The Prospects of M2M
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It is appropriate to start this discussion on the prospects of M2M (machine-to-machine) communications with a discussion of what M2M is. This is because, even a decade after the M2M industry came into existence, it is common to find varying definitions of M2M. In consequence, many consultants’ reports on M2M still need to specify what is meant by M2M. For instance, a Forrester report1 of December 2011 notes that “M2M is a broadly applied, and therefore malleable, term; it is also referred to as the “Internet of Things;” the “Extended Internet,” or “connected devices.” Forrester defines M2M as “technologies that collect and transfer information on the condition of physical assets or people.” Ovum, in a mid-2010 report2, spends a whole section asking “What is M2M?” and defines it as “communication where a remote machine is monitored or controlled by a central server.” The Yankee Group defines M2M as “enterprise M2M devices, consumer M2M devices and connected computing devices”3. Providers’ definitions range even more widely—ranging from a narrow telematics-based definition covering interaction between devices without a user interface (such as automated vehicle tracking) to a somewhat broader definition covering interaction between devices with a user interface but in which the user does not maintain a relationship with the provider (AT&T, for instance, looks at a 3G-enabled Kindle Fire tablet as an M2M device because Amazon buys wholesale bandwidth from AT&T and manages the user relationship), to a still broader definition of M2M that encompasses not just the communication but the service provided (such as optimizing energy usage from smart metering). As the definitions expand, so do the expectations of M2M’s potential. Regardless of the definition, as a sector of the telecom industry, M2M (machine-to-machine communications) is in a challenging situation. Its past growth, over the decade that it has been in existence, has been disappointing. The M2M industry’s current market size remains at less than $5 billion of annual revenue (see Figure 1). However one looks at this number—on its own as a segment of investment interest to telcos, share of telecom revenues (less than 1 per cent now, but expected to rise to 2.7% by 2015 in developed markets, according to Gartner, 2011)4, likely size of the M2M segment vis-à-vis the expected decline in fixed line revenues (Forrester predicts5 that, between 2010 and 2016, global fixed line revenues will decline by $116 billion, whereas the M2M segment will grow from $5 billion to $16 billion)6—M2M increasingly looks like the rosy future that never became the present.

1Forrester, 2011. M2M Connectivity Helps Telcos Offset Declining Traditional Service, p. 4
2Ovum, 2010. Operator Strategies in Machine-to-machine Communications, p. 2
4Gartner, 2010. Market Insight: M2M Opportunities for Communications Service Providers; a Quantitative Assessment, p. 1
5Forrester, 2011 (ibid), p. 17.
Why was this the case? A decade ago, M2M was a new industry that promised high growth in a range of fields that would benefit from automated tracking and automated or user-assisted response. The growth was expected from industries with large user bases and revenue potential such as transportation (onboard tracking devices), banking (ATMs), security (surveillance systems), industry (asset management), healthcare (embedded health sensors), consumer services (home security, energy monitoring and optimisation) and utility systems (grid monitors, smart meters).

As the table below shows, only transportation and consumer services today are significant users of M2M. Most disappointingly for the telcos, the growth rates are high in service segments with relatively low bandwidth use, such as RFID-based tracking for fleets and inventory, and, therefore, low ARPU (more correctly, ARPD, or average revenue per device). On the other hand, the high bandwidth usages – such as wellness monitors, video surveillance and consumer energy optimisation, are relatively low users of M2M. As a result, the gap between M2M’s ARPU and other telco ARPU is growing.

Telcos, in turn, responded that the technology was not in place for data-heavy use. With the advent of 4G/LTE over the past two years, they argue that all the pieces for rising ARPU are in place.
While these arguments may be true, they miss an important point. To the point raised by telcos on technological limitations, the reality is that most M2M usages today do not exhaust the capacity of even 2G technologies. Hence, this has not been the constraint on growth. Those who blame telcos for truncating the value-chain should realize that if consulting services could have made a difference, consultants operating in partnership with or independently of telcos and working directly with clients or other providers (such as device makers) would have stepped in. Many did, such as Jasper Wireless and the many applications developers. Their impact, in terms of industry growth, is low for a simple reason. Clients did things in the old way because of knowledge limitations: the artificial intelligence required to create a purely (or even largely) machine-interfaced resolution of problems did not and still does not exist.

