Microsoft

Addressing ROI in Internet of Things Solutions

A practical approach to calculating the return on investment for the Internet of *Your* Things.

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Executive Summary

The Internet of Things (IoT) promises transformative opportunities across your business, yet determining whether or not to get started is often a challenge. The many solution components and considerations make it difficult to know how IoT can add value to a specific business scenario. And unlike many mature trends, there's little guidance about evaluating potential return on investment (ROI) for IoT.

In this paper, Microsoft offers a simplified approach for determining the ROI of an IoT investment, using an example of a firm implementing a remote monitoring solution. It starts with defining a business objective and comparing basic implementation costs to potential long-term savings. It then outlines other considerations, such as evaluating the less obvious costs and unexpected benefits of an IoT solution.

This paper also recommends a practical approach to implementing an IoT solution. By building in phases, you can minimize the risk of deploying an end-to-end solution. Starting small also helps you adjust and refine your solution in a manageable way. Once the initial deployment is running smoothly, you can scale out to the rest of the scenario. As you continue to fine-tune the solution, you can evaluate adding new business processes and scenarios to extend the benefits of IoT across your business.

Whatever your industry and whatever your scenario, Microsoft has the expertise, IoT capabilities, and strong partner ecosystem to help you through every step of the journey.

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Introduction

The Internet of Things (IoT) is increasingly described as the next multi-trillion-dollar opportunity and the solution to many business problems. McKinsey Global Institute predicts that the potential economic impact of IoT will be $4 trillion to $11 trillion a year by 2025.[1]

IoT projects may go by different names depending on the scenario, but the principle is generally the same: connect devices, sensors, cloud services, and data to provide new insights and enable better decisions, improved processes, and new business opportunities. As IoT continues to gain traction, solution providers are jockeying for market positions, and business leaders are evaluating whether and how to invest.

While high-level benefits and long-term projections bring awareness and help shape future policy development, they do little to assist line-of-business decision makers in planning and justifying IoT solutions. The excessive publicity and market hype surrounding IoT makes it easier for companies to make costly mistakes, such as implementing too large of a solution or getting locked into a specific provider. It may also lead to some businesses dismissing the trend as pure hype, forgoing the tangible benefits that IoT can offer. These missteps can be prevented, or even corrected, by building the proper perspective and using the right approach to implement a solution.

IoT projects are significantly different than traditional IT investments
Compared to IT trends, such as virtualization or VPNs, IoT is more involved and far-reaching. For example, virtualization enables companies to maximize server infrastructure usage and operate more efficiently, but it does not fundamentally change the way that company conducts business. IoT has the potential to transform business processes.

By claiming that IoT can transform your entire business, many vendors imply that all areas of your company must be connected and integrated—a complicated and time-consuming endeavor. IoT solutions also require a large number of components that may span many areas of the business: devices, connection methods, data storage decisions, analytics platforms, security, and many more. Each of these must fall within budget, deliver the necessary functions, and integrate with all of the other pieces. Most organizations don't have the staff with deep expertise in each of these areas and must look to third parties for solution ideas.

Like many emerging trends, third-party IoT players and their solutions add to the confusion. Each one seems to have a strength in one or two of the areas mentioned above and approaches IoT from this perspective. Their solutions showcase their strengths but may have difficulty scaling or integrating with other platforms or products. Wrangling the right providers while ensuring that they work well together can be a daunting task.

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[1] http://www.mckinsey.com/business-functions/business-technology/our-insights/the-internet-of-things-the-value-of-digitizing-the-physical-world

Implementing IoT requires a new approach

The far-reaching nature of IoT solutions requires a new way of thinking about implementation. Unlike traditional IT solutions, which primarily affect the technology in your business, IoT solutions can fundamentally improve core business processes—that is the main reason why they can be so transformative.

In traditional solution areas, there are standard benchmarks and established best-practices for calculating potential ROI and implementing a solution. For example, there are ROI calculators and guides available for implementing IT solutions, like ERP systems. The typical approach includes comparing cost reductions over time to the initial investment and calculating a payback period.

