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IOT STRATEGIES FOR DIVERSIFIED BUSINESSES

WHITE PAPER

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1. Introduction

Although it has been known under different names over many years, the Internet of Things (IoT) is suddenly the thing. The ability to connect, remotely manage, and monitor networked devices via the Internet is becoming pervasive. And the incredible rate at which IoT is growing has simultaneously created one of the biggest threats and opportunities for growth in recent memory.

However, building an IoT solution is complicated. Sensors, short-range RF networks, gateways, security concerns, web services, information technology (IT) maintenance and monitoring, web and mobile application development, and enterprise integration are all parts of the system that must be solved. Enterprises seeking to enter the IoT space often have expertise in building durable goods, but not networking, sensor networks, or IT. Additionally, these enterprises are often very diverse, with numerous divisions, product families, and business models that only further complicate the already-complicated world of IoT.

This white paper outlines a nine-step sequence to enable diverse enterprises to create a clear IoT strategy that cuts through the noise and complexity, and establishes a common framework that can be leveraged by connected product families across an organization.

2. IoT Strategies for Diversified Businesses

2.1 IDENTIFY THE OPPORTUNITIES

Some industry estimates predict there will be 20+ billion connected devices online by 2020, representing an overall IoT market size of $200+ billion. Other studies have predicted much higher growth than this, suggesting the annual IoT global economic value will exceed the US GDP by 2025. In order for the industry to achieve these great heights, diverse enterprises must begin to contribute new, innovative product offerings to the IoT market. Those interested in doing so face a number of exciting opportunities for growth, differentiation, and discovery that should be identified and fully explored.

INCREASED REVENUE

One of the most obvious benefits of an Internet-enabled product is the potential for new or increased revenue. Connectivity can add a wide array of cutting-edge features to existing product lines that can fetch a higher retail price than their non-connected counterparts. Connectivity also enables companies to generate recurring revenue from customers and existing products in a way that was not possible before. Rather than a one-time sale, connectivity enables enterprises to also charge monthly fees for value-added services, like remote monitoring and status alerts, that go straight to the bottom line.

REDUCED OPERATIONAL EXPENSES

Internet-enabled products also offer the potential for reduced operational expenses. For example, connected equipment can send email or text notifications when service or maintenance is needed, so personnel can be dispatched on a just-in-time basis to avoid costly or unnecessary service calls. Historical data from connected equipment can also help better anticipate service needs by identifying when and how equipment is likely to break down. This type of information can inform advanced parts replenishment, increasing productivity and reducing operational expenses associated with unexpected downtime.

INCREASED DIFFERENTIATION

As IoT becomes increasingly pervasive, consumer demand for connected product offerings will give enterprises a huge opportunity to revolutionize their industries. By offering new and cutting-edge features not previously available, an organization can establish itself as an industry leader, differentiate itself from competitors in the marketplace, and increase the awareness and positive perception of its brand. A connected product offering can also boost sales of existing products and position a company to capture a large share of the fast-growing IoT product market.

DATA DISCOVERY AND INSIGHT

While the main purpose of data collection may vary greatly from IoT application to application, that data can always be used internally to create a valuable platform for discovery that informs decisions and provides feedback. For example, an IoT system can gather product usage data that provides marketing insight into consumer behavior and future needs. It can also serve as a test platform to collect data on engineering units, complete diagnostics on product function in the field, and identify next-generation design modifications. This insight is priceless and can be utilized to improve an organization's IoT product and long-term strategy.

STREAMLINED CUSTOMER SERVICE

Connected products can make customer service more effective, as support staff can access key usage and performance data for customer equipment on demand to quickly find and fix issues. Customer dissatisfaction can also be preempted by proactively monitoring connected-product performance, alerting customers of potential issues before they even happen.

REDUCED RISK

Connected products can be deployed to any area to monitor and alert on troublesome issues before they become a reality. For instance, detecting water leaks in basements and monitoring automobile driving habits can reduce risk and increase human safety. These products may also enable insurance companies to sell policies at lower rates if the insured item or person is monitored in a way that reduces risks.

INCREASED SECURITY

Connected products can enhance security. For example, connected monitors can detect minor structural damage in bridges, or monitor door locks and smoke alarms as part of a home security system. Ambient security devices that detect motion, light, or vibration in a physical environment can also alert on abnormal

movement or activity that may threaten security.

