Key Factors for a Successful IoT Deployment Strategy

SUNIL HATTANGADY

President, Emblaze Consulting LLC

INTRODUCTION

Wireless Machine-to-Machine (IoT) communications is emerging as a cost-effective and reliable enabler for a variety of industrial applications and services beyond voice-centric handsets that connect an enterprise's machine assets with its IT infrastructure and workforce through wireless data communication.

Cost/benefit analysis is key to winning adoption among enterprise customers. Unfortunately, there isn't a simple, straightforward guide showing how to connect IoT assets to networks and integrate the resulting machine data into business applications. IoT application deployments can be complex, cost sensitive and open ended. Meticulous planning and execution is therefore key to successful deployments.

It would be useful to establish a framework for a Wireless IoT deployment strategy to take some of the complexity out of IoT and make it easier to get applications off the ground.

CELLULAR IoT DEPLOYMENT FACTORS

1. Business Strategy

1.1. Target Market and Business Objective

IoT can be disruptive to existing business models & processes. Every IoT deployment must therefore begin with clear business objectives so that both senior management and the entire enterprise are on board for a seamless deployment with the fastest ROI. This includes:

- The problem statement and target application
- The amount of data to be communicated and processed
- The type of devices to be deployed: fixed or mobile?
- The environment of deployment for the device
- Deployment reach: global, national, or regional?
- The value proposition, in terms of cost savings, time savings, new revenue opportunities, etc.
- The identification of the existing business processes that will be impacted and the appropriate required changes.

1.2. Building on Core Competency

Since IoT can be disruptive, it is best if the application is built on an established business model and core-competency. An example would be 'Smart Metering' where an electric utility company applies Wireless IoT to traditional electric utility metering for real-time monitoring and energy conservation.

1.3. Budget/Resource Constraints

IoT application deployments can be complex, cost sensitive and open ended. Budget and resource constraints can be a significant hurdle to successful deployments. The key question then is – What is the expected time frame to see a return on investment and how much is one willing to spend?

1.4. Impact on Current Business Model

If IoT is disruptive to existing business model, it can be a painful adjustment process. From a risk mitigation perspective therefore, it is important to have a good understanding of the potential ramifications on the business model and plan appropriately so that current business and revenue streams are not detrimentally impacted.

2. Return-On-Investment (ROI)

2.1. Deployment Costs

2.1.1. *IoT Equipment Costs*

Physical size, display size & resolution, battery life, sensor features, wireless network technology, embedded software, etc. are all key factors in determining the costs for the ideal device for deployment.

2.1.2. *IT Infrastructure Costs*

Integrating IoT devices and data into a company's integrated IT infrastructure and back office systems including database, ERP, CRM, automated billing, automatic report generation, workflow management, etc., usually managed as IT projects, can be a significant cost factor.

2.1.3. *Solution Development & Integration Costs*

IoT Solution Architects/Consultants are central to the success of the project. They are responsible for architecting the entire IoT solution and platform including business case, requirements definition, systems design, selection of partners, and planning and managing the implementation.

2.1.4. *Data Communication Costs*

Network services and data communication costs in the form of bandwidth can be the most significant recurring cost item for an IoT application. It is important to ensure the application uses the minimum bandwidth it needs. Optimizing communication costs is key to achieving the desired ROI and the long-term economic viability of the application.

2.1.5. Maintenance Costs

Maintenance costs can be high depending on the level of complexity of the implementation, especially on the IT infrastructure side.

2.2. Revenues

2.2.1. Cost Savings (Lower Total COO)

IoT, when correctly applied, can lead to significant cost savings. For a proper assessment of ROI, one must quantify these savings and account for any potential hidden costs.

2.2.2. New Revenue Opportunities

IoT applications can sometimes represent new revenue streams for corporate adopters. Manufacturers can use their connected IoT assets to develop customer relationships that can generate new revenue streams in an information economy.

2.2.3. Increase in Productivity/Efficiency

With Wireless IoT, optimized equipment uptime and minimized equipment downtime can translate to significant productivity & efficiency gains that have a direct impact on revenues and profitability.

2.3. Competitive / Strategic Advantage

2.3.1. Improved QoS → Enhanced Customer Loyalty

IoT can significantly enhance quality-of-service and consequently customer loyalty. By enabling remote data collection, the vending industry, for example can increase customer loyalty and maximize utilization of resources by addressing critical factors such as inventory management, machine performance, prompt maintenance & service, and optimum product mix and stock levels.

2.3.2. *New Business Models*

Much like the Internet, IoT has the potential of creating new business models and opportunities. Adopting an added-value service model can be a key differentiator for manufacturers in many industry sectors deemed to have reached maturation or saturation. Old reactive business models for service and support of assets will make way for proactive real-time response and ‘smart’ service.

2.3.3. Differentiation - Increased Entry Barrier

While many businesses and industries have reached a point of maturation where their products may not be perceived as unique, IoT-enabled services provide rich opportunities for value creation, new business models, and new relationships between business and customers — each of which has a dollar value and return on investment. The differentiation between two IoT adopters will, of course, lie in the art of their solution.