Enter, ca 2007, the smart mobile device in the hands of the user. It has had two significant effects on telcos’ mobile revenue. First was the creation of a new business location model. Through accessing the Internet on the smart device, it moved business analytics from fixed to mobile devices, enabling data analysis to interface more efficiently with user response. This, in turn, led decision-making to be centred on the user rather than a location. The effect on total business revenue from the mobile business has been dramatic due to the consequent increase in mobile spending per user. This trend is part of the so-called ‘consumerization of business’ enabled by smart devices, i.e., the shift to using smart devices for work (see the next section for a more detailed definition), that is dramatically affecting most non-M2M industries in the developed world and, increasingly, in the developing world.

Second, the smart device created a new user ownership model, because it caused the telco to lose, at least for the moment, user ownership. This is evident in the telcos’ share of the mobile users’ revenue. Prior to the iPhone’s introduction in 2007, cellphone makers’ operating margins typically ranged from 10-15%, while telco’s wireless operating margins typically ranged from 15-20%. Over the lifetime of the device, the share of consumers’ revenue earned by the telco averaged 80%. This dramatically changed with the introduction of smartphones. The iPhone, for instance, earned $24.4 billion of revenue in the fourth quarter of 2011, whereas AT&T’s total wireless business revenue for the same period was $18 billion. Whereas the iPhone continues to hold operating margins steady at 34 per cent, according to published reports, AT&T operating margins have declined over the past year from a steady, decade long operating margins in the high teens to the single digits in 2011.

This raises the following challenges for telcos and their providers in M2M, both connected with the question of whether the traditional telematics model of automated communication between device will be replaced:

1) Will the new business location model help telcos realize higher revenue by leveraging of the dumb M2M devices for feeding data to smart devices? In other words, will the business location model that has developed in other mobile-enabled businesses affect M2M? And, if so, how should telcos and their providers respond?

2) What are the prospects of M2M growing rapidly as a result of smart devices, but with a shift of user ownership to device makers and solution providers? For telcos, these may turn out to be existential questions. The rapid decline in telcos’ operating margins with the advent of smart devices noted above underscores how losing customer ownership can rapidly change a telco’s fortunes. If the same happens in M2M, its impact could be more just one more lost business segment.

In the sections below, we argue that the future of M2M is brightened by the advent of smart devices. However, traditional, telemetry-based M2M models deserve a second look and will be important for many years to come. The driver in this case will not be smart devices but business analytics based on access to the cloud. Over time, these cloud-based tools will surely migrate to smart devices. We discuss appropriate business models in each case and derive conclusions about the prospects for the industry.

Assessing Opportunities

An assessment of telemetry-based M2M services, per Figure 1 above, shows that, in search of billion-dollar plus markets, telcos will see transportation and consumer services as driving growth in the near term, with retail, finance and manufacturing offering emerging opportunities.

The rapid decline in telcos’ operating margins with the advent of smart devices underscores how losing customer ownership can rapidly change a telco’s fortunes. If the same happens in M2M, its impact could be more than just one more lost business segment.

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2For 2011, AT&T’s operating margin was 7.27%. See http://www.wikinvest.com/stock/AT&T_%28T%29/Data/Operating_Margin, downloaded February 11, 2012.
The prime opportunities for services are in applications development and IT services. The applications will continue to sit on the edge of the system on the user-directed side (rather than be integrated into the communication between devices), but will query the remote device more intensively than before and use more types of queries. Business analytics leading to user-driven optimisation will, therefore, drive applications development. For IT service providers, the expansion of their M2M business will need to await some maturing of platforms and applications, probably by the end of 2013, before significant growth is possible. The primary driver for this growth will not be 4G, as noted. This is because connectivity requirements will still be relatively modest. Instead, the driver of growth will be the growing availability of powerful business analytics tools that will be accessed, as noted, at the user-directed end of the business. Such tools are powerful now because of the cloud. The cloud enables data collected from remote devices to be combined across devices and subjected to statistical and other data-based analyses of massive real-time data streams (so-called ‘big-data’ analysis) to make decisions.