REGULATORY COMPLIANCE

In cold-chain systems, regulations by the Food and Drug Administration (FDA) require that certain food types are stored at specific temperatures. If a refrigeration case in a supermarket exceeds the specified temperature for a pre-determined period of time, the food must be discarded. A remotely monitored cold-chain system can help grocery store chains document evidence of compliance for FDA regulators. The same is true for convenience stores, and for the transport and storage of drugs and biological materials.

CONNECTED BRAND STRATEGY

As fast-moving consumer goods set new standards for consumer connectivity experiences, there is an opportunity for brands to benefit from transitioning to a connected company. For example, an engine trend monitoring company can become a *connected* engine trend monitoring company, or an irrigation system company can become a *connected* irrigation system company. This transition can increase brand loyalty as customers engage at a deeper level with products, increase customer support flows and operations, and show that the brand is relevant, modern, and forward thinking.

2.2 BE REALISTIC ABOUT THE CHALLENGES

Although the opportunities abound for enterprises willing to make the leap into the IoT market, the road to success is not guaranteed and an innovative product idea is not enough. In order to be successful, it is crucial for enterprises to fully understand the potential challenges they may face and develop a strategy to address them before embarking on an IoT product deployment.

INTEGRATION

Frankly, developing cloud-connected products from scratch is a difficult proposition. One of the biggest challenges is the number and variety of technologies that must be integrated. The range of software skills required spans IT, web technologies, and embedded development. And a significant amount of development time and money is required to integrate the many pieces of an IoT solution (e.g., sensors, devices, gateways, networks, servers, user interfaces, business systems).

Depth in this range of skills is not typically found in a single company, especially one in which the core competency is not IT, and this type of talent can be hard to find. A person or team that can traverse the entire IoT technology stack and also provide business model inputs is hard to come by. Companies must be realistic about the internal capabilities they may or may not have to handle the varied demands of an IoT solution and be prepared to reach out to industry experts who are well versed in implementation and integration to fill the gaps.

SECURITY

With the rapid growth of the IoT industry, issues of security and privacy have taken center stage. And, as enterprises feel increased pressure to join the IoT game, security can become a back-burner consideration. However, as connected devices begin to perform more and more important functions (e.g., lock doors, manage sensitive data), the motivation of hackers to infiltrate these systems will only increase. Creating an effective and appropriate IoT security strategy is one of the most important steps an enterprise can complete.

Unfortunately, security in IoT solutions is not one-size-fits-all. The ideal security features for any IoT application depend heavily on the type of device being used, the mode of communication, and the type of data being communicated. Understanding the available options and ideal solutions can be a daunting task. The Federal Trade Commission (FTC) recently released a report[1] suggesting several best practices to ensure privacy and security in IoT systems, including taking advantage of readily available security tools and existing expert knowledge. This highlights the importance of choosing experienced IoT partners to supplement an organization's internal resource capabilities.

In order for individual enterprises to realize their potential in the IoT space, they must fully understand the security implications associated with their IoT solutions and be prepared to address them at each stage of the design process. For a more in-depth discussion of IoT security considerations, see Exosite's *Security in IoT Systems* white paper.[2]

OPERATIONAL READINESS

Manufacturing, distribution channels, installation, end-user documentation, support, sales and marketing, brand collateral, end-customer billing, and internal product training are all integral parts of a successful connected product launch. However, product development often consumes most of an organization's time, focus, and investment. Issues of operational readiness can easily become a mere afterthought, threatening the success of an IoT product deployment from the start. Instead, operational readiness planning must take place throughout the development process, ensuring the entire organization is prepared to support an IoT solution at product launch.

INTERNAL FRAGMENTATION

Enterprises are as unique as the IoT solutions they seek to create. Many operate with varied combinations of parent companies, sub-divisions, branches, and divisions, each of which can have different products, services, P&Ls, billing needs, and accounting structures. As these diverse enterprises look to enter the IoT space, things can become further complicated if individual divisions develop one-off solutions. Rather than learning from each other and developing a standard framework each division can then customize, individual divisions work through the long and often complicated process of developing an IoT solution on their own. This creates fragmentation that compromises efficiency and consistency.