IoT is an emerging trend, so standards and practices are not yet broadly established. Additionally, even similar IoT solutions may be used very differently. A remote monitoring solution could monitor vending machines or oil drilling equipment in remote locations, making ROI projections quite different. Calculating ROI for an IoT solution includes not only initial cost and savings calculations but also the new opportunities available from the connected solution.

This paper explores a practical approach to determining the value of incorporating IoT into your business. While implementing any solution requires a certain level of depth in planning, this paper highlights the importance of understanding your IoT business case and framing it in simple terms. It also demonstrates the value of phased investments and shows how Microsoft is uniquely positioned to help you take advantage of IoT. This paper is divided into 3 main sections:

Begin with a business objective in mind	Start with basic calculations	Invest in phases to improve ROI

Begin with a business objective in mind

Given the enormous benefits and opportunities IoT promises, it can be tempting to move forward rapidly with an IoT solution without clear direction. But scoping an IoT project too broadly and connecting and integrating every device right away can create substantial up-front costs without providing tangible benefits, potentially derailing your project before you see results. Installing technology for technology's sake is a poor way to realize ROI. Yet doing nothing has opportunity costs—leading players across industries are seeing value from IoT, and those who do not consider these solutions risk getting left behind.

While IoT solutions may provide value throughout your business, it is helpful to start by determining a specific business area to address with your project, such as customer relationships, supply chains, or operations. By narrowing to a single business area, it becomes easier to scope costs and demonstrate benefits. Without a defined focus area, proving ROI becomes more challenging, as it becomes difficult to associate related costs.

After deciding on the focus area of your IoT investment, determine your business objective. Consider what problem you are trying to solve or opportunity you are trying to address. Are you trying to cut costs? Increase revenue? Expand service offerings?

Whatever your objective, it is important to consider both your starting point and your end goal as you scope the project. For example, if your assets are not yet connected, the scope of your project is going to be broader than if your assets are already capable of collecting and transmitting data. An end goal of developing a new revenue model will likely involve a broader scope than a project focusing on improving efficiency in a single business process.
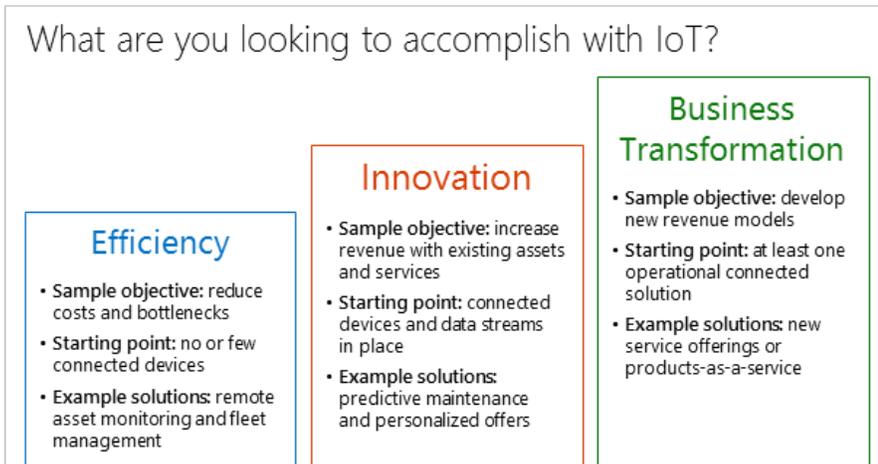
When evaluating an IoT project, take into account both your starting point and the target objective. Most companies start using IoT for efficiency gains and add capabilities and scenarios that help transform business processes once connections are in place.

From there, you can perform cost analysis and risk assessment, offering stakeholders tangible evidence of the benefits of the proposed solution. Evaluate multiple scenarios to form some initial comparisons and determine how IoT can offer the most value.

To help explain the process, let's look at an example company that manages vending machines across a large geographical area. For this company, revamping core business processes to incorporate IoT has the potential to bring substantial benefits, such as reduced operating costs, increased revenue, and an optimized customer experience.

