shawwa is based in Jordan.
As a hot technology initiative, the Internet of Things (IoT) is undoubtedly at the height of its hype curve with all manner of capabilities and possibilities being attributed to it and some distinctly dubious business cases being showcased (think connected toothbrushes and tennis rackets).

Cynicism aside, at a macro country level, IoT certainly presents opportunities across industries and markets - some of them more tangible than others.

Even at a micro individual level, the plethora of health and fitness-monitoring wearable devices and Apps, mobile banking and payment facilities, and smart connected home strategies that both personalise and improve the management of appliances and energy within the home suggest quantifiable improvements and productivity to everyday living.

But are all countries equally positioned to harness the potential the IoT offers?

An uneven playing field

The developed world countries of North America, Western Europe, Australia, Singapore and Japan enjoy mature levels of infrastructure, strong telecommunication networks, and strong healthcare services. A broad education base along with relative stability in government, robust rules of law and governance and mature financial institutions have created strong environments for advancement, innovation and growth - all of which have benefited their citizens, workforce and commercial organisations.
Add to this the pervasive adoption of smart connected devices, widespread deployment of smart sensors in all manner of physical products, processing systems and equipment and widespread access to the Internet. As a result one then begins to see why developed countries with established industries in manufacturing, healthcare, automotive, retail and utilities services are well positioned to take advantage of the IoT phenomenon.

Against this backdrop of government stability, mature levels of infrastructure, financial maturity, development and opportunity, one must ask the question: are emerging countries being left behind in the IoT stakes? How well positioned are emerging countries to gain from the IoT compared to nations in the developed world? Going further: what is crucial for IoT in emerging countries to succeed, where should the focus be, and what are the main challenges?

These are by no means the only questions to be asking when looking to the IoT posture in emerging countries, but they are good starting points to be able to better navigate the avenues of opportunity that IoT could potentially open in this sector.

So, what is an emerging country?
The number of countries considered as emerging varies depending on which source one reads. The same is true of its definition. Going with the lexicon of the Financial Times, an emerging country/nation/market describes a developing country, in which investment would be expected to achieve higher returns but be accompanied by greater risks. Wikipedia goes further by adding that an emerging country has some characteristics of a developed market and has achieved some level of industrial capacity, but does not yet meet the requirements to be a developed market. This includes countries that may become developed markets in the future or were in the past.

IoT is coming their way big time...be prepared!

Few technology shows and conferences announced for 2016 and 2017 across the globe are marketed without some claim to the IoT. CIC principal analyst, Clive Howard, attended Mobile World Congress back at the end of February 2016 had the following to say in his review blog on the event:

“MWC is about more than mobile phones and networks. Although the networks are perhaps enjoying a resurgence, primarily because network infrastructure is widely seen and accepted as being critical to both the digital economy and the forthcoming Internet of Things (IoT) evolution, it is IoT that increasingly steals the show in Barcelona. Whether it’s the ubiquitous connected cars or other connected products (toothbrushes?) there is IoT in every corner of the eight halls.”

As IoT conferences are launched and promoted in countries considered as emerging economies and markets, the risk factors these countries and economies present makes it increasingly important to determine exactly what relevance and value IoT will hold for a broad swathe of internal and external stakeholders.

To evaluate in detail the intricacies of emerging economies is beyond the scope of this article. However, there are a number of important factors and signposts that go a long way to establishing strategies and considerations for engagement.

First things first: Defining the Internet of Things

Ahead of defining IoT opportunities and risk factors for investors, entrepreneurs, tech companies, and the local and global supply chain within emerging countries, we present a Creative Intellect Consulting developed definition for IoT.

All manner of physical devices and systems now contain, as a matter of course, sensors that can collect and transmit all sorts of data to a hub where it can be processed and analysed, with action taken on both the data collected and the analytical insights gained.
This pattern of data collection is not new. The action of sensors and other types of embedded instrumentation collecting data and communicating it back to a central hub has long been the building blocks of machine to machine communication (M2M). Such components have delivered the ability to monitor and control the operations of physical devices and processing systems through software programs and applications acting on the monitored data. In fact, one could even argue that embedded sensors and standard computer processing chips have been one of the bedrocks of software driven innovation in smarter products and systems. Communication connectivity, on the other hand, has permitted more adaptive functionality on the fly and opened the way for a services-based revenue model.

