

Unlocking the Power of IoT

A White Paper by Eckhard Wernich, Business Development Executive, SATO

Few people can fail to have heard of the Internet of Things (IoT), but many still struggle to understand how its true potential can be harnessed and applied in practical terms to derive genuine value, particularly in the business environment.

In this white paper, we will explore how adopting an IoT world view can transform a business model from product-oriented to service-focussed. As an example, we will demonstrate how the IoT is changing the role of the humble label printer from a peripheral product into a fully integrated component in the process and supply chain; and the enormous benefits that can be derived as a result.

The IoT is the network of physical objects or “things” embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. Applications can range from a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile with built-in sensors which enable the manufacturer to collect data for performance optimisation. In fact, any other natural or man-made object that can be assigned an identity and provided with the ability to transfer data over a network can potentially be considered part of the IoT.

Like other technological revolutions, the IoT has been born from a timely convergence of several diverse developments. For example, our ability to make sensors smaller and cheaper, with greater computing capacity and much lower power requirements, has led to their broader adoption and deployment. When combined with the rapid developments in commodity storage options, such as the Cloud, we have the perfect opportunity for businesses to not only gather data, but also analyse it to derive insights that can add real value. We even have the ability to push decision support and performance monitoring out from a central controller to the source of the data.

No business can afford to ignore the huge potential for growth that the IoT represents: a Boston Consulting Group predicts that by 2020, 250 billion Euros (\$267 billion) will be spent on IoT technologies, products and services. However, we often struggle to understand how the vast potential can be harnessed in practical terms and what changes that entails for our business processes and our people. Focussing in on one particular process – label printing – may help to illustrate what is involved and how the IoT will transform the way we do business.

Transforming the business model

In a traditional business model, the label printer is usually the last thing anyone thinks about. All the attention and investment goes into the production and/or processing of the object to be labelled: whether it is a parcel for delivery, a new garment going on display, a prescription medicine or a food item. The printer in this case is passive: it just accepts whatever information it is given and transfers it onto the label.

This is inherently inefficient and has many limitations. The printer relies on intervention from others to collate the data and offer it up in a format that it can understand. Historically this means an accompanying computer and middleware to translate requirements for the printer. Each item

comes at a capital cost and has its own running costs and maintenance regimes to consider. In addition, it requires human intervention to assimilate and validate the data: both at the input and the output stage. There is reliance on knowledge vested in people when the printer requires maintenance, such as ordering labels, clearing a fault or replacing a printer ribbon.

So, the simple task of printing the right information on the right label at the right time, checking if it is correct and attaching it to the right object is actually very complex, as well as time and resource-heavy. Due to the number of information interfaces, it also presents massive opportunities for mistakes to enter the process. While mislabelling an apple as a cabbage may cause brief delay and some sarcastic remarks in the supermarket queue, shipping a container full of left-hand drive car components to the wrong production line or assigning the wrong medicine to the wrong patient has more serious consequences.

In the IoT business model, the print process is simplified and the potential for error is greatly reduced because the printer and label are no longer passive: they become an integral and proactive part of the process. This is possible because the printer is imbued with the ability to actively collate and exchange data, talking bidirectionally with all parts of the value chain. Equally, the label becomes an identity that can travel with the object to which it is attached. In this scenario, the information the label carries is not simple one-time data: it is real-time information that can be constantly updated from the Cloud or from interaction with other, similarly equipped, objects. There is virtually no need for human intervention because the printer has the intelligence to merge and interpret information to produce the label, validate its own actions, monitor performance and anticipate preventive and actual maintenance requirements.

Intelligent Printing and the IoT

Progress towards this scenario is already evident in the retail environment, where barcodes are commonly used to track and then analyse customer buying habits. Elsewhere, the advent of Radio Frequency Identification (RFID) has enabled patients entering hospital to be tagged with unique information about their condition and medication.

In essence, the IoT is all about data – its capture, interpretation and application. The big questions for any business are: what data is useful to capture; where does it need to be applied, and; who or what makes the value decision?

So, while creating and attaching a label in order to move an object on through the value chain is a small part of a much larger process, it is also critical to success. As a print technology specialist, SATO focuses on leveraging the power of data to bridge the “last inch” of the supply chain; helping our customers to exploit the potential of the IoT to integrate the virtual and physical world in order to achieve precision, time and resource savings. We are unique in developing Application-Enabled Printing (AEP), whereby intelligence is placed in the printer itself – thus enabling decision support and performance monitoring to take place at the source of the data.

