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# Accelerating IoT device time to market

An analysis of 30 IoT deployments

July 2020

## Executive Summary

While the IoT industry has big potential, set to reach $1tn in this decade, launching IoT devices and managing them at scale can be a time intensive and complex process. This results in 85% of IoT initiatives not being launched after a year of development. A slower time to market, and often with little initial results to show, is a key reason that greenfield IoT projects within at-scale companies get cancelled.

Key challenges faced include slow decision making in hardware selection, or rushing this decision, without the necessary due diligence, which can have longer term implications. Time and budget can also be spent on building expensive infrastructure, instead of focusing on core application value, that can instead be accessed from third party specialists. Finally, innovation can be stifled as business focus is sacrificed during critical points of a project where product teams are putting out fires in areas they have less experience in, rather than innovating.

To overcome these challenges, Canonical has introduced SMART START, a packaged IoT solution that reduces business and technical decision making into a 2-week, fixed-cost decision. SMART START provides a guided journey through hardware selection and provides the infrastructure needed to develop, customise, and distribute software to fleets of devices. With consulting services to de-risk the journey at critical points, an enterprise's IoT strategy is fast tracked to market.

# Introduction

IoT has a bright future. Conceptually, this stems from a new paradigm in technology: unprecedented computational power accessible and integratable into virtually any device. Industry analysts 451 Research says that by 2024, the IoT market opportunity will be worth $658bn. Similarly, they predict that there will be nearly 14 billion connected devices in the same period.

The last five years in particular has seen some maturity within the industry too; 'winners' are emerging in key consumer IoT use-cases. Amazon's Alexa-enabled range of devices have successfully infiltrated millions of homes and the Apple Watch is worn by sports enthusiasts and CEOs alike.

However, studies on the success of IoT products and projects paint a sobering picture. Back in 2016, Gartner found that 75% of IoT projects took longer than expected. More recently, McKinsey found that 85% of IoT products are still in pilot mode one year from inception, while Cisco found that 33% of IoT projects fail.

This whitepaper distills findings from over thirty case studies, project summaries and business cases about customers that came to Canonical for help with their IoT project. We will use this knowledge base to isolate why IoT projects stall or even fail due to slow decision making, technical complexity and business uncertainty. Then, it will look at practical solutions to these problems, and introduce SMART START - a turn-key solution to create an IoT product, which reduces business and technical decision making into a 2-week, fixed-cost decision.

# Challenges in bringing IoT devices to market

## Slow decision making due to hardware

Hardware poses a challenge in IoT because companies find it difficult and costly to understand its intricacies, especially when it comes to software compatibility. Either the decision is rushed, which leads to larger and long term impacts, or the thoroughness needed to make the decision leads to time running out. An oil & gas customer succinctly summarised the issue by stating that, “a decision on what IoT hardware to use became a decision on the entire software stack.”

This is because IoT hardware is not standardised. While headline statistics on CPU and RAM are standardised, the performance and use of IoT hardware is contingent on underlying features, such as different architecture sets that often pose nuanced trade-offs.

To speed up the process, some customers started writing apps before hardware had been selected. On more than one occasion, the hardware underpinning the project was changed midway through, leading to the extensive re-write of software and the accompanying increase in costs and delayed timelines.

From the project summaries analysed, companies also turned to Canonical to get hardware working with an operating system (OS) and software stack. Even multinational, technology focused companies felt that understanding how a kernel and OS worked with hardware, was a barrier to project progression.

## Technical complexity and infrastructure

Having infrastructure that can automate key processes, from writing software to updating devices in-field, is critical to engineering efficiency and customer retention. It’s easy to think this is something an organisation needs to build and own to gain a competitive advantage. However, customers discovered trying to understand the complexities of infrastructure was overwhelming - there were too many decisions about too many technical concepts, too early in a project’s life.

A direct risk from the complexity of infrastructure is the impact on unit economics of a device. This is both in terms of upfront costs to create and continuing costs to maintain. Specifically, the need for infrastructure to be highly available with minimal down time, and the associated costs, should not be underestimated.