It’s not M2M

However, a number of vital factors make the IoT different to the traditional M2M market. One is the use of the common architectural principles and open standard interfaces and protocols of the Internet. Together with other widely adopted open wireless and wired protocols, the Internet provides a universally accepted and proven communication and interoperability framework. This in turn opens access to existing third party services and solutions, storage capacity, and processing facilities for data analytics, avoiding the need to build everything in-house. It also supports the reuse of established and widely available programming skills. In short, with the ability to use commoditised and “consumerised” hardware devices (e.g. smartphones, tablets and wearables), cost and time to deployment and market are substantially reduced.

Delivering cost efficiencies in a highly competitive and more open global market is vital, but so too is an ability to innovate fast and deploy out into the market quickly. The opportunity of extending the life and functionality of products and systems, obtaining predictive insights, and enabling value-added services to be delivered by a broader ecosystem of partners and suppliers explains why the IoT is so attractive.

The IoT is part of the digital transformation journey that has already begun, with Internet connectivity and Mobile apps already providing information about services, offering payment options and other location based services. In essence, it is a logical evolution of software’s increasing presence in physical products and the pervasiveness of a broad range of wireless and wired communication strategies, enabling a spectrum of connectivity models and wider access to the Internet and third party value added services and resources.

IoT is not so simple – three figures of note

In the second half of 2015 CIC conducted a study to investigate the role of connectivity and the IoT across a range of industries and markets mainly in developed world countries. The goal: to expose the challenges that connectivity presents, showcase a variety of lessons learnt from real world implementations, and identify the processes and strategies that help support the effective delivery and management of an IoT based product, service and manufacturing process.

The full results and detailed insights can be freely downloaded from our website via this link: http://www.creativeintellectuk.com/iot-study-results-principles-for-effective-engagement/

On the whole, the study achieved a number of important and encouraging insights as outlined in figures 1, 2 and 3 below.
Figure 1: Study achievements at a glance

Source: CIC

Figure 2: IoT impacts

Source: CIC
Additional challenges include a coherent alignment of current standards to identify which is most appropriate and what overlaps there may be. Network and communication requirements are rarely understood outside the realm of network operations, making it difficult for others to recognize the impact of any architectural choices made from the outset. This brings into the frame the possibility of a new role to the solutions team in the form of an IoT Architect. The immense amount of data that is expected to be generated from connected systems heightens the challenge of finding the signal in all that data noise and raising the prospect of specialist analytical skills and tooling to help.

Ultimately, this and subsequent studies have identified that IoT maturity will emerge in verticals. More of an issue is that the way to the money for all partners in a specific supply chain (local government bodies looking to smarter connected services) is not always clear, making the investment and procurement model tricky to scope and make a business case for.

Given the complexity of all these considerations, what challenges does this present for IoT in emerging countries?

**IoT reality for emerging countries**

The reality is that there are IoT opportunities in emerging countries. There is even strong potential for them to
leapfrog the developed countries through the use of some of the new innovations in telecommunications and Internet connectivity. With the latter, there would be greater scope for applications, solutions and services that were able to leverage some of the newer wireless communication network strategies and protocols. In turn, this could expose new ways of engagement and shine a light on new business models that could then be replicated in the developed world.

After all, there is something to be said with coming late to the party and not having to address the challenges of entrenched legacy infrastructure that might need an upgrade in order to leverage advances in technology and communication networks. The flipside to this however, is that the emerging countries to varying degrees offer considerably more challenges - no more so than when it comes to the stability of government, the ability to put in place policies and rules of law that are then adhered to, and the quality of and access to educational services. On top of this, there is also the consistency in supply of energy, and financial maturity and access to investment funds. Even across those countries that demonstrate greater alignment with the standards of developed countries (e.g. China) there can be significant issues with some of the aforementioned points that will put a dampener on the IoT.

Not even a level playing field within the emerging countries sector

IoT opportunities and strategies will differ across the emerging market landscape as a result of differences in education, the level of industrialisation and the types of industries, the level of support for structural transformation and infrastructure investment, and stability of the rule of law and government. It is therefore important to recognise the differences in economies and potential within the emerging countries sector to understand which IoT strategies will be most effective.

