

IoT Strategy for Telcos: Critical Success Factors to Win in the Changing Business Landscape

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ABSTRACT

The term Internet of Things (IoT) has been a buzzword for past few years with analysts claiming this to generate up to \$11T in economic value by 2025. In the search of these economic benefits, Telcos have experimented with IoT with varying degrees of success. This paper gives a view of changing business landscape with the advent of IOT and discusses the critical success factors required for Telcos to succeed. With the help of concrete examples, the paper will answer questions such as – Why is the IoT market different; Why do the Telcos need to offer services beyond connectivity; What key changes are required to capture value across IoT value chain.

The paper argues that Telcos will need to take decisive steps along 4 key dimensions – Strategic Focus, Organizational Realignment, Partnership Orientation, and Technology Selection – to establish themselves as a successful IoT service provider. The paper provides evidence via failed IoT initiatives of pioneering Telcos and the changes made along these dimensions to be successful. The paper also gives a summary of latest initiatives by world leading Telcos and proposes a holistic approach to turn a Telco into a successful end-to-end IoT service provider to capture maximum value in the IoT market place.

Keywords: Internet of Things, IoT Strategy for Telcos, IoT value chain, IoT success stories, IoT Access

1. INTRODUCTION

Internet of Things (IoT) has become one of the most discussed segments of the ICT industry during the past few years. Numerous research firms have quantified the opportunities brought about by IoT and have projected significant market sizes. Gartner projects \$1.9T market size by 2020 (Gartner, 2013), while McKinsey projects \$11T in value add to the societal impact (Manyika, Chui, Bisson, Woetzel, Dobbs, Bughin, & Aharon, 2015). Similarly, Ericsson forecasts the number of IoT connected devices globally to grow 3x – from under 5B in 2016 to 16B by 2021 (Ericsson, 2016).

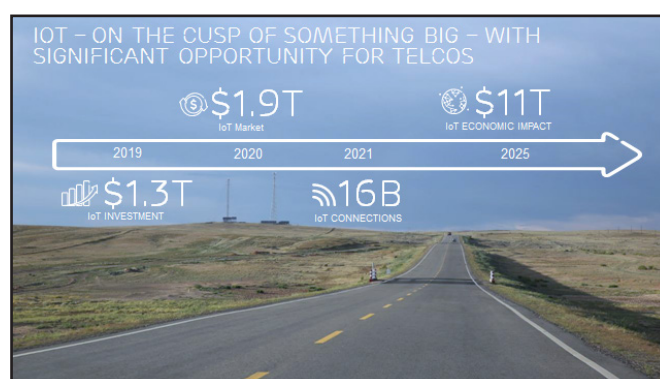


Fig. 1: Significant Opportunity for Telcos

Telcos have been providing connectivity services, which is one of the important building blocks for IoT services. Therefore, Telcos have an important role to play in the IoT ecosystem and the potential to ride this inevitable tsunami of IoT. However, analysts suggest that connectivity would provide only 10-15% of revenue in the entire IoT value chain. Most IOT solutions are expected to be bespoke with evolving scope, heavy SI, and will require multiple partners to put the solution together. Telcos have minimal experience in dealing with such solutions and also in working with Enterprises. Besides, traditional Telco organizations & their business dynamics are significantly different from the emerging organization structures needed for IOT services, as illustrated in figure below:

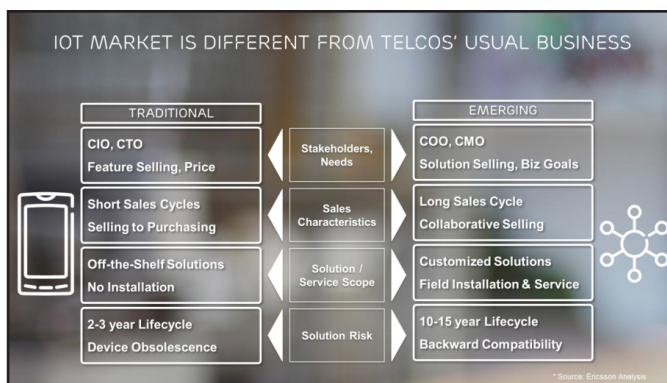


Fig. 2: Traditional Telco Organization vs. Emerging Organization Structures

Consequently, to succeed in IOT market, Telcos need to re-align their strategy and approach to fulfill the requirement of IOT services.