## Business uncertainty and risk

Finally, organisations do not successfully manage business risk by using specialists when necessary. This leads to a slowdown and increased costs across processes as discussed in the two points above. However, it also impacts product teams who spend more time ‘putting out fires’ rather than focusing on innovation, their customer and use-case.

Further, the process is labour-intensive - specifically with engineering time - and the cost base of IoT projects is predominantly variable. This increases the burn rate with any results or outcomes coming much later than the budget is spent. Critically, IoT projects then lose senior stakeholder support, specifically by decision makers that identify greenfield and high-tech projects as intrinsically risky.

# Overcoming challenges

## Hardware

### Looking deeper than headline statistics

Organisations need to select hardware that matches a project's use-case. Specifically organisations need to select hardware that has an energy consumption level that is tolerable, but this is traded off with the speed of compute possible. Other factors that organisations need to be aware of are developer tools for hardware and how long a vendor will build the hardware.

For example, x86 and Arm based hardware are both popular for IoT. x86 began as a personal computer (PC) motherboard, and so consumes more energy but is capable of more complex and faster computations. On the other hand, Arm hardware trades complex performance for better energy efficiency. Devices that are battery or solar powered, therefore, are better suited to Arm hardware. In contrast, for industrial IoT devices, such as gateways, robotics or edge-cloud infrastructure, organisations would usually utilise x86 for its computational ability.

Further, x86 devices usually have shorter life-cycles, with newer hardware being released and older hardware no longer in production. Arm devices have historically seen longer support timeframes, so if an organisation wants to use the same device for over a decade, this would usually be supported by Arm-based hardware.

### Select tested hardware

Organisations will accelerate time to market by selecting certified hardware. Certification ensures that the hardware will work with an operating system and its app ecosystem. Usually, certified hardware has been extensively tested with an operating system, by a team of specialist engineers either from the hardware vendor or the operating system distributor.

This gives organisations comfort that all features of the hardware are usable 'out of the box'. Critically, it decreases the amount of bug fixing and manual adjustments needed to operate the hardware. An effective certification scheme would ensure the hardware and the operating system are compatible both now and for future updates.

SMART START bootstraps your IoT project by leveraging hardware certifications by Canonical. Organisations can select Ubuntu certified hardware across both Arm and x86 platforms which means they can choose based on their use-case.

Canonical's certification process is robust and covers both the technical feasibility of using Ubuntu on the hardware, as well as testing the user-experience for specific applications and workloads such as WiFi connectivity. Certification guarantees long term security, with patches over the lifetime of the Ubuntu LTS release. Canonical gives feedback to the hardware vendor if any deficiency is identified, and certification is only provided when a strict criteria is met for both areas.

Click here to see the full list of certified IoT hardware.

# Infrastructure

## Utilise infrastructure vendors

First, organisations need to make strategic build-versus-buy decisions in IoT. To identify when to use third-party infrastructure, consider analysis of how per-device unit economics changes with different phases of an IoT project. For example, if building features to send updates to devices, or manually changing and maintaining an operating system requires upfront engineering cost that skews unit-economics, it is a sign to rely on a trusted vendor.

This is particularly important for greenfield projects; organisations may feel making all foundational elements will lead to a competitive advantage in the future. However, a variety of other industries - from e-commerce to cloud computing - rely on de-risking greenfield projects and lower the burden on unit-economics by trusting experienced infrastructure vendors.

## Select infrastructure that supports automation

The infrastructure an organisation selects should include build tools that support development and integration of hardware and software. This ensures software engineers are productive and system integration at the end of the project does not lead to large amounts of re-work.

First, software engineers in organisations typically are efficient in certain programming languages and in the past decade, the most popular languages are typically not suited for IoT. This includes languages such as Go and Python. Organisations should select infrastructure that includes build tools that allow engineers to use the languages they are experienced in, and still make software for IoT devices.

Second, integrating hardware and software is streamlined with build tools that bridge the gap between user-apps and hardware that is managed by the operating system. For example, with high quality build tools, app code that needs to switch WiFi on, will have a well-defined way to interact with the hardware modules that control WiFi. This reduces the time and complexity of integrating all elements of an IoT device.