CUSTOMER NEEDS

One of the biggest challenges of transitioning to a connectivity-focused company is understanding what customers actually want and will pay for. The IoT movement is at its peak, and over the next few years, there will be a boom of connected product launches, some of which will be successful and some of which

1 https://www.ftc.gov/tips-advice/business-center/guidance/careful-connections-building-security-internet-things
2 http://exosite.com/whitepapers/

will not. Those that are successful will seek to solve a specific, tangible customer problem. Surveys, market research, and focus groups are all tools that can be leveraged to identify customer needs. They should be completed early in the planning phase of product development to ensure the insights they uncover are adequately accounted for during design.

EMBRACING INNOVATION

Traditional durable goods companies typically develop core competencies in certain markets and technologies. If those products were not previously Internet-connected, the new frontier of IoT and the many technologies it involves may be daunting. For example, connected products include software that requires additional knowledge by staff to diagnose and troubleshoot issues in the field. In this way, companies must be open to the difficult journey of innovation, where they must develop new core competencies, forge new partnerships, and embrace new technology that ushers them in to the next generation of connected product fleets.

2.3 ASSESS THE RISKS

As with any high-reward opportunity, the risks associated with entering the IoT space can be equally as high. In addition to the challenges noted above, enterprises may be susceptible to the following pitfalls when seeking to deploy an IoT solution:

- **Naive technology selections.** Employees and divisions that are new to the IoT space run the risk of making uninformed decisions about the technologies that are best suited for their solution.
- **Poor execution.** IoT solutions are complicated and require significant inter-department coordination. Inadequate planning can result in poor project execution, especially with regard to multi-team integration and quality challenges.
- **Lack of a comprehensive security strategy.** Security is one of the most important aspects of an IoT solution, and many durable goods companies are ill equipped to create and execute on a comprehensive strategy without outside help.
- **Unrefined business models.** New connected product offerings often require new business models that may be unproven or inconsistent with the way an enterprise has done business in the past; selecting the right business model that will maximize the return on investment is a challenge for many enterprises moving into the digital era.
- **Ill-equipped support teams.** Connected product fleets often require an organization to provide support in a way they never have before. Training programs, internal communications, external communications, and tools that allow support teams to remotely diagnose and troubleshoot issues are often an afterthought that should be planned for from the beginning.
- **Not acting fast enough.** IoT is at the peak of its hype, and that means competitors are actively creating IoT solutions now. Organizations that do not move fast enough will miss the opportunity to capture an early market share of this quickly changing economy. Enterprises should evaluate opportunity costs and market windows to determine the risk they face by not acting.

This list is not exhaustive, and many additional risks may arise based on unique circumstances specific to each enterprise. In order to successfully navigate the IoT market's rapidly changing expectations and table stakes, an organization must carefully access the possible risks and pitfalls.

2.4 IDENTIFY PROBLEMS TO SOLVE

At the outset of any connected product deployment, it is important to understand the market need the IoT solution seeks to fulfill. A clear understanding of this will help inform important technology and trade-off decisions during the development process, set internal expectations about the results, and ensure customer needs are adequately met. Below are a few of the questions that should be answered in an attempt to clearly identify the problems an IoT solution will solve.

- What is the customer need?
- What is the expense to be reduced?
- Where will the revenue be gained?
- How will the corporate brand be furthered?
- How will the solution protect against competitive forces?

Successful IoT solutions solve problems instead of looking for them. Enterprises must develop a culture of purpose that seeks to find and meet problems with solutions, as opposed to merely piecing together technology without a clear vision.

2.5 BRAINSTORM BUSINESS MODELS

An unrefined business model posses a significant risk to the success of any IoT product deployment. It is important to carefully consider the applicable business models to identify one that best suits the product, organization, and target market. In addition to the primary business model categories discussed below, there are many others to consider, including hybrid models, subsidy models, pre-paid models, advertising models, and more.

REVENUE GENERATION

The value-added features of connected products lend themselves well to a revenue-generating business model. As a part of this model, it is necessary to consider whether the costs associated with connectivity will be:

- Charged to the customer on a recurring basis
- Built in to the cost of the hardware
- Free for the first N months and then charged to the customer thereafter
- Subsidized by network carriers or insurance companies

If the costs of connectivity will be passed on to the customer, organizations must ensure the necessary infrastructure is in place to bill customers for these services if they have never done so before.

