WHAT SMART SYSTEMS CAN TEACH US

This Wipro and UBM Tech survey examines how smart and connected systems are changing the ways products and services of tomorrow will be delivered, deployed and monetized.

"Remote monitoring is generally the first smart systems use case. The real value lies in the information captured, analysed and acted upon. We also see a move towards embedded intelligence, where you add smarter presence in the devices themselves at the expense of infrastructure and virtualization. Keep in mind that smart systems is still an emerging technology that requires changes to existing architecture before you're ready to dive deeper into device-side smart systems development."
– Nitin Narkhede

Nitin Narkhede
General Manager – Emerging
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Smart systems are devices that incorporate sensing, actuation and control. They can describe and analyze situations, making predictive, adaptive decisions based on the available data and subsequently performing smart actions. However, we're entering into a new frontier in human-machine interactions as embedded computers get smaller and more powerful. Also advances in nano-electronics, sensing and communication technologies enable machine-to-machine interactions giving rise to the Internet of Things and increased use of Artificial Intelligence (AI) and machine learning.

Smart devices, such as home healthcare monitors and those embedded within automobiles, have been part of our lives for more than a decade. They help us perform tasks more efficiently, monitor assets, log system usage and performance patterns, and improve productivity. For example, ultra-low power, wearable medical devices which are small, intelligent devices that integrate sensors and embedded computing with advanced analytics. The result is a system that can remotely measure multiple vital parameters such as heart rate, respiratory rate, skin impedance, blood-oxygen levels and blood pressure, with automated alerts that indicate when a patient should seek medical assistance, facilitating anytime, anywhere, affordable medical care.

The new smart system frontier includes machines and devices, people, cyber and physical sub systems and information all connected and interacting in a seamless, adaptive manner. Smart systems have shifted the focus from individual technologies to overall system intelligence, resulting in fundamental changes in how the products and services of tomorrow will be created, delivered and monetized.

Enterprise Smart Systems

A recent UBM Tech survey commissioned by Wipro on smart systems asked more than 160 business-technology professionals about their plans regarding the Internet of Things. Almost all of the respondents are high-level management decision makers: Most are IT managers, line of business managers and corporate C-level management. In fact, nearly one-third (31%) hold executive job titles (C-level or VP).

Quite a few of the respondents (41%) come from healthcare, IT, financial services and manufacturing, all industries where smart systems have a lot to offer.

Twenty-seven percent of the respondents work at companies with 10,000 or more employees, 28% at companies with 1,000 to 9,999 employees, and 45% at companies with fewer than 1,000 employees. 42% of respondents work at companies with at least $500 million per year in revenue and just over one-third (34%) at companies earning $1 billion or more.

Methodology

UBM Tech conducted an online survey on behalf of Wipro in May 2013. Respondents include 163 business technology professionals with management titles who are learning about, deploying or working on smart systems from various industries across all company sizes.

The greatest possible margin of error for the respondent base (N=163) is +/- 7.6 percentage points. UBM Tech was responsible for all programming and data analysis. These procedures were carried out in strict accordance with standard market research practices.

Survey respondents consider smart systems to be mainly newer devices. High on their list of initial uses for smart systems is remote monitoring and follow-up services connected to remote monitoring.

The survey raises questions regarding smart systems, such as acceptance of consumers to pay monthly fees for services that they rarely use or ones they would only use in emergencies. The results back empirical data showing that smart systems must deliver clear value to the consumer and enterprise, not just information. Smart systems and the people using them need to be able to act on the data the systems provide. For example, a system that tracks monthly electricity usage also should identify inefficiencies and potential savings, and then do something about them.

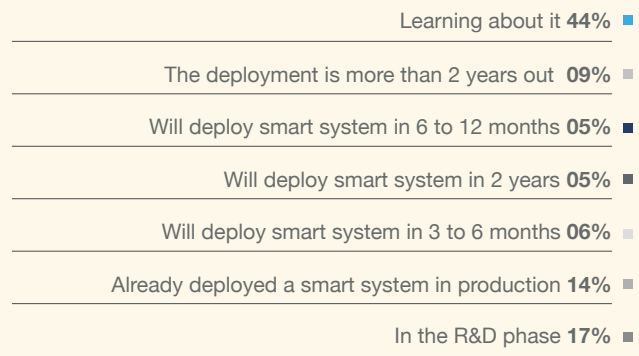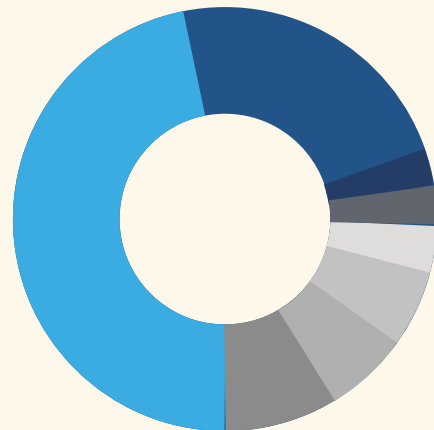## The Current and Future State of Smart Systems