Nine essential factors for consideration are outlined below:

1. **The strength of educational reform and investments in training:** This will be important to assess and forecast the skills potential of the workforce

2. **Industrial capacity and industry focus:** Not all emerging countries have the right infrastructure in place for heavy industry and manufacturing, with many - such as those in Sub Saharan Africa - having greater focus on and capability for agriculture.

3. **Government stability and fiscal responsibility:** This is crucial for the sustainability of IoT investments and ensuring that there can be a return on investment. Strong policies and adherence to them can encourage foreign investment, spur spending in infrastructure, and boost consumption.

4. **Partner ecosystem support and footprint:** Policies that offer a framework of support and incentives are vital to both encourage and maximise collaboration between key stakeholders. The presence of and investments from international supplier organisations indicates a level of due diligence in the long term benefits.

5. **The drive for digital:** This indicates a recognition of the importance of digital technologies and an appetite to both embrace digital transformation and engage in the digital economy

6. **Energy dependency and delivery consistency:** Power is crucial but it is not always reliable. Communication strategies and architectures will need to take this into account.

7. **Structural transformation:** The ability and flexibility to make significant resources changes can allow for quick advantages and benefit from new demands. This can serve to create an environment that can readily support IoT innovations and drive wider ecosystem engagement.
8. **Availability of investment capital**: Access to investment capital indicates to a degree the level of confidence that financial institutions have in a country and in a venture. Support from government driven economic zones can help to lower some risks and allow for shared services and greater collaboration within the supply chain.

9. **Data privacy management**: One of the major challenges for emerging economies will be balancing personal freedoms and privacy against the amount of data that IoT will generate. This will be especially true of location and tracking data and of data gathered within personal residencies. The challenge then for emerging countries is the ability to put forward sufficient regulations and policies that not only meet international standards but then can be monitored.

The above is by no means an exhaustive list of the factors that need to be considered when looking to understand what IoT investment means within emerging countries. They should however, provide a level of guidance as to the type of challenges that might be faced and where to set expectations.

**Horses for courses**

Ultimately IoT in the emerging countries offers a fertile ground for opportunities but those looking to take advantage of this need to know where and what to focus on. Doing so will require a paradigm shift in thinking in some areas and a different approach to execution in others. Therefore, stakeholders need to think differently about IoT and what it means inside emerging countries and markets. This is vital to really understanding the true potential on offer from IoT.

For anyone looking to invest, in whatever format, the onus is on them to get a better understanding of the underlying structural and cultural dynamics if they are to be successful.

For some countries it is about transitioning to smarter and more interconnected cities (Dubai) while for others it is about making micro improvements to existing industries to effect a step change in the quality and volume of output. Both China and India have greater industrial and manufacturing capacity and capabilities while Africa and Latin America depend more on agricultural and extractive industries. Healthcare, utilities and climate change unify them all but expose differences with regards to access to resources.

While this mantra is true when embarking on any new venture in a country, there are wide ranging factors (some of which are unique) within emerging countries that can substantially impact the outcome of any project undertaken or investment made.

**Conclusion: The glass is half full when it comes to IoT in emerging countries**

The IoT offers substantial positive impact right across the emerging countries sector – for its citizens and workforce especially across industry sectors such as healthcare, agriculture, transport and manufacturing. There are opportunities for every sector of the supply market: service providers and operators, independent software vendors (ISVs), entrepreneurs, investment bodies and local government departments.

There is much to be positive about when investigating IoT potential in emerging countries. Right across the landscape of countries that fall into this category, important metrics...
The Internet Of Things

are being met and strengthened. Gross Domestic Product (GDP), the key performance and productivity indicator of a country, has steadily risen for the emerging countries sector – some more markedly than others. While many countries are currently experiencing a general reduction in growth forecasts owing to volatility in global markets and reduced commodity prices, many of the global economists are expecting a return to rising growth and GDP levels by 2020. In general, it is becoming easier to do business in emerging countries, especially as many governments have sought to apply prudent fiscal policies and invest in structural infrastructure, health, and education reforms. Governments from Africa to the Far East have also looked to upgrade their technology infrastructure and make structural transformations. With regards to long term growth prospects, all this is good news for the technology investment community.