In this paper, we suggest a prescriptive execution-oriented process for a Telco to re-align its strategy, become an end-to-end IoT service provider and capture much larger piece of the pie.

2. RELATED WORKS

Research and analysis firms have done multiple studies on IoT eco-system and Telco IoT strategies. For example, Machina came out with an IoT Communications Service Provider Benchmarking in 2016 capturing details of IoT strategies of various Telcos globally (Chua & Hatton, 2016). Frost and Sullivan published European IoT operator profiles in 2016 (Frost & Sullivan, 2016). Analysys Mason published 'Operator Approaches to IoT', which analyses the role Telecom Operators can play in IoT market (Rebbeck, 2017). Most studies so far either document IOT approaches that Telcos have adopted,

analyze their strategy or highlight different roles Telcos can play. As a result, they are mostly backward looking and address part of the overall approach required.

The analysis and recommendations presented in this paper go a step further, and provide a methodological step-by-step end-to-end approach spanning strategy setting to executable steps on ground to make the strategy happen. It also addresses the most important asset that Telco has – the Network – which most other studies omit.

3. RESEARCH METHODOLOGY

A three-pronged approach has been adopted for research and drawing out results of this paper:

- Analysis of multiple analyst reports in depth.
- Detailed analysis of the approach adopted by successful IoT players.
- Drawing out in-sights from live IoT/M2M Consulting engagements of the authors.

Specifically, we studied IoT value chain, IOT revenue projections, common attributes from Telcos' IoT initiatives, and success factors of Telco competitors & peers. Based on this analysis and practical knowledge gained by working with world leading Telcos, we came up with the four-step process documented here.

The suggested steps here can be adopted as skeleton to define the IoT roadmap of a Telco. Specific tools and frameworks for each step can be used as per the operating environment and intended objective of a Telco.

4. RESULTS AND FINDINGS

Based on deep-dive analysis of IoT market, our understanding of traditional Telco business & Telco organizations, IoT success stories, and our practical experience, we have been able to come up with the following tangible four-step process for Telcos to identify their IOT strategy to and to potentially become an end-to-end IoT service provider, as applicable. The four steps involve refinement across:

- Strategic Focus
- Organization Realignment
- Partnership Orientation
- Service Aligned Network



Fig. 3: Process to Define Telco IOT Strategy

4.1 Strategic Focus

To define an actionable IoT strategy, Telcos need to take two key steps. The first step is to identify the key verticals and the key applications to pursue. The second step is to determine the role in the value chain of the select verticals/applications. Each step requires rigorous analysis & stakeholder alignment to define the right strategy for the Telco.

4.1.1 Step 1: Vertical / Application Selection

Five key factors are the decision enablers for this step, namely external market dynamics, internal capabilities, regulatory trends, entry barriers and telco addressable revenue. These factors help Telcos identify key verticals / applications that are most favorable for them considering their strategic priorities, market reality, and those that can also be supported by internal capabilities.

To arrive at the result of focus verticals/applications, each factor needs to be broken-down into sub-factors; each vertical/application needs to be evaluated on each sub-factor and the factors then need to be brought together in an evaluation or prioritization framework.

To illustrate this further and make it tangible, we break down two key factors, namely External Market Dynamics & Internal Capabilities, and show a typical prioritization process and the outcome of such an exercise.

The key sub-factors for External Market Dynamics & Internal Capabilities are:

The above parameters are rated on a weighted scale to arrive at rankings and help prioritize the select applications. Various 2x2 matrices can be prepared while doing this

exercise to evaluate the intensity and impact of key variables on the prioritization. Typically, no. of cellular connections, growth rate of the opportunity, addressable market and ease of implementation are variables that are considered during decision making. Additionally, the split of the addressable market into connectivity, solution/SI and device market size are also considered, in some cases.

Table 1: External & Internal Factors for IoT Application Selections

<i>External Market Dynamics</i>	<i>Internal Capabilities</i>
Overall Market Opportunity expressed in multiple forms such as revenue, connections, ARPU, profitability, etc.	Solution Development Complexity to develop and launch an IoT service
Competition from Telco as well as non-Telco players	Sales and Marketing Complexity to sell and market an IoT service
Fragmentation in the market in terms of the no. of buyers	Delivery Complexity to deliver & support an IoT service
Market maturity based on IoT service adoption and penetration	Network Readiness for the new requirements
Other factors such as existing customer relations, existing sales channels, delivery & support channels	

Similarly, for each IoT service and market, Telcos will need to look at Regulatory compliances as well as the maturity of the compliances.