To get a view of what enterprises are doing with smart systems, we asked respondents to rate their maturity level with them. Forty-four percent say that they're in the learning phase, and another 17% indicate that they're in the research and development phase. In terms of actual smart system deployments, 14% say they've deployed at least one system, and 25% are working on systems that will be deployed within 3 months to more than 2 years *(see Figure 1)*.

The largest number of respondents (35%) indicated that connected machines will have the most impact on their business, followed by integrated sensors (24%), location tracking (20%), and sensor networks (15%). However, if you combine all responses related to sensors and

Fig 1 : What is the current maturity level of your smart systems integration?

Data: UBM Tech survey of 163 business technology managers engaged in smar systems deployment, May 2013

Learning about it **44%** ■

The deployment is more than 2 years out **09%** ■

Will deploy smart system in 6 to 12 months **05%** ■

Will deploy smart system in 2 years **05%** ■

Will deploy smart system in 3 to 6 months **06%** ■

Already deployed a smart system in production **14%** ■

In the R&D phase **17%** ■

sensor networks, this percentage jumps to the number one spot with nearly 40% saying sensor-related smart systems will have the biggest impact.

When asked to pick the top three industry sectors that will see the greatest impact from future smart system development, nearly half of the respondents chose healthcare, followed by security (34%), energy & utilities (30%) and manufacturing (28%). Biotechnology, transportation, safety and retail each ranked in the middle at about 20%, with education, entertainment, and construction ranked lowest *(see Figure 2)*. However, the engineering, procurement and construction (EPC) industry is a heavy smart system user, both as part of the equipment used (i.e. drills and excavators) and as part of smart infra-

Fig 2: On which of the following do you believe Smart Systems will have the greatest impact?

Note: Maximum of three responses allowed
Data: UBM Tech survey of 163 business technology managers engaged in smart systems deployment, May 2013

Healthcare	47%
Security	34%
Energy & Utilities	30%
Manufacturing	28%
Biotechnology	21%
Transportation	21%
Safety	19%
Retail	18%
Education	13%
Entertainment	05%
Construction	02%

structure and smart city initiatives.

Security's high ranking reflects the fact that many respondents come from industries like financial services and healthcare. These rankings also depend on whether you're considering the use of smart systems from a business-to-business (B2B) or a business-to-consumer (B2C) perspective. For instance, with B2B, manufactur-
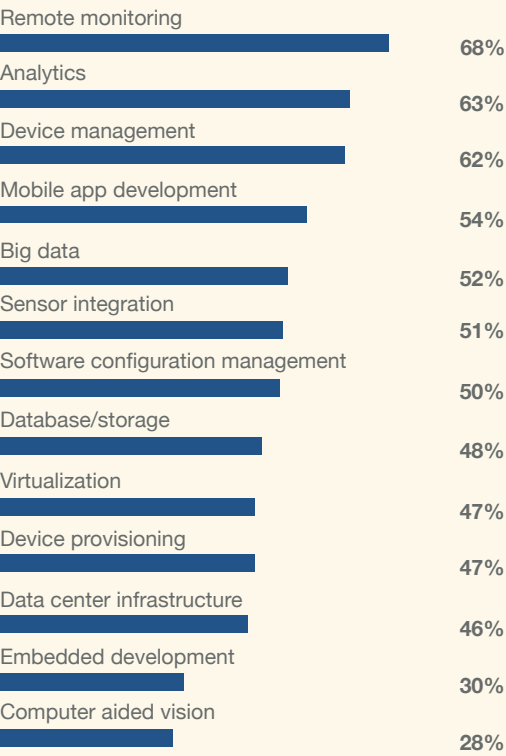
ing would rank higher, compared with B2C where retail may have a larger impact.