AUTHOR BIO

Bola Rotibi, Research Director and founder: has over 20 years of industry experience spanning engineering, software development and IT analysis. She is a high-profile and highly experienced analyst focused on software development technologies, processes and market trends.

Bola is regularly sought after to provide input into and drive vendor and product selection decision processes. She has acted as an advisor to leading IT providers such as Microsoft, IBM, Cisco, Oracle, Fujitsu, Adobe, Accenture and HPE; to investment and education bodies; and to large (and small) IT user organisations in Retail, Aerospace and defence, Manufacturing, Media, Government, Automotive, Financial Services, Telecommunications and consultancies. An experienced presenter, Bola is also regularly quoted in trade and business press in Europe, America and Asia Pacific and has a column on ADTMag and writes for The Register.
Factors to consider for IoT engagement in emerging countries

By Bola Rotibi, Research Director, Creative Intellect Consulting.

Within developed countries, IoT offers exciting potential. Historic industrial strength and mature infrastructures as well as high levels of communications and internet connectivity prevail. As a result nations in the developed countries sector are well positioned to take advantage of the IoT initiative.

While there is much to be gained from IoT technologies and strategies within the emerging countries, there are crucial factors to consider before navigating through IoT opportunities in this sector.

Below is a list of such factors which is by no means exhaustive of all concerns:

1. Many of the emerging countries have sizeable populations with a higher proportion of the younger generation who are more open and willing to embrace change and technology.

2. Ownership of mobile phones is pervasive and consistently above 80% in penetration. The numbers of smartphone ownerships i.e. those that are able to access the internet are low (e.g. in sub Saharan Africa, South Africa and Nigeria have by far the highest penetration with 34% and 27% respectively of mobile phone users who say their device is a smartphone. Kenya comes next at 17%), but the numbers are growing. All the major indices show upward growth in the mobile arena. February 2016 saw Cisco announce its 10th Annual Cisco Visual Networking Index (VNI) Mobile Forecast. This projected that 70 percent of the global population will be mobile users by 2020. The same forecast sees many of the emerging countries regions experience
significant increases in regional mobile data traffic growth rates – The Middle East and Africa (15-fold growth), Asia-Pacific (9-fold growth), Central and Eastern Europe (8-fold growth) and Latin America (8-fold growth).

3. Intermittent access to electricity is consistently experienced across the emerging sector which will require IoT solutions and communication infrastructure that take this into account in their architecture. But this also makes the case for greater levels of ingenuity and innovation. For example, the African Economic Output report of 2011 highlighted an example of adapted technology in the form of a China-sourced system that charged three mobile phones solar power chargers linked to new LED light technologies in East Africa. The system was also able to provide electric light for a family with no connection the power grid.

4. Many countries within the emerging markets sector have seen poverty levels fall, as well as a rise in levels of basic education and access to affordable healthcare. Average incomes - although still considerably lower in comparison to those in the developed world - have risen, with the emergence of a burgeoning middle class of consumers with spending power. That said, affordability and price sensitivity is a limiting factor since few will be able to pay the prices typical of developed countries. So while many might see the value of smart homes, not many will have the financial means for smart home devices and management services. Nor will they want to run it over older generation networks that they may only have access to since this will significantly increase the cost of their data plans. For suppliers, price sensitivity in emerging countries may impact product lifecycles since consumers of these countries will only acquire smart products for new purchases and not upgrade non-smart products that still work.

5. Cultural behaviour and dynamics can influence how citizens and workforces engage with technologies such as the Internet and smartphones. The Pew Research Centre found in March 2015 that the Internet was seen as positive influence on education but negative on morality in emerging and developing nations. This may have an impact on certain types of IoT applications.

6. Interoperability is just as important in emerging countries as it is in the developed ones, and in some cases more so owing to the level of confidence in having to use multiple applications to manage the myriad of smart products that might become available to them (e.g. smart home appliances and connected cars, alarm systems etc.).

7. As well as opportunities for those from the developed countries, there are also ones open to other emerging countries. In fact, China has displaced the US and Europe in becoming Africa’s largest single trading partner.