EXPENSE REDUCTION

Organizations seeking to take advantage of the predictive and proactive nature of connected products may benefit from the expense-reducing business model. Under this model, an organization must have a realistic and proven plan to ensure the expense reductions associated with the connected product will offset the costs associated with its development and deployment.

FREE

A business model in which connectivity is offered free of charge is well suited for enterprises seeking to use the collected data for internal purposes. This model allows an organization to leverage its IoT solution to enhance differentiation from competitors, streamline customer service processes, or gain insight into customer usage and product performance.

2.6 SELECT A TECHNOLOGY FRAMEWORK

In order for an enterprise to deploy a successful IoT strategy, it must create value for customers, distributors, dealers, service personnel, and users. Much of that value depends on the way in which the selected technology framework allows data to be collected, stored, and shared. Figure 2.1 below outlines a number of connected deployment patterns that should be considered in order for an enterprise to select a technology framework that best suits the needs of their connected products and delivers high value for all parties involved.

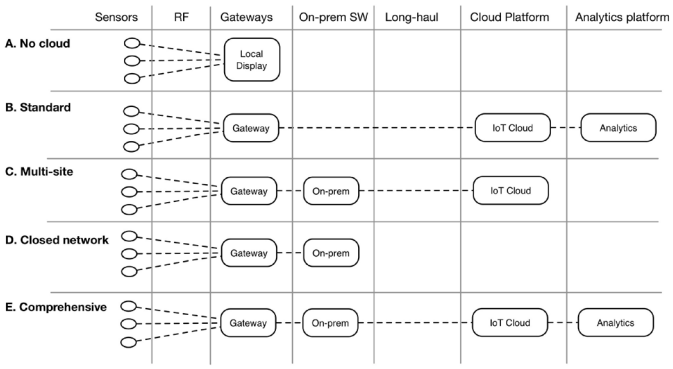

FIGURE 2.1: CONNECTED DEPLOYMENT PATTERNS

A description of each connected deployment pattern is provided below.

- **No cloud.** Some products may only have connectivity to a local display device such as a Human Machine Interface (HMI), smartphone, tablet, or laptop computer. IoT is a broad concept and also applies to configurations such as this that do not leverage cloud infrastructure on the Internet.
- **Standard.** A common deployment pattern is one that includes a series of smart devices or sensors that speak to a gateway device. That gateway device relays data to a software platform (denoted as "IoT Cloud" in the diagram) that stores, processes, and provides views on that data. If the device is a common device such as a pump, it may also have its data routed to a backend analytics solution. There the information is stored and provided to select corporate divisions and personnel to analyze device performance data and failure modes.
- **Multi-site.** As an example of a multi-site setup, consider a chain of grocery stores that each requires monitoring of refrigeration case temperature. Each store has a closed network and so requires an on-premise installation of software (denoted as "On-prem" in the diagram) that can aggregate, store, and alert on temperature events within that store. On a periodic basis, that store also sends aggregate data to a centralized software instance for the entire chain of stores that allows corporate personnel to view and audit data from refrigeration cases across all stores.
- **Closed network.** In instances where regulations, policies, legal liabilities, or technical limitations require that data not leave a local network, a closed-network deployment pattern is required. Common examples include municipalities, medical devices, aerospace applications, convenience stores, and box-box merchants. In this pattern, devices connect (perhaps through a gateway device) to an on-premise software installation that collects, analyzes, and alerts on key events on site.
- **Comprehensive.** In this deployment pattern, all components are activated. Devices communicate with aggregators or gateways, which store data in on-premise software installations that have a connection to an IoT cloud platform. The cloud platform is then federated with a backend analytics platform.

When selecting an IoT cloud platform for a diverse enterprise that may need differing deployment patterns across the organization, consider the following:

- Data storage and retrieval platform with open application programming interfaces (APIs)
- Flexible data schemas
- IT infrastructure hosting
- Eventing system
- Firmware over the air (FOTA) updates
- User dashboard system
- Integration with backend billing systems
- Mobile application user interfaces
- Embedded device hardware and firmware design

2.7 DEVELOP A PROTOTYPE

A marathon is run one step at a time, and a connected product development is not different. At first, the ideal framework and set of technology selections may not be clear-cut. In these cases, the first step should be to develop a prototype that can be used to frame out the necessary parameters and understand the pinch points. The prototype should be end-to-end and include a thin thread that connects the sensor through the device, network, cloud, end-user interface, and enterprise integration.