However, decision makers recognize that starting with a defined objective can help them get started quickly and expand to new scenarios down the road. They note that machine maintenance costs are high and want to know if IoT would be a worthwhile investment for this area.

Your business objective depends greatly on your industry and on your specific business. For some, it's streamlining operations with predictive maintenance; for others, it's improving visibility and control of globally distributed assets. The key is to define a specific objective and apply a methodical approach to determine if it's a worthwhile investment.

Vending Machine Example

This paper uses an example company to demonstrate the concept of calculating ROI. While your industry and scenario may be different, the process the vending machine company uses is applicable across industries.

Start with basic calculations

Calculate the most basic costs and potential savings

Once the objective is identified, it is helpful to begin calculating the most basic costs associated with that area of the business. While every business and every scenario is different, this step can often be done without complex calculators or in-depth spreadsheets.

In the vending machine example, the company looks at the overall costs of servicing machines—the number of visits per month, average labor and equipment cost per visit, and travel costs—and calculates a broad total-service cost.

By talking with a few technicians, the company figures out that despite monthly service calls, some machines break down between visits, resulting in lost revenue. Other machines do not require service at all, making a maintenance visit unnecessary. If their IoT solution could eliminate both the unneeded maintenance trips and the lost revenue from lengthy machine downtime, the vending machine company could see substantial cost savings. It could also use historical data to determine what maintenance is most effective and what is not useful.

After identifying the potential savings, it's important to consider the general costs of implementing the solution and calculate a breakeven point. The vending machine company finds that it not only has to pay for connecting devices and integrating systems, but it also needs someone to train all of its employees to use the new solution. Adding installation costs, integration costs, and employee training costs puts the breakeven point at a date farther out than first anticipated.

While these simple calculations provide a great starting point for evaluating an IoT project, they do not tell the complete story. With only the basic estimates, you may adopt a solution and incur hidden costs or reject a proposal and miss out on tremendous opportunities. To gain a more accurate prediction of ROI, you need to factor in the less obvious costs and consider new possibilities of a connected solution.

Factor in the less obvious costs

Although implementing an IoT solution offers the potential to greatly reduce costs from normal business operations, it is important to keep in mind that the solution itself comes with new costs. Most people compare the potential savings to the cost of planning, purchasing, and configuring, but there are other factors that should be considered, including:

- **Implementation downtime costs.** Not only does a solution require an investment to implement, it can also take away from production during installation. Retooling a plant floor or installing smart meters may involve outages and revenue loss. For the vending machine company, each machine needs to be taken apart so sensors can be installed. If the company doesn't plan ahead to rotate out machines for service, the retrofitting could result in lost revenue while machines are offline.

> ### Case study: Taking elevators offline
>
> An elevator company wanting to improve reliability and offer customers new predictive maintenance installed an IoT solution that helps gather insights from its sensors and systems worldwide.
>
> To implement this solution, the initial investment included the cost of taking elevators offline to install sensors and configure systems.
>
> Check out the customer story

- **Retrofitting costs.** Not all machines can be directly connected to an IoT solution, and retrofitting existing machines can generate extensive costs. In the vending machine example, some machines have no connection capabilities whatsoever; it may be more cost effective to replace the machines with new ones instead of retrofitting the old ones.

- **Consulting costs.** Unless your workforce has the capabilities to plan, implement, and manage IoT solutions, you will likely need to look to third parties to perform these tasks. It will likely require more than one provider, and each of them will charge for implementation and ongoing consulting services. The vending machine company works with two different partners—one to connect the devices and another to provide a platform for data storage and analytics.

- **Platform costs.** Regardless of solution provider, any IoT solution has the ongoing cost of paying for the data storage, processing, and analytics involved. Be aware that each vendor may use a different pricing model—some offer a fixed-price subscription while others charge a metered price for each service. Each vending machine sensor connects to a central platform that collects and compiles data. The company pays a monthly fixed price, which includes both the use of the platform and the partner's consulting services.