8. Security is a major concern – as it is around the globe - but especially when it comes to IoT solutions and products. There are few common frameworks or industry wide policies to standardise on. When one thinks about the multitude of connected devices with different chipsets and operating systems that might reside in the home, where does the responsibility lie for applying a security patch to mitigate against vulnerabilities?

9. For anyone looking to invest in the IoT market in emerging countries, the onus is on them to get a better understanding of the underlying structural and cultural dynamics if they are to be successful. While this is true for anyone embarking on a new venture in any country, there are wide ranging factors (some of which are unique) within emerging countries that can substantially impact the outcome of any project undertaken or investment made.
PROFILE SPOTLIGHTS:

Africa

If we take a look at Africa, based on the 2015 African Economic Outlook report, it is a continent with a young growing active population and a fast growing domestic market of 1.1 billion people. It has an emerging middle class of urban consumers with a projected spending power of USD 2.2 trillion in 2030, which is up from USD 680 billion in 2008. It has a diverse ecosystem, large scale and vast land areas providing 24% of the world’s arable land. It also has abundant and largely under exploited natural resources. Population growth is not just confined to urban areas, with rural areas seeing equal increases in growth. With this more inclusive growth, a one size fits all approach will not work. A range of strategies that address both rural and urban needs will be paramount. This means that agriculture-led innovation services will be just as valuable as those that focus on delivering construction and urban infrastructure improvements.

India

Crucially, India has seen how technology in general offers a way of levelling disparities with countries. This has underpinned their goals to digitise their country and put in place a digital program and charter to ensure that it is not left out. To the Indian government, digital technology is as essential as any of the main utilities (water, gas and electricity). The Digital India Program envisages providing digital infrastructure as a utility to every individual, delivering governance and service on demand while digitally empowering their citizens. Such a progressive strategy creates a fertile environment for IoT investment.

Cisco and India

Companies like Cisco have recognised that digital disruption is a reality that is transforming countries, states, cities and the lives of individuals. Digitalisation is fast becoming a means to drive GDP growth, improve productivity and create jobs. While the company is not alone in its endeavours and strategy, it is working with states within India to support their efforts to improve their digital posture and economy. They have provided technology centres of excellence and research labs to help with skills development and the deployment of network and communications strategies. In addition, the company has extended its investments in networking academies, innovation centres, and support for start-ups with programs in India. This in turn has seen Cisco take advantage of its support to deploy key technologies such as smart Wi-Fi and smart safety and security products to deliver smart lighting, parking and transport solutions and remote experts for government and educational services. This level of support demonstrates the mutual benefits and returns that can be achieved by vendors working both at the macro country level and the micro start-up and educational institute level.
Interest in The Internet of Things has never been higher, with the rise of connected devices now a powerful catalyst for transformation across a number of industry verticals. A new wave of use cases is forming as different industries look to transform their customer interactions, differentiate their services and optimize the utilization of their assets.

For their part, operators are seen as key enablers of the IoT revolution. Many service providers have well-established machine-to-machine businesses, while the number of horizontal and vertical partnerships struck in recent years highlights how the telecommunications industry at large is recalibrating itself to the needs of the Internet of Things.

Yet, beyond the hype, very real challenges persist. Recent global initiatives to standardize cellular M2M are important, yet regulatory policies at a national level remain a work in progress. Meanwhile, business models require continual overhaul if they are to meet the needs of a fast-changing ecosystem where new use cases continue to appear.

For operators, IoT is a critical opportunity for them to meet new customer needs yet progress varies by region. Operator strategies in developing markets are more nascent compared to their developed market peers, reflecting a greater focus on the consumer mobile market and its ongoing transition towards smartphones and data-centric tariffs.

Even so, the opportunities for Internet of Things are just as pronounced, particularly when you consider the lack of legacy infrastructure that may hinder or complicate IoT deployments in certain verticals. This is reflected in EY’s survey of operators’ digital growth ambitions. Use
cases such as mobile financial services, enterprise mobility and smart city all score higher among emerging market participants as sources of incremental revenue growth – reflecting the considerable long-term potential in ‘mobile first’ economies.