Certain fields are likely to benefit more than others. Using smart-meters on their own to optimise efficiency use, for instance, might not grow as much due to the cloud. However, combining, say, smart pressure meters located on water pipes, with information generated through video on sludge conditions as the water flows through the pipes, and combining this information using statistical tools available on the cloud, will lead to significant differences in efficiency. Similarly, combining video and sensors to generate reports on industrial assets through their life-cycle, and subjecting these to big-data analysis will offer significant growth opportunities.

The use of the cloud for M2M will allow the M2M business to benefit from a key new global trend: the growing importance of the ‘long-tail’ in responding to consumer demand. The long-tail is used here to describe consumer demand for many items such as social networks, travel, education, books, films and unique goods. Thanks to low search costs, consumers are spreading their demand more evenly across products and services, rather than the more traditional bell curve of demand, in which a few products accounted for most of the demand.

The way that this trend affects M2M is in business analytics of tangible goods. Retail firms such as eBay, Amazon and Netflix, whose business models are built around the long-tail, need to keep automated track of significantly larger types of items than before. They spend considerable resources on business analytics that result from tracking. As business analytics of the long-tail grows in importance, M2M becomes a focus area for retail firms that earlier saw only limited need for M2M.

As these trends get realised, the telcos will benefit from the need for many different types of remote devices, or, at least, the embedding of multi-function chips within these devices; device makers will gain, as well as IT service providers. The biggest gainers in terms of revenue growth will be the applications developers, who will likely develop vertical-specific applications to leverage big-data on the cloud.

However, we do not expect these trends to change the revenue model, given that neither the business location model nor the customer ownership model will change. Hence, telcos are likely to be able to retain customer ownership and shape pricing practices, which will continue to be based on bandwidth use.

If the cloud will fuel traditional M2M’s growth in new directions, the smart device will change it in ways that are harder to anticipate but are likely to arise rapidly over the next few years. To analyse this, it is useful to evaluate the new global trends that will be inspired by smart devices.

The first is the rapid “consumerization” of business. By this is meant that, thanks to declining device and bandwidth costs, combined with the growing market share of consumer revenue earned by devices relative to network services, the consumer has become the focus for providers of new technology. The result is that the consumer nowadays often accesses new information technology ahead of the traditional workplace. Examples are smart devices and cloud services, but the trend started much earlier with webmail.

In consequence, businesses are increasingly willing to allow work to be undertaken over devices owned by the consumer. This affects M2M because the devices such as tablets and smartphones need to be enabled for M2M. For instance, tracking the condition of city water pipes through pressure sensors, in its old and still dominant form, is managed by the following process: the sensor on the pipes sends information over 2G networks to a PC located in the utility’s office. Then, the device uses software applications to decode that information and generate an SMS to the personnel who must respond. With the consumerisation of business and the bandwidth-intensive requirements of big-data, this information must be available on mobile equipment-enabled applications accessed over the Internet. The initial alert may come over SMS or
An important strategic implication of our analysis is that portions of the M2M work may be undertaken outside the telco’s domain. Consider the example of using a smart device, say, an iPad, to check-in for a flight. First, the airline automatically sends the user a notification for check-in. The user responds with a check-in affirmation and the airline sends him a bar-code for validation at an NFC-enabled reading device at the airport’s check-in counter. The reading device communicates the validation over the airport intranet to a local validation device at the gate and perhaps other locations (the security counter, for instance) and over the Internet to the airline’s servers.

From the airline’s viewpoint, the M2M aspects of the check-in process described above are the initial notification, the emailing of the bar-code, validation at the airport and its communication over the intranet. From the telco’s point of view, the M2M aspects of the check-in process are different and would exclude at least the NFC-based bar-code validation and the communication to the gate validation device. This is shown below.