- **Ongoing operational costs.** IoT solutions often reduce overall operating expenses, but they also add operating expenses of their own. Regardless of industry, devices and sensors all require a power supply and Wi-Fi, cellular, or other forms of connection; each of these increases the operating costs. There are also ongoing costs for operating, maintaining, and updating the solution itself. The vending machine company works with a mobile network operator to

connect the sensors in each machine and incurs monthly charges from its ongoing connectivity service plan.

- **Security costs.** Connected devices need security measures in place to ensure the integrity of the data and prevent unauthorized access to devices. Even on a secure platform, devices, connections, and users themselves may open vulnerabilities that need to be addressed. Without security measures in place, the vending machine company risks losing merchandise to users who find ways to exploit data connections. It isolates its systems to prevent a compromise in one machine from impacting the entire network. Other solutions will have their own specific requirements, such as securing video feeds or setting up safeguards to defend against digital attacks.

> ### Case study: Security in healthcare industry
>
> A national healthcare provider integrated a remote patient monitoring solution, connecting smartphones and devices like blood pressure and glucose meters. This solution increased the level of patient care and safety through near real-time remote monitoring of vital signs and automated alerts.
>
> The healthcare provider invested in protecting the security and privacy of patient data to ensure compliance with industry regulations.
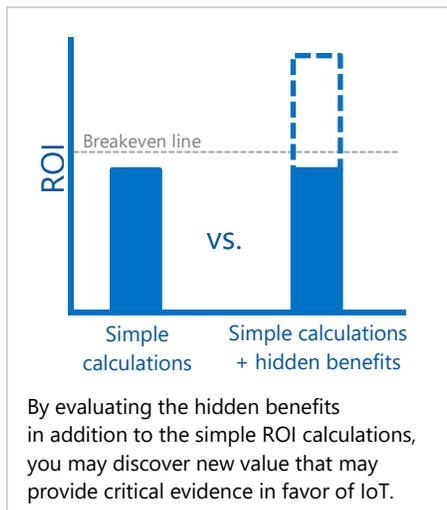>
> Check out the customer story

- **Lock-in costs.** Not all IoT solutions are equal, and ones that are limited in scope and not built to scale can require a major overhaul down the road. If a turn-key fleet management solution is cheaper to implement but can't scale to include new scenarios like predictive maintenance or inventory management, the low up-front costs will not offset the costs of reworking the solution when needs change. If the vending machine company does not plan for future business needs, it could end up locked into a solution that will not be able to address its needs down the road.

By determining the actual costs of these factors, the vending machine firm is less confident that an IoT solution is the right investment. It seems that the breakeven point is too far in the future. However, to round out the assessment, the company also needs to look at some potential benefits it could gain from implementing an IoT solution.

Examine the new possibilities of a connected solution

Many companies look to IoT to reduce costs and expenses. Once one solution is in place, however, it may generate new benefits beyond its initial intended use. The majority of these benefits will have calculable financial impact that, if quantified, can help support your business case for an IoT implementation. Even those

By evaluating the hidden benefits in addition to the simple ROI calculations, you may discover new value that may provide critical evidence in favor of IoT.

that are not easily defined by dollar amounts can still support an investment in IoT. Examples of new possibilities include:

- **Extensibility to new business processes and scenarios.** Once the underlying infrastructure is in place, it can be a lot simpler to add new capabilities and extend to other processes and scenarios. Initial investment costs may be higher, but by planning ahead, you can reduce the costs of other implementations down the road. This still factors into the cost savings of the overall solution because the cost of the initial implementation is spread over multiple scenarios. While the vending machine company's original intent was to monitor machine maintenance, it determines that it can use the same sensors and connection points to begin an inventory management solution for all of the connected machines.

- **Revenue-generating capabilities.** While reducing operations costs is a major focus of IoT solutions, that same cost-reduction solution may also be able to generate increased revenue. As data is collected and analyzed, new trends may reveal new revenue opportunities. These opportunities may include personalizing offers to customers, scaling based on user demand, or providing new services like preventative maintenance. For example, with granular visibility into each machine's inventory and customer purchasing behaviors, the vending machine company can identify correlations in the merchandise purchased at different locations at different times of day and year. With this information, it can adjust inventory at specific locations to maximize sales. This level of visibility also helps reduce the cost of maintaining inventory items that do not sell.