Canonical provides a device build system - Snapcraft - that packages apps to work with the operating system and hardware of a device. This removes the complexity involved in integrating the full stack that will run a device.

As a result, the process of writing apps and packaging and making them work with your device is automated. Any changes or updates to apps are slotted into the model-driven architecture, minimising ongoing effort to integrate a devices full stack.

Click here to read how an app store will transform your IoT business model.

## Extend automation to updates

Organisations can drastically decrease total lifecycle costs related to IoT devices by selecting infrastructure that automates device updates once in the field. Further, as legislation on IoT security becomes stricter, ensuring security patches can be delivered to a device throughout its lifecycle extends the viability of a device after it is sold.

Similarly, if an organisation wants to increase the value of a device by adding new features, this requires updating infrastructure to distribute software to in-field devices. Like the mobile phone market, IoT devices can have IoT software distributed to it by means of an app store where a software publisher hosts and then distributes software, at scale.

Finally, developers need update tools that allow control over the update process - unlike mobile phones, there is usually not a human controller that can actively monitor an IoT device and look for a convenient time to update it.

SMART START gives you access to infrastructure to update any number of devices in-field, with no on-site engineering needed. Canonical provides a field-tested update mechanism, your app store, to host and then distribute software to deployed devices.

Customers, such as Fing and Cyberdyne, have successfully updated fleets of up to 30,000 devices across the globe in only a few hours, with an app store. With options to update automatically or during downtime and failure resistant updates that have transactional properties, customers have benefited from infrastructure that eliminates the need for site visits, recalls, or any kind of manual patching of individual units.

Click here to read how Canonical supported Fing and Cyberdyne in taking their IoT devices to market.

## Use of specialists

### Filling skill gaps and shortages

Organisations should consider specialists and consultants to overcome peaks of high engineering demand, without having to take on headcount. Specialists also serve as a parallel workstream during periods of high activity, which helps break through bottlenecks. This means product teams do not fall behind schedule due to early periods of difficulties and ultimately helps maintain stakeholder support.

Further, an organisation can benefit from specialist knowledge which its team may not have the time and resources to develop. This allows organisations to maintain business focus and deploy resources to innovate instead of 'putting out fires'. Specialists also enable a passive knowledge transfer - by working closely with a product team; future iterations of the product benefits from the initial boost of knowledge.

### Reduce risk with outcome based contracts

Organisations should seek out outcome based contracts to reduce risk and ensure predictable costs that are otherwise variable and uncertain. With less variable costs, organisations will have a smoother budgeting process and often this can be a deciding factor in maintaining senior stakeholder support.

Further, the risk of delivery is removed from a product team, and is moved to the specialist team with a clear timeline. Often, specialists are in the best place to manage this risk as they have addressed and solved the problems multiple times and across a variety of use-cases.

With SMART START, Canonical's engineers will package your apps as snaps - the universal Linux application format. They will then package your choice of apps and OS into a device image delivering a flashable image.

SMART START also includes 3 days of consulting services that can be used at any point in your project. This can cover learning how to use Snapcraft, Ubuntu Core or your app store. Or it can be used for specific technical advice and guidance for the times that your team needs a boost.

Click here to see the full range of Canonical consulting services to boost your IoT project.

# Conclusion

The IoT industry has huge potential but there are challenges related to the speed of decision making in early stages of a project, technical complexity especially with respect to infrastructure, and how business risks are managed.

Successful projects speed up decision making by basing their product on the work performed already. For example, selecting certified hardware enables organisations to forgo early exploration costs. When it comes to building IoT infrastructure - ranging from the OS to mechanisms to update devices in-field - integrating with existing infrastructure is preferable to building and owning it. Finally, strategic use of specialists will help organisations break through bottlenecks and spread risk by fixing costs based on outcomes.

## Resources

Webinar: Accelerating IoT device time to market

Learn more about SMART START or contact us to discuss with a Canonical representative.



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