Priorities for Future Smart Systems Development

When asked to prioritize various areas of their smart systems development, respondents rated remote monitoring highest at 68%, followed closely by analytics at 63% and device management at 62% *(see Figure 3)*. Monitoring is usually the first use case considered for smart systems, and analytics and management typically provide the most business value.

Fig 3: On which of the following do you believe Smart Systems will have the greatest impact?

Note: Maximum of three responses allowed
Data: UBM Tech survey of 163 business technology managers engaged in smart systems deployment, May 2013

Remote monitoring	68%
Analytics	63%
Device management	62%
Mobile app development	54%
Big data	52%
Sensor integration	51%
Software configuration management	50%
Database/storage	48%
Virtualization	47%
Device provisioning	47%
Data center infrastructure	46%
Embedded development	30%
Computer aided vision	28%

"In terms of impact, the answers will vary based on the scenario . In B2B scenarios, smart systems might have a higher impact in manufacturing, whereas it could be healthcare in case of B2C. It surprises me to see security coming up on top, and may reflect where the industry the respondents come from."

It might come as a surprise that embedded development isn't rated higher, since building smarter devices requires embedded code. However, it's likely that the many respondents who rated mobile app development high (54%) were including embedded apps in that category. Given the tools available, developers are building the embedded intelligence required of smart systems into mobile applications.

Typical enterprise tasks such as virtualization and data center infrastructure are lower on the priorities list. At first glance this makes sense, as these components are most likely already in place for organizations focused on the future of smart systems. However, changes to existing architecture likely would be required before many organizations are ready to dive deeper into device-side smart systems development. For example, with high-value equipment and systems, customers are looking for maximum utilization, so uptime is crucial. Therefore, monitoring becomes important, and diagnostics and fixes must be completed quickly. The true business cost isn't in paying technicians to fix a problem but in the cost of downtime.

In other cases, business liability is potentially high. Enterprise storage systems, for instance, help to ensure data is maintained, and storage must remain available. Predicting system outages and avoiding them is paramount. Smart systems can predict component failure based on usage data, and find and fix problems before a single customer is affected.

This is especially true in manufacturing, where smart systems are deemed to have high impact in our survey. When something goes wrong in the manufacturing process, traditionally you would send engineers and techni-

Smart Systems in Industrial Automation

Industrial automation (IA) is the use of machines and technology to increase productivity and quality when manufacturing goods and delivering related services. IA goes beyond simply replacing people with machines; it analyzes the processes used with a feedback loop to learn from and improve them. As such, smart systems have been increasingly used in manufacturing to improve quality, reduce costs and increase safety.

Mark Hessinger has created a remote services program for IA as part of his work as VP and general manager of services at Gerber Scientific. Smart systems are more mature in healthcare but are an emerging technology in IA, he says. Overall, he expects business-to-business adoption of smart systems to be slower than in the business-to-consumer market.

Based on his experience, Hessinger says, the greatest challenge for smart systems adoption is customer acceptance and a willingness to begin using the technology. Once customers start to use it and see that their data isn't at risk, they quickly become excited with the results, he says. However, getting to that starting point is a challenge. Overall, Hessinger sees improved system uptime assets and equipment ROI as the biggest benefits of smart systems in IA.

cians on location to fix it. With smart systems and proper connectivity, you can perform much of the same work remotely without the travel time and associated costs.

With large potential savings, it's not surprising to see that 21% of our survey respondents say their budget for smart systems development is $1 million or greater. Twenty-seven percent say they don't have a set budget, which could indicate that their focus is on building the right systems despite up-front costs or that associated costs are being built into existing product development efforts.

Feasibility in the Enterprise

As mentioned above, smart systems development is still an emerging field. One reason for this is that mobile devices have only recently had enough processing power, connectivity and battery life. When asked where additional support is needed for successful smart systems deployment, 60% of the survey respondents say connectivity support, 50% device reliability and 48% storage capacity.
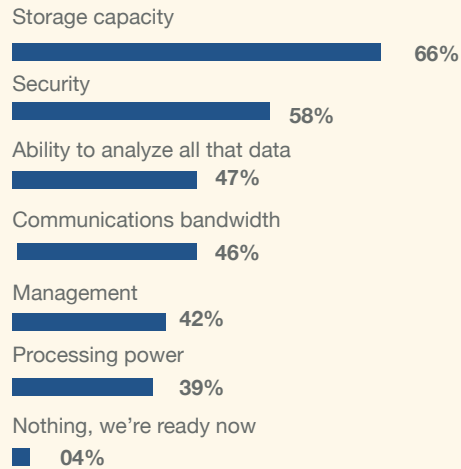
These top three areas of support are followed closely by provisioning, security, remote management and power, in that order. This indicates that as far as the Internet of Things is concerned, we've reached an acceptable level in terms of device battery power, but improved connectivity and reliability (perhaps related to connectivity) are still required.