2.8 REVIEW WITH STAKEHOLDERS

Once the prototype is developed, it is time to complete a post-mortem to understand the successes and failures, obtain customer input, and plan either further refinements to the prototype or additional prototypes. When a final prototype is complete, the solution must be evangelized to other divisions. When doing this, it is important to have a clear set of documents, descriptions, and diagrams that show what has been built and how other divisions can take advantage of the framework.

The shape of an IoT solution for diversified enterprises is often an hourglass, where the middle (platform) is constant across device deployments, but the bottom (device personality) and the top (user interface) is different depending on the products, end user types, and business models. Part of the review with stakeholders after the initial prototype should identify which parts should be kept constant and which parts should be customized for each

IoT solution within the company.

2.9 DEVELOP A COMPREHENSIVE ENTERPRISE IOT STRATEGY

Once the technology framework is in place, an initial prototype has been developed, and a post-mortem review has been completed with key stakeholders, it is time to develop a comprehensive IoT strategy that covers the following areas:

- **Business modeling and options.** Identify the business model or combination of business models that adequately supports the purpose of the product, goals of the enterprise, and needs of the target market.
- **Competitive analysis.** Conduct research to understand which competitors have or are seeking to enter the IoT space, what their product offerings include, and who their target markets are.
- **Intellectual property portfolio strategy.** Develop a strategy to grow and protect the intellectual property associated with current and future connected product deployments.
- **Technology framework.** Identify how data must be collected, stored, and shared to suit the purpose of the product and provide high value to customers, distributors, dealers, and service personnel.
- **Action plans.** Create concrete multi-team plans to show how product development, manufacturing, pricing, distribution, sales and marketing, enterprise integration, and long-term product support will be conducted.
- **Checklists.** Create checklists for IoT deployments so that each new product or division can follow the same set of steps to ensure that enterprise IoT strategy policies are maintained. Examples include creating a business model, conducting a focus group, creating plans that integrate major business units within the company, and adopting/tailoring the corporate IoT security model.
- **Operational readiness items.** Ensure plans are in place for manufacturing, distribution, installation, and end-customer billing.
- **Enterprise web-service federation.** Plan how enterprise software packages will be integrated into IoT solutions, and what aspects may or may not be customized per division or per product.
- **Voice of customer.** Conduct user research, focus groups, and surveys to understand customer needs and expectations.
- **Engineering.** Address the engineering function in the overall IoT strategy to ensure that key intellectual property and other technology elements are leveraged in the best way possible.
- **Marketing.** Develop a strategy, content distribution plan, and brand collateral to capitalize on product features and capture target market interest.
- **Sales.** Ensure programs are in place to train sales staff on product features, differentiators, troubleshooting, and support options.
- **Business unit leaders.** Ensure roles and responsibilities for business unit leaders are well defined. Examples include checklists, business model guidelines for creating return-on-investment models, and device volume/sale projections.
- **Support.** Develop a strategy to provide first-tier support to end customers, including a support website, support hotline, and end-user documentation.

3. Conclusion

IoT solutions are perhaps the single biggest opportunity and threat facing diversified enterprises over the next five years. By understanding the opportunities, challenges, and risks, and by developing a framework, set of steps, and overall IoT strategy, an organization can position itself in the best possible place to succeed.

After years of serving hundreds of customers in a variety of industries and verticals, Exosite can help any enterprise develop a comprehensive IoT strategy through interviews with key stakeholders, strategy recommendations, and on-site support of internal IoT committees. Contact Exosite[3] to find out how we can help your enterprise transition to the IoT generation of business.

3 http://exosite.com

Exosite's cloud-based services provide companies with the technology needed to build and deploy next-generation IoT applications that leverage the expanding world of connected devices. Customers all over the world use Exosite to build custom remote monitoring and control solutions that meet the demands of their connected products, which in turn improves uptime, reduces maintenance costs, and increases value-added service offerings.

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