Following figure summarizes the key evaluation criteria for Telcos to offer targeted IoT services in a market along with a sample 2x2 matrix of number of cellular connections and application revenue.

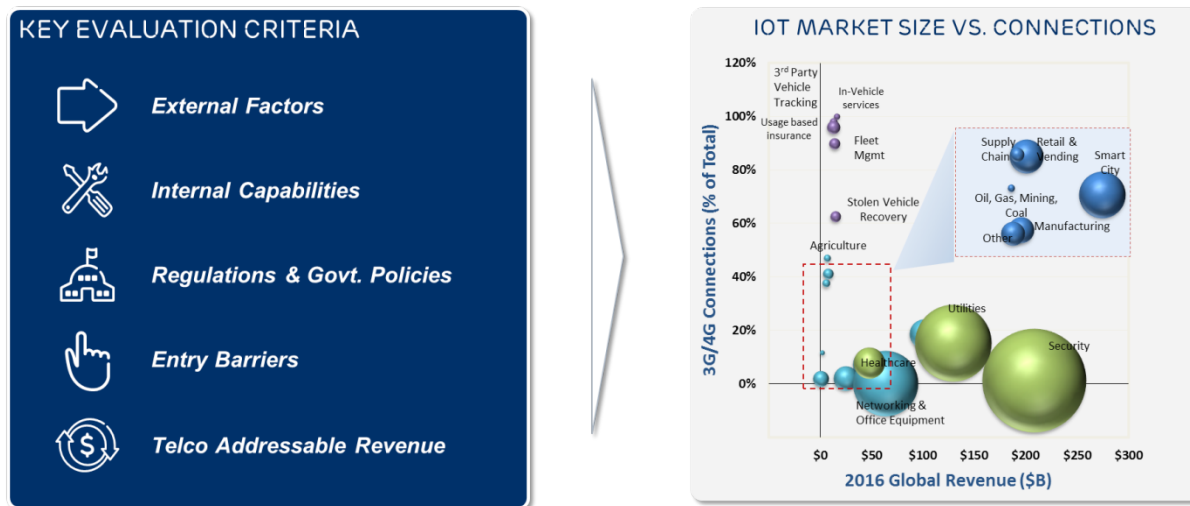


Fig. 4: Strategic Focus - Market Selection

Based on the above 2x2 matrix, there could be three categories of IoT applications that a Telco can potentially target:

- 1. Mobile Applications:** Applications in verticals such as automotive have a high number of cellular connections, and they are low hanging fruits for Telcos. It is easy for Telcos to establish a leadership position in this space based on their current capability of mobile networks.
- 2. Mature Applications:** More mature applications such as Healthcare, Utilities, and Security remain a priority due to the revenue potential and a large number of connections. These applications present a good revenue opportunity even if a Telco captures even a small pie from the total revenue.

- 3. Strategic Applications:** There are set of applications where existing revenue is not significant and connections are not primarily cellular, however, these applications have high growth potential and remain a question of choice and strategy for a Telco. A telco can strategize to enter some of these industry verticals based on their internal capabilities, external market environment, and strategic focus.

4.1.2 Step 2: Determine role in the value chain

Based on the market assessment and application selection, a Telco needs to identify what role it should play in the value chain specific to each IoT application selected. This in turn defines the size of the market that is addressed by the Telco i.e., higher the role assumed, higher the market addressed and the returns and vice versa.