- **Valuable customer preference data.** The information you collect may be beneficial to other companies as well. A car manufacturer that tracks vehicle information could sell valuable customer data to insurance companies, creating data monetization opportunities and generating new revenue from an existing IoT solution. Once the vending machine company determines that its sensors can also be used to identify customer buying preferences, it begins marketing that information to other businesses with similar interests, such as the company's suppliers.

- **Qualitative benefits.** An IoT solution may provide "soft ROI" benefits, such as improved customer satisfaction, greater worker safety, and increased business flexibility. While these often contribute to increased revenue, their specific financial gains may be difficult to discern. Adding value to the customer through lower prices, increased security, or faster delivery of care can improve customer loyalty and ROI. For example, by alerting technicians which machines need repair and when, the vending machine company offers repair staff more predictable schedules and reduced stress.

> ### Case study: Increasing worker satisfaction at great speeds
>
> A Formula 1 race team incorporated a connected solution that helped them significantly reduce the number of systems they use for parts, manufacturing, and production.
>
> These changes improved visibility and helped employees more easily see how their own contributions impacted the car and their teammates, resulting in increased worker satisfaction.
>
> Check out the customer story

With each level of new possibilities, the business case for the IoT solution becomes stronger. After evaluating the ROI for this scenario, including the hidden ROI benefits, consider other areas where IoT could potentially add greater value. If connecting vending machines doesn't provide the necessary return, consider which other scenarios—such as supply chain tracking—could deliver value instead.

When developing a business case for IoT solutions, it is important to start simple, using basic ROI calculations to develop a general indication of the value an IoT solution can provide for that business scenario.

Evaluate available solution providers

Identifying your business objective and costs up front can help narrow your search to specific solution providers that can help you reach your goals. If you don't know where to start, it may be helpful to work with a partner right away who can assist you in identifying potential IoT use cases and developing a business case. Pick a provider that aligns to your business goals and use them as an advisor throughout the process.

Whenever you begin considering solution providers, make sure to ask strategic questions to ensure the right fit for your business. Example topics include:

- **Expertise:** Do they have a history of offering connected solutions? Do they offer multiple capabilities essential to an IoT solution, such as device connectivity, a services platform, and analytics?

- **Integration:** Do they work with your existing infrastructure? Do you have to replace all of your devices?

- **Scale:** Can you start small and grow as needed, or do they require a long-term commitment up front? Does their platform enable you to incorporate new capabilities as your business needs change?

Choosing the right IoT team is a vital part of the process.

The vending machine company evaluates several vendors and considers Microsoft as a partner for its IoT solution for several reasons. Microsoft has the expertise in building connected solutions and can help—either directly or through one of their many partners—plan, deploy, and scale an IoT solution. Microsoft also offers preconfigured solutions, such as remote monitoring, that they can use to get started quickly and test out capabilities without heavy up-front investment. With Microsoft's open cloud platform, the vending machine firm can connect its existing machines, regardless of manufacturer or operating system.

Invest in phases
to improve ROI

As mentioned previously, IoT investments are fundamentally business investments, not IT solutions, so the implementation approach you take should be different from a traditional IT project. The all-encompassing scope of these solutions makes a phased investment the best approach.

Phased investments help minimize risk, even though some phased deployments may not maximize your initial investment. Phases enable you to adjust and refine a small-scale deployment before expanding out across your business. They also reduce the risk of realizing an error, anomaly, or unforeseen issue in full production and having to rework every connection and integration point. When planned correctly, phased investments can also help you lower costs of future investments, boosting the ROI of the entire solution. Phases typically fall into 3 main categories:

Start small and start fast

Once you decide that an IoT solution is right for your business and have chosen a provider, starting quickly helps sustain momentum. Choose an initial deployment within your price point, ensuring that the solution platform is robust enough to expand to new scenarios down the road to minimize rework.