Operator confidence in digital services revenue development

Q. Which digital services represent the best opportunities for incremental revenue growth?

% respondents

Source: “Navigating the road to 2020” EY (survey of 40+ telecommunications industry leaders)

In recent quarters, operators in emerging markets have won contracts across a number of IoT domains, with smart city developments an important driver. In Brazil, a smart city project is underway near Sao Paolo through a partnership of local government, operator and infrastructure vendors. Involving a number of smart solutions from health and education to security and tourism, the development of various use cases has been dovetailed with an upgrade of the city’s broadband infrastructure. The partners involved are prioritizing certain applications, and there has already been a 35% reduction in electricity costs in the area due to the provision on intelligent lighting.

Another smart city project with telco participation is underway in Johannesburg, South Africa. Alongside the benefits of smart infrastructure, the 10 to 15 year development is designed to create 200,000 fixed jobs for the local community. Smart city projects are also proving popular in Middle Eastern countries including Qatar, Saudi Arabia and UAE. Many of the operators involved in these projects are majoring on connectivity solutions, with accompanying forays into control centre and data sharing initiatives.

Elsewhere, operators are also building traction in fleet management solutions and smart metering initiatives. Back in 2009, Russia introduced a Federal Law that mandated smart meters rollout as the route to improved energy efficiency and management. Since then, local operators have won smart metering contracts, but energy suppliers are also working directly with device manufacturers to upgrade meters.

Despite positive news flow on IoT rollout, quantifying the scale and scope of the opportunity is in itself challenging. Early forecasts of growth in connected objects have been tempered in recent years, yet the range of connection types continues to widen. According to the most recent GSMA Intelligence forecast, the Internet of Things in its entirety
will add up to 23 billion connections by 2020, with M2M accounting for around 10 billion of these. However, within M2M, cellular connections are expected to total 1 billion by the end of the decade, with low-power, short-range and fixed connections accounting for the remainder.¹

Such a mix of technologies suggests that more nuanced technology roadmaps will be vital if operators are to maximize their share of wallet. Moves by the 3GPP to standardize low power cellular networks through NB-IoT will act as a shot in the arm for many carriers – while, of the non-cellular standards, LoRa technology is already well positioned in emerging regions, with rollouts underway in the likes of India, Russia and South Africa. Yet risks accompany these opportunities – as non-cellular low power networks come into play, operators must take step to ensure they are not disintermediated as connectivity providers.

Meanwhile, the growth prognosis per industry vertical also varies considerably. Early adopting verticals in emerging regions include utilities, transport and manufacturing. However, public sector demand for smart city solutions is rising fast while healthcare is likely to overtake a number of other industries in terms of connections during the remainder of the decade.

As demand grows within healthcare and public sector customers, so operators must sensitize their approach to a new raft of stakeholder dynamics. In smart city, public sector demands are likely to vary substantially from market to market, due to varying awareness of IoT’s transformational capabilities or the extent to which cohesive policies exist that can embrace a range of partners and use cases. Meanwhile, healthcare connectivity revenues may well be lower than other verticals, while regulatory issues persist over patient data management.

In such scenarios, a more consultative relationship with customers can unlock new demands, with telcos able to realize a larger share of wallet through the provision of specific managed services. Strategic investments in new capabilities can help operators maximize their offerings for service clusters such as smart city and real estate, which contain a number of diverse use cases in their own right.

This potential for operators to assume new value chain positions will in turn ask questions of their business models and organizational structures, which will require refinement if they are to thrive in the long term. Overhaul of existing ecosystem relationships may also be necessary, while the building of competencies in analytics and security can bolster operators’ position in the IoT value chain well beyond initial connectivity rollouts.

¹ “MWC 2016 Day Two”, GSMA, February 2016

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Adrian Baschnonga is Global Telecommunications Lead Analyst at EY. With over 15 years’ experience of the telecommunications sector he is responsible for developing EY’s thought leadership output in telecommunications and for advising clients on strategic issues in the sector. He is a regular speaker at industry events and has been quoted in the press on a range of industry issues.

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Last Mile Connectivity: Connecting the Unconnected

This report looks at how emerging markets are overcoming the challenges of extending connectivity to their most remote communities, as well as ensuring that connections can be relied upon beyond the landings of major communications hubs.

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