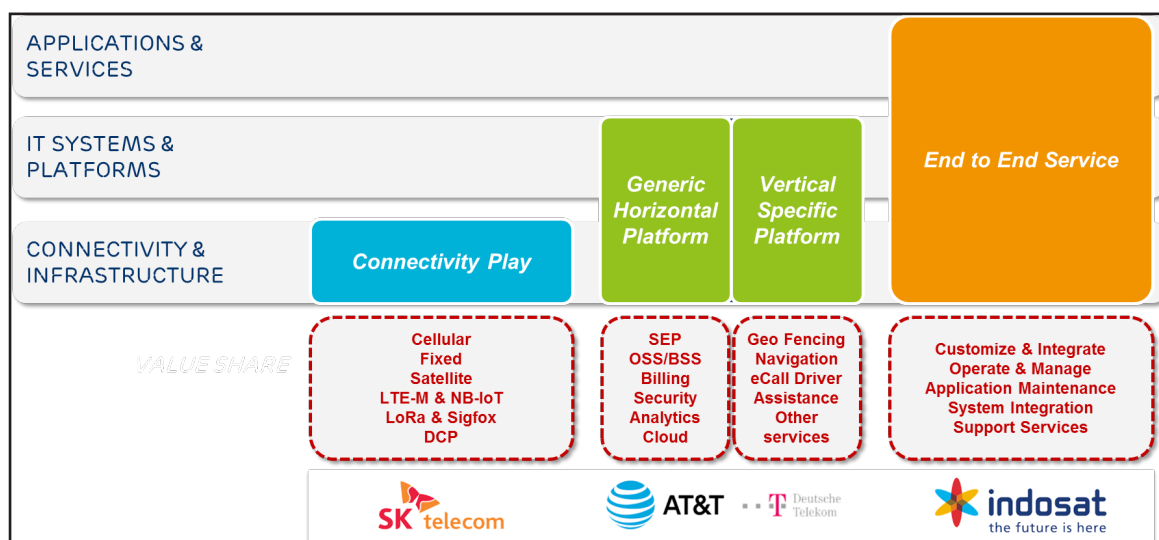


Fig. 5: Value Chain Role

As shown in the above figure, there are 3 main layers - Connectivity & Infrastructure, IT Systems & Platforms, and Applications & Services. Telco needs to figure out its role and identify its play in the value chain across each layer.

- **Network Developer** (Connectivity Play): Telco only provides connectivity for the IoT service
- **Service Enabler** (Generic Horizontal Platform & Vertical Specific Platform): Telco provides a platform or a set of value-added services in addition to connectivity that enables other players to get APIs for easy application development
- **Service Creator** (End to End Service): Telco itself provides end-to-end IoT service that includes

Connectivity, Application, System Integration, Support Services, and other related services to consumers

4.2 Organizational Re-alignment

Traditional telco business has been different from the IoT business, and if a telco wants to become an end-to-end IoT service provider, it becomes imperative to realign the organization to suit the new business model.

4.2.1 Principles for Organizational Realignment

To become an end-to-end IoT service provider, Telcos shall realign their organization design around 4 key principles, as illustrated in Figure 3:

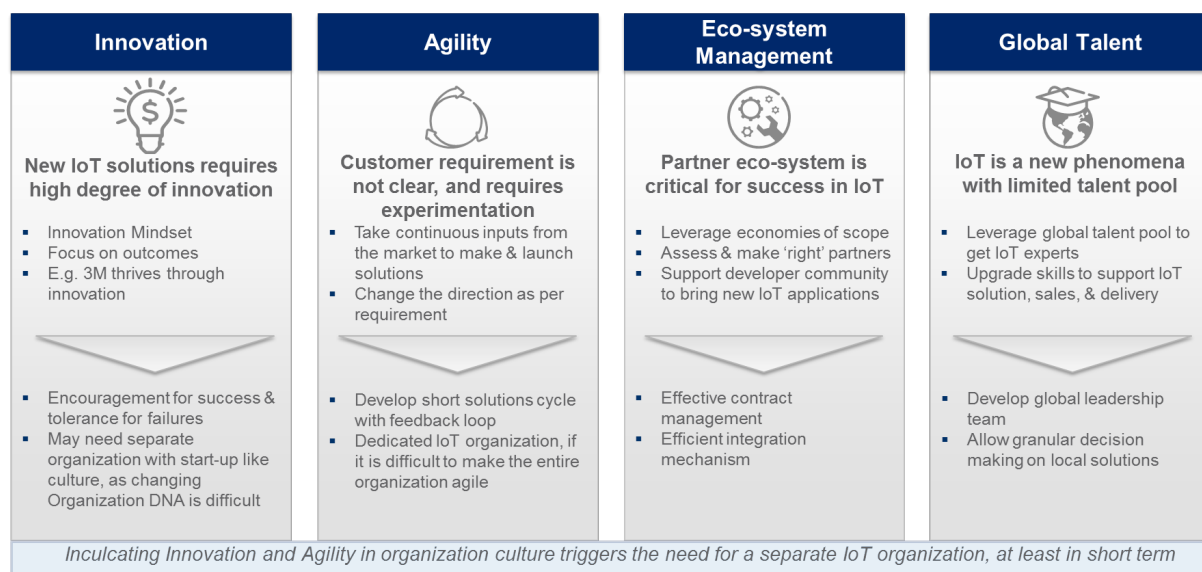


Fig. 6: Principles for Organizational Realignment

First principle for organization realignment is Innovation. To develop new and useful solutions in the evolving IoT space, Telcos need to develop a start-up like culture, i.e. focus on outcomes, defying hierarchy, idea generation, and small teams working in collocated spaces etc. However, it could be difficult for big Telcos to change the organization DNA, and hence they will need to take a series of steps to achieve it - one of which could be to have a dedicated IoT organization within the larger organization.

Second, principle is Agility - IoT solutions require experimentation with customer requirements and would require continuous feedback from the market. Making an Agile organization or an agile IoT entity would be required to succeed in the IoT market. For Telcos, this

would mean enabling the organization with a set of lean processes and tools to get this feedback and enabling the organization to act on it during sales as well as delivery, so as to increase both revenue and profitability.

Effective management of Partnership eco-system is the third critical element to succeed in IoT market place. It involves not only making 'right' partners for solution design, sales and market access, but also bringing into fold innovations from open source communities, developer communities, and partners.

Finally, the fourth component is talent management. IoT is a new phenomenon and eco-system is being developed. There is a limited talent pool that everyone will need to

dip into. In addition, the current in-house talent of a telco needs to be evaluated and aligned to IOT market needs. Skills would be required around the complete lifecycle i.e. product design, pre-sales, sales, and delivery of IoT solutions.

4.2.2 Pillars for New Organization Design

Based on the four principles mentioned above, a Telco needs to take tangible steps on the ground, to make changes to organization design, sales process, teams, and service delivery.

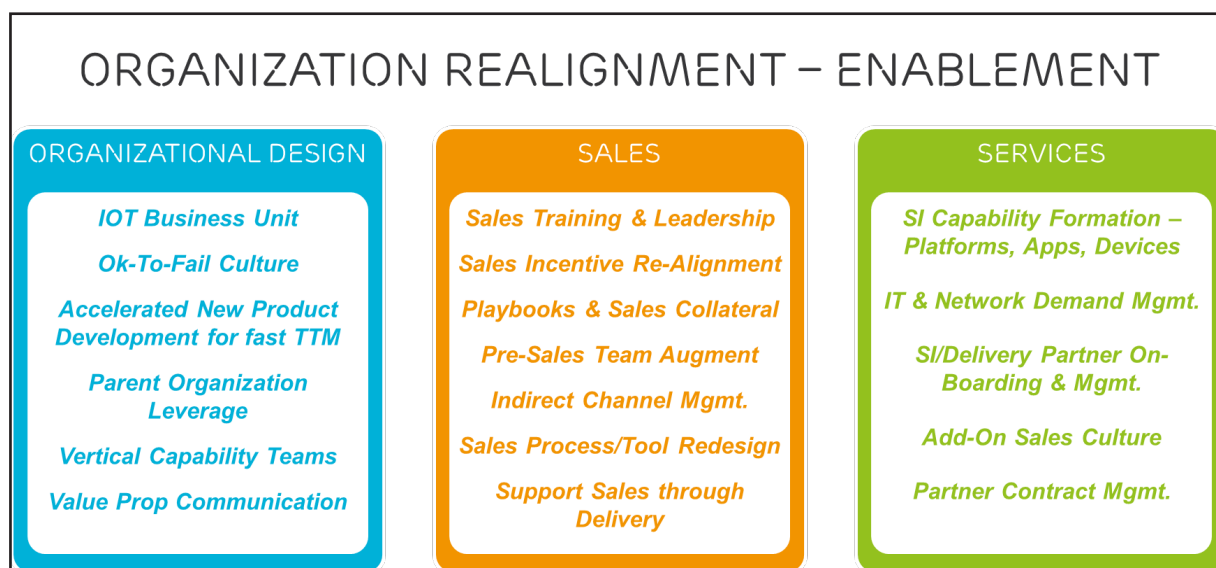


Fig. 7: Three Pillars for Organization Realignment

To enable innovation and agility and to keep a sharp focus, Telcos would need to setup separate IoT unit with a tolerance for failure, but one that can bring out new solutions quickly. To ensure this, the unit should not be created as a silo, but will need to have good alignment with parent organization. Hiring the right leadership with domain competence will be critical at every stage of the new product lifecycle. In addition, Telcos would really need to communicate these value propositions clearly in the marketplace to attract the right kind of talent.

