A Business Oriented Approach to IoT

An array of businesses across a wide span of industries are contemplating what could generally be called "business process automation" activities that, in many cases, will end up being called "Internet of Things" (IoT) implementations. But while IoT holds great promise, an inevitable conclusion that can be drawn from the preceding statement is that most IoT projects are not born as IoT projects. Nor should they be.

More often than not, when businesses embark on strategic initiatives related to fundamental processes and systems, what they are seeking to do is improve business outcomes. For example, a manufacturer may be looking for ways to reduce warranty costs. Product designers and operations personnel may be interested in finding ways to improve asset uptime or service quality. Service personnel may be seeking ways to optimize troubleshooting, thereby reducing repair time and costs. The list of challenges being addressed is almost without end primarily because efforts to reduce costs and increase revenue are themselves never ending. Only after analyzing the business outcomes they are attempting to improve, and the variables that go into determining those outcomes, does it become evident that, in many cases, there is a wealth of data that can be captured, analyzed, and acted upon in service of those business objectives. And only then does it begin to dawn on these businesses that they are potentially embarking on an IoT journey.

IoT has become a catch-all term used to describe a multiplicity of underlying technologies, few of which are actually new. Certainly low speed, low power wireless technologies needed to be developed (e.g., ZigBee) but these are not new and have applicability beyond IoT. Other necessary ingredients, such as machine learning, data analytics, and predictive reasoning have also been around for some time. In fact, it could easily be argued that the lack of any fundamentally new enabling technology underpinning IoT is one of the principal reasons successful projects in this area rarely begin life as IoT projects. Instead, they start out, as they should, focused on improving business outcomes.

For over two decades, Bsquare has helped hundreds of companies add intelligence to remote devices, connect them, and drive better business outcomes with the data generated by those devices. This legacy, which touches on many aspects central to IoT, puts Bsquare in a strong position to impart meaningful lessons as business of all types embark on IoT journeys.

Resist the temptation to launch overarching IoT initiatives

Many industry analysts and consultancies, often to further their own business objectives, advise clients to develop IoT competencies and even, in at least one case, "Chief IoT Officers" (CIoTOs?). But this gets the cart before the horse. While many business process improvement projects will necessarily include several aspects of IoT, IoT is merely and enabling technology, not an objective in itself.

The advantage to orienting IoT undertakings around specific business objectives, in addition to the obvious business benefits, is that only those aspects of IoT required to satisfy those business objectives need be included. This streamlines and simplifies the effort, meaning a higher probability of success. Approaching the other way around, i.e. implementing pure IoT systems as a more strategic initiative, inevitably results in greater complexity since the system architects must design for every potential use case. This, in turn, raises risk and results in a higher probability of failure.

Common IoT Business Objectives

- **INCREASED ASSET OR SERVICE UPTIME** For businesses with expensive physical assets, downtime can be very expensive. It potentially reduces revenue, impairs productivity, and raises service costs. Using advanced data analytics, businesses can predict failures and taking corrective action before they occur.
- **WARRANTY COST REDUCTION** Business involved in the production of expensive assets incur substantial warranty costs. By pro-actively identifying the nature of failures, prescribing optimal repair paths, and tracking actual repair work, IoT can substantially reduce warranty costs.
- **DEVICE OPTIMIZATION** Most businesses strive to maximize asset performance, whether to improve output or increase efficiency. IoT can identify assets that are under performing and provide prescriptive, corrective actions.
- **DEVICE RESOURCE OPTIMIZATION** Many remote devices require careful management of device resources such as batteries, bandwidth and even CPUs. IoT can apply complex resource optimization logic directly on the asset itself, enabling the asset to make decisions in a disconnected environment.
- **ASSET UTILIZATION** Businesses are often challenged with locating assets in the field and understanding how effectively they are being utilized. IoT be used to reallocate underused assets or enforce business policies.