2.3.4. *Scalability with new features (E.g. Security)*

For increased ROI, an IoT solution must have sufficient scalability and flexibility that we can continuously add more and more sensors and networked devices to it.

2.3.5. *Scalability into New Verticals/Market Opportunities*

In today's challenging climate, the need to remain competitive continues to increase especially in the face of changing regulatory and economic conditions. Since the investment for IoT deployment can be significant, it would be valuable to assess opportunities to leverage this investment to expand business and operations into new geographic and vertical segments. Companies expanding into new markets can ease their journey and accelerate their presence by partnering with consultants like Emblaze Consulting who have the experience and relationships required to successfully execute towards market expansions.

2.3.6. *Enhanced Image/Branding*

IoT businesses will recognize that their IoT assets will have a unique personality (as in a 'smart service') based on their business model, their business needs, and their customers' demand for reliability, service, and support — each of which has a dollar value and return on investment. This opportunity for differentiation can be exploited in enhancing the brand image of the company as a leader in the industry.

3. Implementation

3.1. Customization Requirements

Since IoT implementation is still not mainstream, many IoT applications are usually customized for a particular application and industry. As the IoT industry matures, technology providers are endeavoring to create off-the-shelf components to streamline portions of the deployment. Customization however will very likely be required in a large-scale project. IoT Solution Integrators and Consultants can help scope out capability gaps and identify appropriate solutions to enable on-schedule deployment.

3.2. Network Communication

3.2.1. *Bandwidth requirements and Communication model*

For IoT, there are too many choices for network communication. This includes wired communication versus wireless, with the latter including cellular (GSM/GPRS/EDGE/3G/4G), Bluetooth, WiFi, Zigbee, etc. or a combination thereof. The choice is usually straightforward for most deployments depending on the specific bandwidth and service requirements.

3.2.2. *Network Coverage and Site Survey*

Availability of network coverage for the machines that need to communicate is a critical factor. A Site Survey ensures ample coverage is available for networked IoT assets throughout the lifetime of deployment.

3.2.3. *QoS including reliability of data delivery*

Other requirements may include real-time delivery of data, consistent performance, reliability of data delivery, and acknowledgement of data delivery.

3.3. IoT Device/Hardware Selection

For end users, the greatest challenge may be figuring out which hardware options meet the requirements of the application. There are too many choices especially in the wireless communication path (GSM/GPRS/EDGE/3G/4G…) and the development process for this group can be intense with a steep and costly learning curve. Application and hardware providers are usually saddled with the burden of making the hardware ready for deployment.

3.3.1. *Bill-of-Materials (BoM)*

To a first order, the bill-of-materials (BoM) is a key element in determining the cost of the equipment. This can have several components all of which contribute to the total BoM of the equipment such as:

- eBoM (Electronic BoM) - which is comprised of BoM associated with key electronic components including integrated circuits, modules, actives, passives, connectors etc.
- mBoM (Mechanical BoM) - which is comprised of the non-electronic mechanical components including housing, plastics, substrates/pc board, keyboard and buttons, screws, antenna cover, etc.
- sBoM (Software BoM) - which is comprised of costs associated with embedded software including operating system, firmware and device drivers, user interface etc.

3.3.2. *Sensor Features*

There are countless varieties of sensors available on the market. Transducers including miniaturized MEMS sensing solutions (e.g. pressure sensing, microphones, accelerometers, gyroscopes, etc.) solve advanced monitoring and control challenges, together with turnkey wireless communication modules. The choice of the sensor depends on the target application. Smart sensors provide high flexibility and freedom in application design and configuration for IoT solutions.

Many sensors often work well by themselves; however, they cannot pool resources since they cannot co-exist within the same network. It is

therefore important to choose sensors that speak the same 'tongue' or protocol as large scale Machine-to-Machine (IoT) and sensor networks become more popular.

3.3.3. Network Technology

The choice (GSM / GPRS / EDGE / 3G / 4G, Bluetooth, WiFi, Zigbee) is usually straightforward for most deployments depending on the specific bandwidth and service requirements. This has implications on the cost of the communication chipset that constitutes the communication module.

3.3.4. Device Size and Weight

While device size/weight may not be a constraint for industrial IoT applications, it will most certainly be for consumer applications (e.g. wireless medical devices). The device size & weight will depend upon the target application.

3.3.5. *Modularity* and Certification

Modularity, especially with regards to the communication module, is important to decrease deployment costs. Certification refers to the process of getting wireless IoT products approved for operation on a cellular network. IoT manufacturers, however, often associate the device certification process with high costs and longer time to market, and it can be a significant cause for concern for OEMs (original-equipment manufacturers) navigating the process for the very first time. With a certified communication module, device re-certification may be expedited when the original module is replaced with another certified module.