Pick a small subset of your targeted business case and work with your provider to deploy a proof of concept (POC). It may seem counterintuitive to start with only a few devices, but a small-scale start helps you detect and address issues before you roll out broadly. Once this subset is connected, you can decide which additional business process changes are needed, determine the most relevant data, and adjust the solution to better address your target business scenario. All of this provides a strong foundation for scaling the solution when you are ready.

Small beginnings may not necessarily mean small initial investments. Planning ahead and increasing up-front investments can make expanding the solution faster and easier down the road. The vending machine company finds that it can receive a bulk discount by installing sensors on all machines at the same time instead of staggering installation. It decides to install sensors on all 1,000 machines up front, while only using the data from 25 in the initial POC. This decision increases the initial investment and reduces the short-term ROI. In the long run, however, it makes all of the company's subsequent phases cheaper and faster because the initial connections are already available.

Addressing ROI in Internet of Things Solutions

Scale out to production

After running a proof of concept or pilot and refining the solution based on initial learnings, the next step is scaling out to achieve the target business outcome. This may entail connecting additional devices or incorporating increased data volumes. There will still be adjustments during this phase as you continue to refine data streams and adjust business processes. During this phase, the ROI is often more noticeable as cost savings from the solution, such as reduced equipment failure or lower fuel consumption, start offsetting the earlier investments. In addition, as the solution is rolled out into production, adjustments can be made based on lessons learned from the pilot, contributing to greater ROI than anticipated.

In our example, because the vending machine company installed sensors on all machines early on, it can scale the solution much faster in this phase. It realizes higher ROI during this phase by incorporating new devices and data without additional up-front costs. The solution built on the Microsoft Azure platform easily adjusts to incorporate the new additions.

Once this phased approach reaches a broader level of integration and historical data, new insights may become available, helping you identify new areas where IoT can add value.

Extend to new scenarios

Down the road, as you realize noticeable returns from your IoT investment, you can begin extending to new scenarios and business needs. Using the same approach from the first solution, evaluate the costs of addressing new scenarios and calculate the expected ROI. Because the original investments are already in place, ROI should be higher and break even sooner for additional scenarios. Start small by adding one or two new capabilities to the existing system. Refine the data, determine business processes to alter, scale the solution, and repeat. In some cases, adding new capabilities may completely transform business processes or create entirely new ones.

The vending machine company's solution on Azure can automatically integrate with its Microsoft-based CRM and inventory systems down the road. As the company grows, it begins incorporating these other systems to turn new data into insight and realize even greater value from the IoT solution. It even pursues some experimental ideas, like deploying new vending machines with more intelligent capabilities that suggest products to customers based on time of day, weather, and previous buying habits.

Conclusion

As an emerging trend with transformational promises, multiple components, and a lot of choices, IoT inherently seems to involve a certain level of complexity. The complexity should not hinder action, however.

There are simple ways to get started, using basic ROI calculations to develop a business case and a phased approach for implementation. After defining your business objective, calculate the most basic costs and benefits to get an initial view of your scenario. Then

make sure to consider less obvious costs and benefits to get a better understanding of the project's expected ROI.

Regardless of where you are in the IoT evaluation process, Microsoft can provide tools and resources for every step of the journey—from developing a business case and calculating ROI to rolling out a full solution. Microsoft resources include:

- **A strong partner ecosystem** that will not only help you identify areas you need to address but will also provide continued support throughout the deployment and management of your solution

- **A robust portfolio of enterprise-grade solutions** that enable you to connect and scale with efficiency, analyze and act on new data, and integrate and transform business processes

- **Preconfigured, modular IoT solutions,** like remote monitoring and predictive maintenance, that help you get up and started quickly and add new capabilities across your business

Microsoft's open approach to IoT means that you can start with the devices you already have, regardless of vendor or operating system. Connect the systems you already use to the scalable Microsoft platform to realize greater value from the Internet of Your Things.

Learn more
- Check out Microsoft's IoT offerings at www.InternetofYourThings.com

- Find a partner to help you get started in IoT

- Keep up on the latest IoT research, customer stories, and market insights with the Microsoft IoT blog