The second key step they need to take is to enhance the sales organization – given that Telcos are entering the area of evolving SI heavy IOT solutions, they need to ensure that their sales teams are able to spot and sell these opportunities. This requires reskilling sales team, realigning their sales incentives, and giving them new playbooks to help pitch new solutions. Also, given the evolving and SI heavy nature of IOT solution, there is considerable amount of risk in development and delivery of such solutions. Telcos need to have new set of processes and tools along with a pre-sales team to minimize these risks.

Finally, the third area is Services – Telcos will need to bolster their SI skills by at times in-house development of platforms, applications and devices, and by ensuring that

requirements of these applications are fed into network organization as well. Given the diversity of IOT solutions, evaluating and on-boarding various kind of development, delivery and service partners will be key. Finally, to ensure profitability, 'add-on sales culture' i.e. identifying upsell opportunities during delivery as well as 'partner contract management' e.g., having back to back agreements, is going to be key.

For example, AT&T is a good example of a Telco which has focused and produced results in IoT market. It has about 500 dedicated resources for IoT solutions along with similar number of support staff (Chua & Hatton, 2016). It has 6 foundries so far, with each foundry focusing on innovation for specific verticals (AT&T, 2016), e.g. foundry in Atlanta is focused on connected cars and that in Houston focuses on healthcare segment. They are leveraging partnerships two ways, firstly by partnering with enterprises such as Cisco and Texas medical center to establish these foundries; and secondly by supporting innovators and start-ups through these foundries to bring out new solutions. These foundries are a playground to succeed and fail, and finally work with the incumbent organization to bring the solutions to market. AT&T has dedicated sales resources for IoT solutions and also trains its existing sales force to sell IoT solutions. Similarly its

IoT team has focus on services and integration as they are leveraging partnerships as well to provide the services.

4.3 Partnership Orientation

As Telco's transition to become an end-to-end IoT service provider, third-party collaborations with OTT and other providers would become increasingly important.

An end-to-end IoT solution requires expertise in different value chain segments, including connectivity, platforms, IT systems, Application, and Services. Each segment has established players with experience and knowledge of their respective segments. As such, telcos will need to retool their partner management strategy and invest in systems that allow for the seamless onboarding of new IoT partners. In addition to enabling partner on-boarding & settlement tools for connectivity related services, developer outreach will be a greater focus as operators try to drive usage of their IoT platforms and infrastructure, and to gain a greater understanding of potential new IoT use cases across a broader range of industries – with a further side benefit of bringing some “start-up spirit” into operators' own businesses.

4.3.1 Partnership Imperatives

IoT solutions are complex and bespoke solutions, and require good service integration capabilities. The solution complexity requires different partners with deep expertise in their respective competence areas. Some of the considerations that are important to note while selecting M2M/IOT partners are:

- **Connectivity:** In order to offer a seamless IOT experience, wide connectivity is required, wherein devices can stay connected even if you roam in different geographies. Telcos often choose partners that help provide regional/global connectivity services using global SIMs or inherent platform capabilities.
- **Platforms:** There are platforms such as Axeda, Predix, Watson etc., and they can be leveraged to provide an e2e solution instead of building one of your own.
- **Vertical Expertise & Application Development:** IoT applications require the understanding of vertical markets along with application development capability. Certain partners provide this differentiation owing to their vertical experience and targeted development capability.

- **SI:** Taking the IoT services to customers requires service integration capability, and SIs play important role in integration, support, and maintenance of the IoT solutions.

It becomes necessary to on-board partners to deliver an end-to-end IoT solution. These partnerships are required for varied objectives such as value chain expansion, handling solution complexity, addressing market uncertainty, expanding market reach, specific vertical market expertise, and / or market making.