"An important focus of smart systems is the device itself. The next generation of devices will feature sensor fusion, and data fusion. There will be multiple sensors in multiple domains, and this is an area of focus for Wipro. To go deeper into this, data from these sensors is captured then used to come up with intelligent applications and decision making."

Fig 4: How will your back-end system require change to handle an increase in data?

Note: Maximum of three responses allowed
Data: UBM Tech survey of 163 business technology managers engaged in smart systems deployment, May 2013

Storage capacity — 66%
Security — 58%
Ability to analyze all that data — 47%
Communications bandwidth — 46%
Management — 42%
Processing power — 39%
Nothing, we're ready now — 04%

Enterprise Challenges for Smart Systems

In terms of challenges to enterprise systems, respondents indicate that smart systems and devices would require back-end changes to handle the explosion of data coming from smart systems. Very few say their back-end systems are ready now (see Figure 4). Since they could choose more than one answer, respondents indicate that almost all enterprise systems would require some degree of change.

Although storage capacity and security once again rank high among our respondents, the bottom two choices -- management and processing power -- are still important considering the percentage of those who chose them (42% and 39% respectively).

The Costs of Smart Systems and their Management

Respondents say greatest barriers to smart systems are cost (65%), integration with legacy IT systems (59%) and device management (35%). Regulatory requirements and the existing business model aren't as much of a concern, with less than 20% of respondents identifying

"Costs seem to be the largest barrier to smart systems adoption, but costs are coming down. From what I see, enablement and management seem to be the top issues. In house competency is a big barrier to some customers."

them as barriers. Other barriers include those specific to the respondents' industries, as well as in-house expertise and education. Given the costs associated with deploying and managing sensor networks and associated connectivity (i.e. cellular communications), it's not surprising that cost is the biggest barrier to smart systems success. However, those costs are coming down. Beyond this, device integration and management seem to be the top issues.

Smart Systems Enable Business

When it comes to topline business growth and new revenue streams generated from smart systems, respondents are clearly focused on connected machines, which they say will have the most impact on their businesses. When asked how smart systems will improve their businesses, the majority of respondents say increased process efficiency (57%), whereas 41% indicate increased customer satisfaction and 37% decreased costs *(see Figure 5).*

Closer analysis shows correlation between the answers. For instance, the high ranking of improved human-computer interfaces can be attributed to its relationship to increased customer satisfaction.

In terms of business value, half of the respondents expect smart systems to translate into less than $25 million in business value. Specifically, 30% of respondents say it would be less than $1 million, while 20% say between $1 million and $25 million. Combined with the almost 40% of respondents who say that they don't know the dollar value of smart systems (or would rather not say), the results infer that most are in the early stages of deployment and are testing the market with limited use cases. and start to focus on the new business opportunities they'll enable.

Fig 5: On How do you envision smart systems will improve your business?

Note: Maximum of three responses allowed
Data: UBM Tech survey of 163 business technology managers engaged in smart systems deployment, May 2013

Increased process efficiency
41%

Increased customer satisfaction
37%

Decreased costs
33%

Improved human-computer interfaces
30%

New revenue generating opportunities
26%

Increased revenue across existing products
23%

Competitive differentiation
23%

Solve domain problems
12%

Customer lock-in
09%

Conclusion

Smart systems and devices have the potential to help us perform tasks more efficiently, improve the quality and productivity of real-world processes, increase worker safety, reduce costs and find new revenue opportunities in business processes. Although still emerging in many industries, these systems have already proven themselves in areas such as healthcare and industrial automation for many years.

As seen in this UBM Tech survey commissioned by Wipro, data storage and security remain high among the challenges to smart systems adoption. However, as device capabilities expand and user confidence in them increases, more companies in a wider range of markets will begin and expand pilot programs. And as real-world examples have shown, once companies experience firsthand how smart systems can improve their business and customer relations — and see their competitors doing the same — there will be explosive growth in their use across industries. ∎