The second global trend of importance for M2M, in the context of smart devices, is the obvious aspect of enabling M2M for mobility. As was discussed earlier, the more traditional understanding of M2M involved device pairs of which at least one was fixed, while the other might be mobile or fixed. Usually, the latter device was less intelligent and fixed to equipment that needed to be tracked. It was paired with a fixed device, which managed multiple such pairings, contained the telematics and was linked by fixed lines to servers, etc. With the rapid evolution of the cloud and mobile devices with smart applications, it is now possible to conceive of larger components of the M2M eco-system being built around smart mobile devices. For instance, smart tablets are increasingly being configured to interact with tracking devices in the home and automobiles for purposes such as monitoring and controlling temperature. As a result, smart devices, such as tablets, will increasingly intermediate the communication between energy consumption monitors located at different points in a building and control devices. The smart devices would aggregate information from the monitors, undertake analytics (over the cloud), and communicate this information to control devices. Similarly, smart devices have created a business for NFC-based readers that handle a range of business tasks, from flight check-in to coupon validation.

**Strategic Implications**

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**Figure 2: M2M from the enterprise (airline) and telco viewpoints**

**Airline View**
- Airline sends check-in information
- User affirms check-in
- Airline sends check-in bar-code
- User presents bar-code at check-in counter
- Bar-code validated by reader
- Information communicated to security counter, gate and servers

**Telco View**
- Airline sends check-in information
- User affirms check-in
- Airline sends check-in bar-code
- User presents bar-code at check-in counter
- Bar-code validated by reader
- Information communicated to security counter, gate reader and servers

Note: M2M communication is colored red below.
Traditionally, the logic of separating M2M from other forms of wireless communication handled by telcos was usage-based, i.e., the traditional revenue model was per-user, per-bandwidth used. M2M used low bandwidth and this allowed users to pay less than, say, voice. However, with the advent of smartphones, the paradigms are changing rapidly. Airline check-in using smartphones created a new market for M2M devices, in the process invoking the use of high bandwidth-consuming devices. The need for business analytics requires that data be stored in servers and communicated over the Internet—another high bandwidth-consuming activity.

For telcos, the change in the business environment occasioned by the cloud and smart devices is almost tsunami-like. As one large telco told us, “The cloud will be the enabling platform of choice and the smart device will be the center of the M2M eco-system.” The issues for the telco caused by these changes include the changing relationship to the customer, which has historically been at the center of telco activity. While more revenue must be shared, the shift to higher bandwidth devices, and the growing importance of embedded applications and business analytics, raises the revenue potential substantially. So, for telcos, the challenge is not the old fear that the customer will be able to bypass their network services. Instead, it is that their relationship with the customer is changing and they need to work hard to figure out how to keep a relevant share of the customer’s revenue.

As one large telco told us, “The cloud will be the enabling platform of choice and the smart device will be the center of the M2M eco-system.”

This has historically been a challenge that telcos have tackled poorly—and were usually saved only by their ownership of the network. The classic case of how telcos typically work is that of ownership of broadband services using ADSL technologies, which began outside the telcos, but has since gravitated to telcos due to their ability to bring scale and reliability to the service. While this process was going on, most telcos initially introduced their own service, sought to add value-added components such as search, collaborated with other firms, etc. Ultimately, they reverted to what they do best, i.e., provide a scalable, reliable service with no froth or frills.

M2M’s likely transformation due to the global trends described above has thrown telcos back into their frothy phase. What was, till two years ago, viewed as a dull, low-growth, low-ARPU telematics business is now viewed as potentially high-growth, with the value apparently lying in software development for platforms and applications, and business analytics.

Most telcos are moving in this direction. Others, as evidenced by Ericsson’s 2011 purchase of Telenor’s Connexion platform, are realizing that pipe management is their core advantage. Given the early stage of such developments, it is too early to predict success either way, though recent historical evidence suggests that smaller, nimbler competitors will quickly grab short-term market share, while the aggressive, large firms such as Apple, Amazon, Facebook and Google will take long-term market share.