The argument that narrowly tailored IoT systems may result in technical dead-ends can be easily addressed by ensuring extensibility is designed into the IoT system. In essence, since future requirements cannot be accurately forecast, ensure the system is flexible enough to grow in different directions.

Key takeaway: The most successful IoT projects are those that are started in pursuit of specific business goals. IoT is the means to achieve these goals, not the goal itself.

Data is vital but not all data is the same

Many organizations that have begun to move forward on IoT initiatives understandably tend to start the process with data collection. This generally means endowing remote devices with the intelligence necessary to capture sensor data and forward that data to cloud-based databases. But this raises a host of problems, not the least of which is cost. It costs a lot of money to transport and store what could quickly become terabytes of data. In fact it can be so expensive that many business find themselves in the position of only saving data for a limited time period of time and then deleting it.

Without knowledge of what data is actually required and what business rules will be applied to that data, it is impossible to know what data to capture. Consequently the answer is often "well, all of it."

There are two ways in which the volume of data necessary to achieve business objectives can be substantially reduced, in some cases by two full orders of magnitude. The first is simply to ensure that only data required to drive business rules is captured, transmitted and stored. The second is to perform some level of on-board monitoring and filtering of the data stream. Both of these approaches require greater intelligence at the device level but substantially reduce costs.

> **Key takeaway:** Data is vitally important to any IoT undertaking. But data is also the most significant cost driver for enterprise-scale IoT initiatives.

Don't confuse cloud with public cloud

Apart from anything related to IoT, enterprises have been virtualizing their data center infrastructures for quite some time. By doing so they are essentially creating clouds—data center infrastructure in which compute, storage, and networking have been completely virtualized. If they operate these clouds inside their own data centers they're called private clouds. If they use Infrastructure-as-a-Service (IaaS) offerings such as those available from Amazon Web Services (AWS) or Microsoft Azure, they're called public clouds. If they use a little of both they're called hybrid clouds.

The lesson here is that almost all IoT implementations will store data and host many of the requisite applications inside "the cloud." However, the decision of what type of cloud can be made completely independent of IoT.

Frequently, given its nascence, IoT implementations will start off entirely within private clouds. Later, as the technology matures and comfort with public cloud security improves, some aspects may be moved to public clouds.

> **Key takeaway:** Virtually all IoT implementations will depend on cloud compute and storage. But that doesn't necessarily mean public cloud.

Data visualization is only the start

Frequently, the next logical step in the IoT journey is to look at the data. Businesses have taken the trouble to enable devices for IoT, collect massive amounts of data, and store it in cloud databases. Now they understandably want to be able to see it. Toward that end, many companies have developed sophisticated data visualization tools that can help consolidate and render meaningful the large volume of data being collected in real time.

But visualizing data does not, by itself, solve any problems and certainly does not deliver the improved business outcomes that should have been the core objective of the IoT initiative.

First, by definition, visualization implies a human element, i.e., people looking at the data, attempting to understand it, seeking anomalous conditions, and taking action. Any system that includes a human element will not scale and will be prone to errors. Second, many of the conditions being sought will have a temporal element. For example "if event *c* occurs 48 hours after event *b* and 2 hours after event *a*, then…". These types of conditions are exceedingly difficult, if not impossible, for humans to observe.

For these reasons, IoT systems require advanced analytics and learning algorithms to be effective.

> **Key takeaway:** Data visualization tools might be nice to have (e.g., to show management what they paid for) but are insufficient.