At a minimum, devices must meet standards set by regulatory bodies (for instance, the Federal Communications Commission, www.fcc.gov, Washington, D.C.) and by the standards bodies for GSM or CDMA. Many IoT device manufactures are novices when it comes to the certification process.

Each carrier may specify its own set of requirements before allowing a piece of equipment to activate on the network. IoT manufacturers must reach out to carriers earlier in order to ensure they're designing their products to their carrier's specifications. Integrated devices must complete PTCRB testing by an approved test house that provides testing & certification services (e.g. 7 Layers, Cetecom). Typical testing can include audio interface testing, power interface testing, SIM interface testing, RF interface testing, MMI interface testing, and other testing.

3.3.6. *Reliability*

The device is perhaps the only tangible element of the IoT solution. The Customer therefore associates the IoT Company with the device. The

reliability of the IoT device is a key factor in the selection of the IoT equipment. In smart metering, for example, the utility companies would not like to replace the meter for the life-time of the house where it is deployed. Key considerations in the choice of a reliable device are:

- Electrical defects
- Physical (Wear and Weather) reliability
- Battery Life
- Ease of Battery Replacement
- Certification

3.3.7. *Application Enhancement*

Many adopters would multiple improvements from a single IoT investment. It is desirable to design the system such that the same application/network infrastructure for one application can also be used for several others, regardless of the specific nature of the application. Application enhancement is a periodic enhancement or adaptation of the system performance with changes in business requirements, technology, and new opportunities.

3.4. Level of Complexity

3.4.1. Level 1: Simple remote data collection and monitoring such as by SMS and 1-way GPRS

3.4.2. Level 2: Automated Device Management with, for example, 2-way GPRS data traffic

3.4.3. Level 3: Enterprise wide deployment with end-to-end automation & management and extensive integration with IT infrastructure (ERP, CRM, automated billing, etc.)

3.5. IT Infrastructure Integration

This can have the following key components:

- IoT Middleware - an intermediate component hosted on the Internet that manages connections with IoT modules in the field and the transfer of data to and from a back-office server.
- Back Office Integration – consisting of data storage and business specific processing

3.6. Service Activation / Provisioning

Activation and provisioning should be a seamless user experience for IoT adopters. Unless close attention is paid, the activation and provisioning process, usually a simple step in an IoT deployment process, can easily become a painful experience for the customer. Having activation software embedded in the IoT

device (i.e. no software to download) is the ideal solution for activation/provisioning ease. With such automatic provisioning, many manual steps and activation delays can be eliminated.

3.7. Integration and Testing Complexity

Testing and integration are important steps in IoT application deployment. Besides hardware (device) testing discussed above, systems integration, field testing & validation, security compliance testing, and usage scenario testing conducted by IoT experts is key to fine tune IoT applications to operate more efficiently and cost effectively.

3.8. Maintenance & Service

The IoT deployment process must be managed and maintained throughout the lifecycle of the project (which can be as long as over 10-20 years in some instances). Continuous monitoring, long-term reliability, software and feature upgrade infrastructure (over-the-air), and ongoing maintenance including security and back-end management must be considered at the outset.

3.9. Training – Business & Customer

Since IoT can be a disruptive technology, it requires considerable investment and can pose a significant transformation from a business culture perspective. Adequate training is necessary to ensure the customer receives optimal benefit from their investment. Proper training of field service employees is vital to ensure they fully understand new processes and procedures.

SUMMARY

IoT application deployments can be complex, cost sensitive and open ended. Meticulous planning and execution is therefore key to successful deployments

Unfortunately, there isn't a simple, straightforward guide showing how to connect IoT assets to networks and integrate the resulting machine data into business applications.

Best practices will continue to evolve and refine as more companies find ways to profit from IoT technology. This builds momentum, accelerates adoption, and helps companies bring IoT solutions to market.

ABOUT THE AUTHOR

Sunil Hattangady is the President of Emblaze Consulting LLC, a company dedicated to helping technology businesses define and implement strategies for business competitiveness, new market penetration & customer acquisition, product innovation, creative marketing & communications, and strategic alliances & acquisitions.

Sunil is a marketing and business leader with multi-disciplinary achievements, international experience, and a track record in achieving revenue generation via market analysis and competitive product positioning, driving new product & business initiatives, building efficient cross-functional teams & alliances, and managing effective & persuasive communications.

Sunil is a results-oriented business leader with extensive experience in strategy & operations, product management & marketing, program/project management, execution excellence, and cultivating trusted customer relationships. His strengths include strong analytical skills, gaining clarity in complex multi-disciplinary issues, cross-functional collaboration and leadership, influencing stakeholders across all levels, and balancing strategic business imperatives with technology needs to propose and deliver feasible, high-value solutions.

Sunil has an MBA from University of Texas at Austin, and a Ph.D. in Engineering from North Carolina State University, and holds over 20 US patents.

For more information, please contact:
EMBLAZE CONSULTING LLC
info@emblazeworld.com
http://www.emblazeworld.com