Telcos are aware of history’s weight and are looking actively for partnerships. Jasper Wireless’ platform is the archetype here, which has found collaboration with AT&T and others. Will this change the telcos’ relationship with System Integrators (SIs)? We foresee some significant changes. We note that some of these changes will cut across the board to include the large equipment makers, as well. Ever since the 2001 downturn, the equipment makers have focused on scale and reliability over innovation, thus mirroring the telcos’ survival strategy. Thus, they are subject to some of the same disruptive forces described above.

Before we turn to an analysis of SIs, we discuss the change in revenue models likely from the above global trends. Historically, the revenue model was based on usage — this model was instituted during the analog voice era and continued into the Internet era. Thus, the telcos preceded and set the paradigm for SaaS models. This model allowed them to earn more, though at a declining rate, as per user usage increased.

Although telcos report that they are willing to consider other models, that vary with the domain, such as fixed-cost models for consumer wellness, we expect the traditional pricing model to dominate, notwithstanding the threats posed by wholesale buyers such as Amazon.

But, this is not what will change the revenue model. As discussed above, the real threat is that other large providers on the value-chain, such as Apple, will also claim a usage share. This would mark a change from the past, where other providers, such as mobile phone makers, could only claim a fixed, increasingly commoditized, price for their equipment. Hence, the forces that favor usage-based pricing are actually increasing, not decreasing. The importance of this situation is that it reduces telcos’ incentives to provide value-added services, such as developing vertical-specific platforms.
While for telcos, the strategies appear to be clear-cut, if somewhat less optimistic than a strategy of ‘spanning the value-chain’ may suggest, the opportunities for applications developers, especially applications that involve business analytics, is immense. It will drive new types of multi-signal devices, vertical specialization and platforms. Ultimately, it will provide SIs with highly scalable businesses.

For SIs, changes in the revenue model and in the expectations from their large clients are thus likely. While their clients would welcome their support across the value-chain, it is important that SIs play to their own strengths as well. We expect the following changes:

- As other players in the value-chain take a larger share of a usage-based price, telcos and equipment makers will expect SIs to provide ever-more economical services for their traditional supporting activities of integration, provisioning and access. In return, they will offer SIs more scale. SIs, in turn, will need to invest more in efficiency provision.

- Competitive power will determine whether SIs can also move to usage-based pricing. Traditionally, SIs, given their limited visibility to the end-user and focus on efficiency over innovation, tended to gather ever lower shares of user revenue. Given the global trends described above, there will be an ever increasing number of players who will obtain usage-based revenue – notably the applications and analytics developers, thus further tightening the scope for SIs to do so.

- SIs could consider a variety of strategies to improve their competitive power. Among the possible strategies – consulting, vertical expertise, applications, platforms, and analytics – perhaps the most viable will be in platform-based strategies. The reason is that this is the most important segment to telcos from their viewpoint of customer ownership. While the other segments are important to the value-chain, they are not as important to telcos because of their historical weakness in these aspects. From an SI viewpoint, too, platform expertise is easier than expertise on applications due to the rapid evolution of applications. For large equipment makers, also, platform expertise is important to understand and work within. The additional key advantage for SIs is that it offers a pathway to usage-based revenue for SIs.

Concluding Thoughts

This paper began by noting that the promise of M2M over the past decade turned out to be bigger than its performance. In most industry segments – retail, finance, manufacturing, utilities, healthcare, security and consumer services – M2M remains, as of 2012 a sub-billion dollar industry globally. Only the transportation sector is a large business at this time. Even by 2016, some forecasts suggest that M2M’s revenues will reach $16 billion. As we noted above, M2M increasingly looks like the rosy future that never became the present.

The reasons for M2M’s hitherto poor performance, we argued, have little to do with telco underperformance or bandwidth availability. Instead, the reason is that of limitations of knowledge: the artificial intelligence required to create a purely (or even largely) machine-interfaced resolution of problems did not and still does not exist.

This means that the future growth of M2M will be driven by user-directed interventions. In this respect, perhaps the significant factor is the growth of cloud computing and its impact on business analytics. The cloud enables data collected from remote devices to be combined across devices and subjected to statistical and other data-based analyses of massive real-time data streams (so-called ‘big-data’ analysis) to make decisions. Combined with the growing importance of the long-tail in responding to consumer demand, we believe that M2M is likely to see big growth, primarily because of the growth of business analytics.