4.3.2 Partnership Dimensions

Based on the above mentioned imperatives, partnerships can be categorized into three main categories:

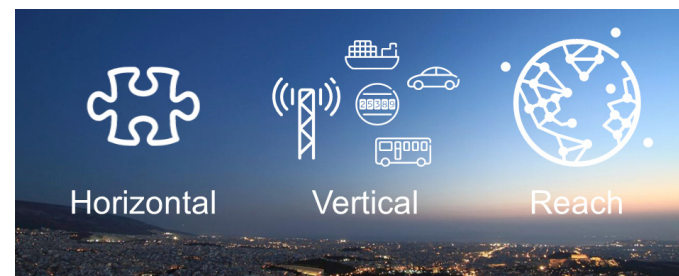


Fig. 8: Types of Partnerships

1. **Horizontal Partners** for building capabilities across IoT value chain segments e.g., AT&T and IBM partnership, where AT&T would develop apps on IBM Watson. AT&T also joined hands with AWS to develop IoT solutions in analytics and security space.
2. **Vertical Partners** for expertise in specific verticals e.g., AT&T partnered with GM for connected cars, where GM included LTE connectivity on all of its 2015 models and beyond. As a result AT&T maintained a strong leadership position in North American market in the connected car segment.
3. **Reach Partners** to increase geographic footprint and explore new sales channels e.g., Vodafone has over 50 partner operators to enhance its connectivity footprint. Partners include the likes of TDC Denmark, MTS in Russia, and China Mobile.

Partnerships need to be done after careful consideration of Telco's internal strengths and market dynamics. Right partner selection and onboarding would be a key success factor for a Telco to offer new services and become an end-to-end IoT service provider.

4.4 Service Aligned Network

It's not only the strategy, organization, and partners that the Telco needs to manage but they also need to work on their networks. The demands on the next generation of networks are not going to be met with a linear change over the current state of the networks. 5G is catalyzing innovation across key areas such as mobile technology (radio, low latency, high-density transmission; core networks and management software; mobile devices); real-time analytics; edge-of-network datacenters; and new (and still to be determined) applications and services such as semi-autonomous vehicles, augmented reality and IoT.

In this emerging environment, as IOT market matures, it is expected to be divided into two main categories namely:

1. **Massive IOT:** Very large number of devices, typically sensors & actuators; extremely low device cost and consume very low amounts of energy to sustain long battery life. Examples are fleet management, environmental monitoring and smart buildings. Device densities could be as high as 200K devices/km²
2. **Critical IOT:** Applications such as traffic safety/control, control of critical infrastructure and wireless connectivity for industrial processes, require very high reliability and availability and very low latency. Low device cost and low energy consumption is not as critical e.g., lifeline communications. The requirement for low-latency services and the need to support local IOT applications (and others) will drive the need for more local processing and storage. This in turn will drive the need for more, smaller edge-of-network datacenters and better software to manage distributed workloads.

Both, Massive or Critical IOT applications will require very different Grade of Service (GoS) from the network. So, the question is how does a Telco design a network that supports such diverse requirements.

Additionally, step changes in System and User device KPIs, typically order of magnitude improvements in throughputs, latency and reliability, the demands on Networks, also on its flexibility and programmability are driving the network evolution. A dense small cell urban HetNet is mirrored by a network slice in its core to cater to such a high throughput Access, another Network Core Slice may cater to a single large Machine Type Communication (MTC) deployment (Telefonica IoT

Team, 2015). The MTC requirements on the Grades of Service required from the network will vary greatly from Industry to Industry and the flexibility of the network to cater to newer and innovative Use Cases will be the key driver for the Network Evolution. In our view, Telcos would need to make strategic choices so that the Network is capable of meeting different GoS without getting locked into a particular Service based Architectural choice.

The diversity of architectural options that are available to the Telco is summarized in Figure 8:

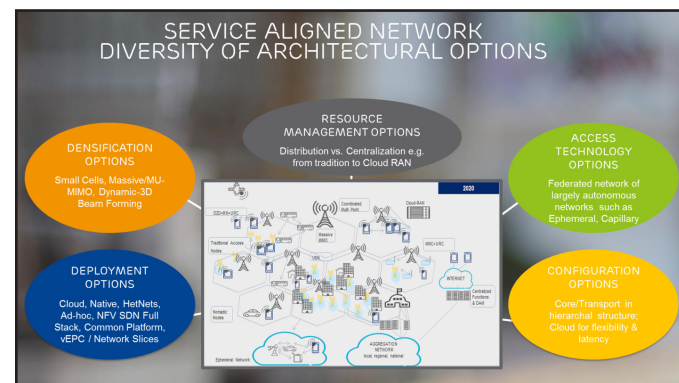


Fig. 9: Diversity of Architectural Options

At a broad level, what this means is that future Networks would need to have a fine balance of Federation and centralized control. Some key Examples of such federated “network of networks” are Smart metering “slices”, and V2V networks. Each of these networks is a specialized network servicing a set of Use Cases that have common QoS requirement. Telefonica UK has deployed such a network “slice” in UK, which is the largest of such an initiative globally (Cary, 2016). This is also a case for a network of massive “capillarization”, meaning connecting massive number of devices (with low data rates) yet aggregating to significant signaling nodes.

We also see Telco as the provider of networks and orchestrator of such networks irrespective of Radio, Fixed, Microwave access i.e. Access Agnostic network orchestrator. Increasingly the Access control and management will move away from the Telco realms to public and even private provider realms. The key design principle of the Network design would be the capability of Programmable QoS delivery and providing the agility of the near real time changes by End User regarding their charging and service bundling.

Two key challenges in the path to the realization of the Service Aligned Network are: One, many of the technologies, such as the New Radio (NR) (Flore, 2017)

aren't defined as yet and secondly, wherever the technology standards are defined, these are not harmonized across the Standards Bodies. The disparate standards have their own priorities and timelines. As a result, standard bodies have lagged, while market has made bets and moved on. This phenomenon has led to development of a heterogeneous set of Chipsets/modules/core technologies that do not seamlessly interwork with each other. The challenge for Telcos will remain to make technology choices which are still not matured without locking themselves in.

This has led to some of the operators making big bets to sway the market – e.g., The US operators / FCC 28GHz positioning in USA or SKT in Korea are examples of local/regional drivers taking precedence over globally harmonized ecosystem in IoT.

Regulations need to evolve with the market and industry - In addition, new suppliers and standards may yet emerge, especially using unregulated spectrum.

5. CONCLUSIONS AND FUTURE WORKS

With the traditional connectivity business stagnating, Telcos are trying to diversify into new & growing revenue streams such as IOT. It is imperative for Telcos to determine their play in the IoT marketplace. In this paper we have suggested a step-by-step approach that can be adopted by a Telco to become a successful end-to-end IoT service provider. The suggested approach is based on a robust methodology where we have analyzed multiple analyst reports in depth, studied successful players, and also drew from live consulting engagements.

The paper recommends that Telcos need to focus on four key pillars to re-orient themselves to become an IOT service provider namely Strategy, Organizational Realignment, Partnerships, and Service Aligned Network to deliver on the new services.

IOT strategy helps identify key verticals & applications to pursue and the role that Telcos need to play in the value chain. Organizational Realignment guides Telcos to redesign their organization on 4 key principles – Innovation, Agility, Eco-System Management, & Global Talent. Based on these principles, actionable changes in the Organizational Design, Sales Process, and Services Delivery are suggested. Partnerships are categorized into 3 types – Horizontal, Vertical, and Reach, which are selected based on Telco's internal strengths and market dynamics. Lastly, Service Aligned Network - networks are increasingly becoming a mix of federated autonomous

network of networks that cater to different Use Case Categories. Given the complex and heterogeneous non-harmonized environment of Standards and consequently the entire ecosystem of Products/Services, the Telecom Network will always need to be flexible to adopt/support new Access Technologies and should be able to integrate with the respective ecosystems. They will have a Network of Networks to meet unique gas requirements and a Centralized Control that is fertilized and connected via a shallow hierarchy by leveraging various techniques such as RAN centralization & virtualization.

Thus, this whitepaper offers a holistic approach to turn a Telco into a successful end-to-end IoT service provider to capture maximum value in the IoT market place.

As IoT Standards, technologies and ecosystem mature, we propose to study how the technologies like Machine Learning, Advanced Business, and Network Analytics influence the Telco Evolution. We propose to build a framework of “Digital Maturity for IoT” of Telcos which will indicate the capability of Telco on different dimensions ranging from capability to provide fine grain GoS to devices, to near real time self-care to customers.

Execution of IoT strategy for Telcos also remains a future area of study. Supporting processes, best practices, and issues, specific to IoT solutions, needs to be studied and identified for on-boarding process, contract management, carrying out POCs, creating effective marketing collaterals, product / solution development, and pricing.

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