An application-enabled printer, of which the NX Series and TH2 are good examples, has its own internal processing power so it can connect to other devices (such as weighing scales, a handheld barcode scanner, or a keyboard and a PLC within an automation line) and print without the need to connect to a PC or using a server for data execution. Instead, the datastream can be sent direct to the printer for interpretation and execution, reducing network and database traffic as well as server load. It is also designed to be readily reprogrammable with the ability to connect

to the Cloud independently. Unlike smart printers, which can only hold one program at a time, new applications can be added to an existing AEP as simply as you might add multiple apps to an iPhone or Android smartphone.

For example, in a manufacturing and logistics environment an app could be downloaded to automatically calculate and print thaw and use-by labels – relying on the printer's internal real-time clock. Another app might use its internal product and price database to correctly calculate and clearly print mark-down labels to clear older stock.

Not only does this inbuilt intelligence future-proof the print function, it also means that the printer can be customised to include exactly the right set of applications for a given purpose. In other words, the product more accurately fits the user's needs; yet at the same time there are fewer components in the chain – fewer devices to look after, fewer interconnections to manage, and fewer things to go wrong.

Better still, an AEP printer can self-monitor: for example, using the data from a barcode scanner or camera, it can validate its own labels and communicate that information back to a core information system. It can order a new set of labels automatically before they run out, or flag up a failing part. In the IoT world, predictive maintenance is the norm – so why would your printer be an exception? Scale up these concepts of predictive maintenance and process efficiency to the whole value chain, and the vast potential of the IoT begins to become clear.

Delivering customer value

By empowering individual objects to exchange data and make informed decisions, the IoT transforms your business proposition from being able to offer a product that has fixed (and therefore limited) functionality to delivering flexible, future-proofed solutions. This transformation has already begun in some sectors and is particularly evident in retail, logistics and domestic environmental control. Knowing exactly when your shopping is due to be delivered or being able to tell the heating to switch on from your mobile phone are no longer extraordinary occurrences.

For manufacturers like SATO, optimising the power of the IoT involves entering into a number of strategic partnerships to make sure that our AEP devices are truly compatible with other 'things of the Internet' and can deliver total, seamless solutions. This open, collaborative way of working means that the end user no longer has to be concerned about system compatibility or the consequences of making a particular printer choice. Instead, they can focus on the key question of what data will be of most benefit to their business, how they collect it and analyse it, and how they act upon the outcomes to offer further improvement to their customers in turn.

In the very near future, Near Field Communications (NFC) will enable the 'things of the internet' to communicate directly with each other without the need for external power, a wifi connection or access to a remote data storage facility or central computer. This will be a further step towards decision decentralisation, where components, tools, machines and people communicate to create autonomous and self optimizing production processes. For example, a component will directly relay information about its purpose and properties to the tool fitting it, and the tool will apply this information to apply the correct screwhead and torque. People will be capable of interacting with the automated process in ways that are most intuitive and helpful for them: using their mobile phone or Tablet as the touch control panel, or even to issue voice instructions. Freed of mundane and disruptive tasks like checking label information, the human part of the supply chain is freed to focus on their core role, where they add most value.

Where will the IoT take us next?

Looking even further ahead to the factory of the future, we may see a single packaging facility being used by multiple companies with very varied packing and labelling requirements. The IoT-enabled devices which comprise this facility will be able to “pull” on real time information to configure themselves to optimise the packing line. Communicating in real time, they will ensure that every batch is packed using the right material (cellophane, plastic tray, cardboard box), carries the right company brand, and is labelled with all the information necessary for the package to be tracked from the factory, through the delivery process, to the customer. With this level of interconnectivity, the labelled goods could even order the drone or driverless car to come and pick it up from the distribution point. While performing these multiple tasks, the packaging plant will also be constantly monitoring its energy and materials consumption to check that tasks are being performed in the most efficient, sustainable and cost-effective way possible.

What is happening for SATO and its print solutions is a microcosm of what is currently happening for other businesses embracing the IoT. The emphasis is now upon doing more with less: less hardware (computers; middleware), less complexity, less downtime and less cost.

So, today's implementation of application-enabled printing is just the start. The same concept will spread to multiple classes of printers in the future, including both mobile and desktop printers ranging from low-end to high-end. All these devices will be able to run the same AEP-developed apps. Ultimately, this means that label printing will no longer be just the “last inch” in the supply chain: it will become an integral part of an IoT-enabled continuous loop of seeking greater process efficiencies, facilitating smarter ways of working and delivering better value for customers.

Source Information and Further Reading

<http://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT>

IoT and its applications including smart cities and communities (SC&C). ITU-T SG20
<http://www.itu.int/en/ITU-T/studygroups/2013-2016/20/Pages/default.aspx>

Internet Of Things Market To Reach \$267B By 2020. Boston Consulting Group.

IoT Software Platforms, Q4 2016: The 11 Providers That Matter Most And How They Stack Up. The Forrester Wave™.

The Internet of Things: Opportunities and Applications across Industries. International Institute of Analytics.