As these trends get realised, the telcos will benefit from the need for many different types of remote devices, or, at least, the embedding of multi-functional chips within these devices; device makers will gain, as well as IT service providers. The biggest gainers in terms of revenue growth and margins will be the primary drivers of growth, i.e., the applications developers, who will likely develop vertical-specific applications to leverage big-data on the cloud.

However, we do not expect these trends to change the revenue model, given that neither the business location model nor the customer ownership model will change. Hence, telcos are likely to be able to retain customer ownership and shape pricing practices, which will continue to be based on bandwidth use.

While the cloud is already in pole position to influence M2M, on the horizon and advancing rapidly is the smart device. Its effect will be significant because of its impact on the consumerization of business that will require the enabling of M2M for mobility at the user end. With the rapid evolution of the cloud and mobile devices with smart applications, it is now possible to conceive of larger components of the M2M eco-system being built around smart mobile devices. For instance, smart tablets are increasingly being configured to interact with tracking devices in the home and automobiles for purposes such as monitoring and controlling temperature. As a result, smart devices, such as tablets, will increasingly intermediate the communication between energy consumption monitors located at different points in a building and control devices. The smart devices would aggregate information from the monitors, undertake analytics (over the cloud), and communicate this information to control devices. Similarly, smart devices have created a business for NFC-based readers that handle a range of business tasks, from flight check-in to coupon validation.

The strategic implication of the smart device on business and revenue models could be significant. The smart device hands over at least part, if not the most significant part, of the customer relationship to device makers and cloud applications providers. So, for telcos, the challenge is
For telcos, the challenge is not the old fear that the customer will be able to bypass their network services. Instead, it is that their relationship with the customer is changing and they need to work hard to figure out how to keep a relevant share of the customer’s revenue.

Even though we believe that the revenue model will still be based on usage, the usage will span the cloud rather than be based on bandwidth used for automated communicating between machines. However, as smart devices have demonstrated for other mobile services, the share retained by telcos of revenue will be under pressure, thus reducing telcos’ incentive to provide value-added services. Instead, telcos will likely focus on what they do best, i.e., provide scalable, efficient services. While for telcos, the strategies appear to be clear-cut, if somewhat less optimistic than a strategy of ‘spanning the value-chain’ may suggest, the opportunities for applications developers, especially applications that involve business analytics, is immense. It will drive new types of multi-signal devices, vertical specialization and platforms. Ultimately, though with a lag, these developments will provide SIs with highly scalable businesses. They, too, must play to their strengths: provide efficient integration, provisioning and access services. However, choosing the right service layers to provide support will be critical.

Among the possible strategies – consulting, vertical expertise, applications, platforms, and analytics – perhaps the most viable will be in platform-based strategies. The reason is that this is the most important segment to telcos from their viewpoint of customer ownership. While the other segments are important to the value-chain, they are not as important to telcos because of their historical weakness in these aspects. From an SI viewpoint, too, platform expertise is easier than expertise on applications due to the rapid evolution of applications. For large equipment makers, also, platform expertise is important to understand and work within. The additional key advantage for SIs is that it offers a pathway to usage-based revenue for SIs.
About the authors

Rafiq Dossani is a senior research scholar at Stanford University’s Shorenstein Asia-Pacific Research Center (Shorenstein APARC) and erstwhile director of the Stanford Center for South Asia. His research interests include South Asian security, government, higher education, technology, and business. He is currently undertaking projects on regional integration, innovation in outsourcing, engineering education, access to capital, and entrepreneurship in information technology in the South Asian subcontinent. His most recent book is Does South Asia Exist?, published in 2010 by Shorenstein APARC.

Ashish Srivastava is VP & head of Wipro Technologies’ Global Telecom Practice & Advisory. He is responsible for conceptualizing and creating solutions around various telecom areas ranging from the traditional OSS/ BSS to new generation solutions like M2M and Connected Home. As a part for this role, he is also responsible for advisory, architecture and technology support for all domain specific programs for Telecom Service Providers.

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