After data, business rules and actions are the core of IoT

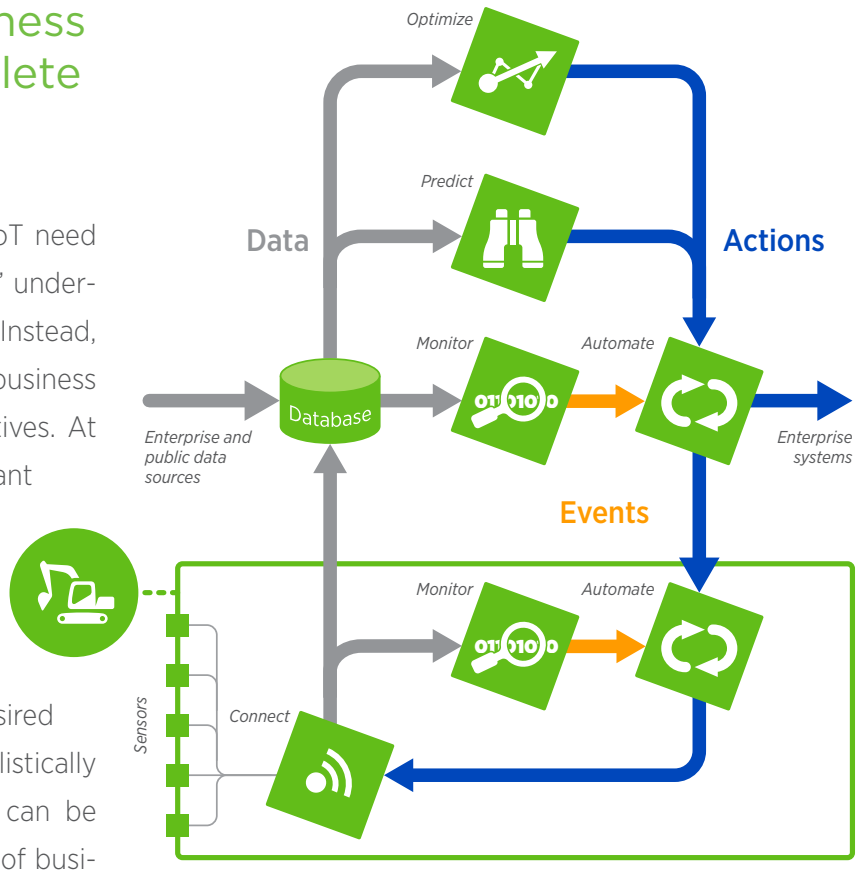
Ultimately, device enablement, data capture, data monitoring and visualization form only the first half of successful IoT implementations. In a way, they represent the inputs. The second half, the outputs as it were, represent the most critical aspect of IoT because this is what, ideally, satisfies the business outcome objectives that started the process. Too often, IoT implementations focus almost exclusively on the first half of the problem and, as a result, fail to meet business objectives.

Successful IoT implementation must "close the loop" by applying business rules/logic to data and event streams and then automatically taking pre-defined actions. This step represents a closing of the loop with regard to IoT: first collect and monitor data, next apply rules to the data stream that trigger events, and then, finally, automatically take prescribed actions. This step also allows organizations to begin predicting events and optimizing outcomes

> **Key takeaway:** IoT systems are incomplete without robust business rules and the ability to automatically take action as a result of those rules.

Conclusion: achieving business objectives requires a complete IoT system

Large scale, multi-domain projects involving IoT need not be—in fact should not be—"boil the ocean" undertakings with high degrees of risk and complexity. Instead, IoT should be viewed as an enabler of specific business objectives and tailored to satisfy those objectives. At the same time however, it is critically important that the entire IoT cycle be included in the architecture. Lacking elements that analyze large data sets, apply sophisticated business logic, and automatically take pre-specified actions will result in failure to achieve desired business outcome improvements. Designed holistically but implemented pragmatically, IoT systems can be scaled and adapted to improve a broad range of business outcomes.



Bsquare: The business of IoT

For over two decades, Bsquare has helped its customers extract business value from a broad array of assets by making them intelligent, connecting them, and using data collected from them to improve business outcomes. Bsquare software solutions have been deployed by a wide variety of enterprises to create business-focused Internet of Things (IoT) systems that can more effectively monitor assets, analyze data, predict events, automate processes and, in general, optimize business outcomes. Bsquare couples innovative software with advanced professional services that can help organizations of all types make IoT a business reality.

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