



Assessing the potential of Internet of Things

A method for early mapping of value creation and assessed earnings of IoT and Big Data potentials

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It's time to exploit the potential of IoT

The article 'Internet of Things in the Caribbean' describes a number of new IoT business cases and how service providers may exploit these for revenue growth in the Caribbean markets. Also the arrival of new IoT technology on the network side is covered.

One of the biggest challenges regarding IoT adoption is however not technical, but identifying the value capture in a company context.¹ Many articles and reports on IoT highlight the big revenue potential, in particular McKinsey Global Institute estimating that the impact of IoT on global economy might be as high as \$6,2 trillion by 2025.² This extreme number is due to the fact that all types of organizations will be able to benefit from the potentials of IoT. But the steps from knowing there is a general potential to knowing where that potential lies in a specific company's products and processes are not always clear.

This article presents a straightforward method for assessing the potential of new ideas and solutions grounded in IoT and Big Data. The work presented is a part of Morten Jensen's work on assessing and prototyping IoT and Big Data solutions through design thinking methods.

To illustrate the use of the method an existing IoT-case from the travel industry is analyzed.

Case: Improving customer service in luggage handling

One of the worst nightmares for a traveler is standing in the airport of the final destination looking at an empty conveyer belt knowing that his or her bag has not arrived. For the airlines, losing or delaying a bag causes painful as well as economic consequences and the risk of losing a returning customer. In 2016 nearly 6 bags per. 1000 passengers were mishandled and the cost to the industry to recover and reunite passengers with their bags was a global bill of US\$2.1 billion.³

Tracking the luggage precisely in real time is an essential part of reducing the mishandling. Stated by the Resolution 753, from June 2018 it is required by all airline members of the International Air Transport Association (IATA) to track and record all bags through four mandatory tracking points:

1. At check-in.
2. When loading onto the aircraft.
3. When custody of a bag changes between carriers and at arrival.
4. When the bag is delivered back to the passenger.

This requirement does however not solve all the problems of mishandling as there are several other critical steps in the luggage journey and most airlines today use barcodes on tags to identify each individual bag. Reading these barcodes with handheld scanners is often time consuming and the manual process can lead to errors from not scanned bags or error messages not seen by the workers.

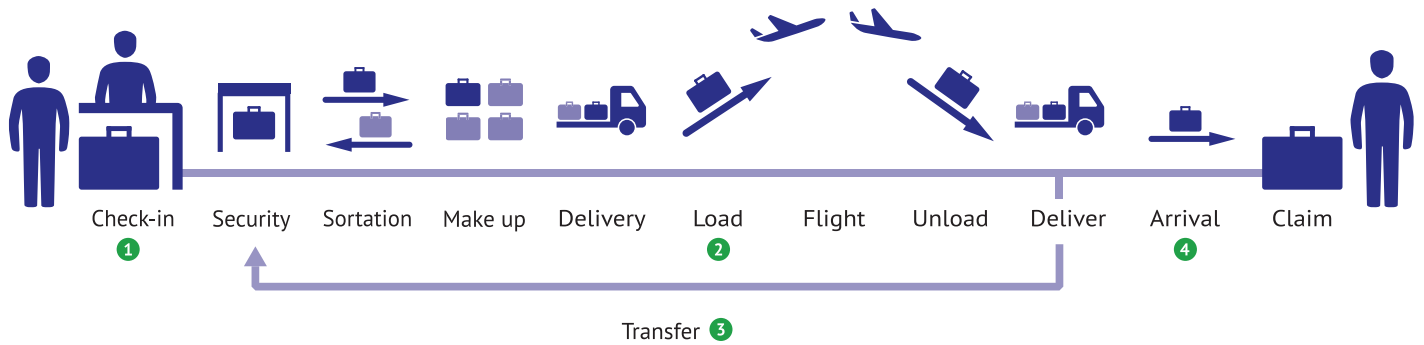


Figure 1. This product journey illustrates the handling of luggage - a process covering a lot of phases, where errors can be made. 1,2,3,4 Bag tracking in these phases will be mandatory due to Resolution 753.

Delta Air Lines is one of the best performing American airlines in regards to minimizing lost and delayed luggage. They handle 120 million suitcases yearly. To improve customer service and reduce the number of mishandled luggage Delta Air Lines have invested \$50 million in deploying a Radio Frequency Identification (RFID) tracking system globally. By embedding RFID chips in bag-tags, there is no longer a need to handle bags individually as they can be read through radio waves by special belt loaders with RFID readers built in.⁴

In the following section a simple and illustrative assessment of the potential value creation and assessed earnings from changing to a new IoT-solution with RFID chips for Delta Air Lines is described.

Explore and assess the potentials

Creating and implementing IoT solutions is a complex process. To fully explore the new potentials a company must think about what strategy and vision should guide the process, which actors and stakeholders are involved and what products and data are part of the system or will be. It is also necessary to understand the activities and processes that are part of the challenge that must be improved, how the new solution and business model will fit into the existing organisation and business and which vendors to work with and get solutions from.

To idea generate and understand the potentials of IoT however, it can be enough looking at the process or activity surrounding the defined challenge and exploring the pain points and potentials connected to the actors and stakeholders involved as well as relevant products and data.

In this article we describe 4 methods in the process from understanding a problem space, ideating ideas and assessing the potential of ideas generated.

Understand

1. Map the eco system
2. Map the products and their data

Ideate

3. The IoT Maturity model

Assess

4. The IoT Value Canvas

1. Map the eco system

An essential part of creating IoT solutions is to get an overview and understanding of the eco-system surrounding the challenge that you are trying to improve. This includes the actors directly connect to a product, service or problem as well as all stakeholders directly and indirectly involved.

If you understand the different point of views and pain points it is easier to create solution that creates mutual value for all actors and stakeholders.



Figure 2. Example of the eco system surrounding the luggage handling.

Actors	Passengers	Ground handlers	Airport manager
Pain points	<p>1:500 passenger are not receiving their luggage on time (1,2)</p> <p>No overview of where a bag is and how it is treated (4)</p> <p>They have a fear of loosing bag with valuable possessions (4)</p> <p>'Track your bag' app with barcode data is unprecise, causing fear and frustration (4)</p>	<p>It is timeconsuming to scan bags with barcode reader (3)</p> <p>It is hard to scan degraded barcodes cause by transportation (3)</p> <p>They forget to scan bags (3)</p>	Lack of data for process improvement (3)

Figure 3. Example of pain points of some of the actors taking part in the luggage handling. () refers to idea described later in the article.

Stakeholders	Airline	Airport	Other airline	Insurance company
Pain points	<p>1:500 bags fails to arrive on time causing big expenses (1,2)</p> <p>No overview of where the logistic pain points in luggage handling (3)</p> <p>High insurance premium</p>	<p>No overview of logistic pain points in luggage handling (3)</p> <p>Lack of for data for improving luggage handling (3)</p>	Complications with lost bags during airline trans-fers (3)	They have to pay insurance money

Figure 4. Example of pain points of the stakeholders related to the luggage handling () refers to idea described later in the article.

2. Map the products and their data

Mapping the different products surrounding a challenge and the available data from these products is also an important part of creating solutions around IoT and Big Data. This is an iterative activity as products and data are being added as ideas are explored and solutions defined.

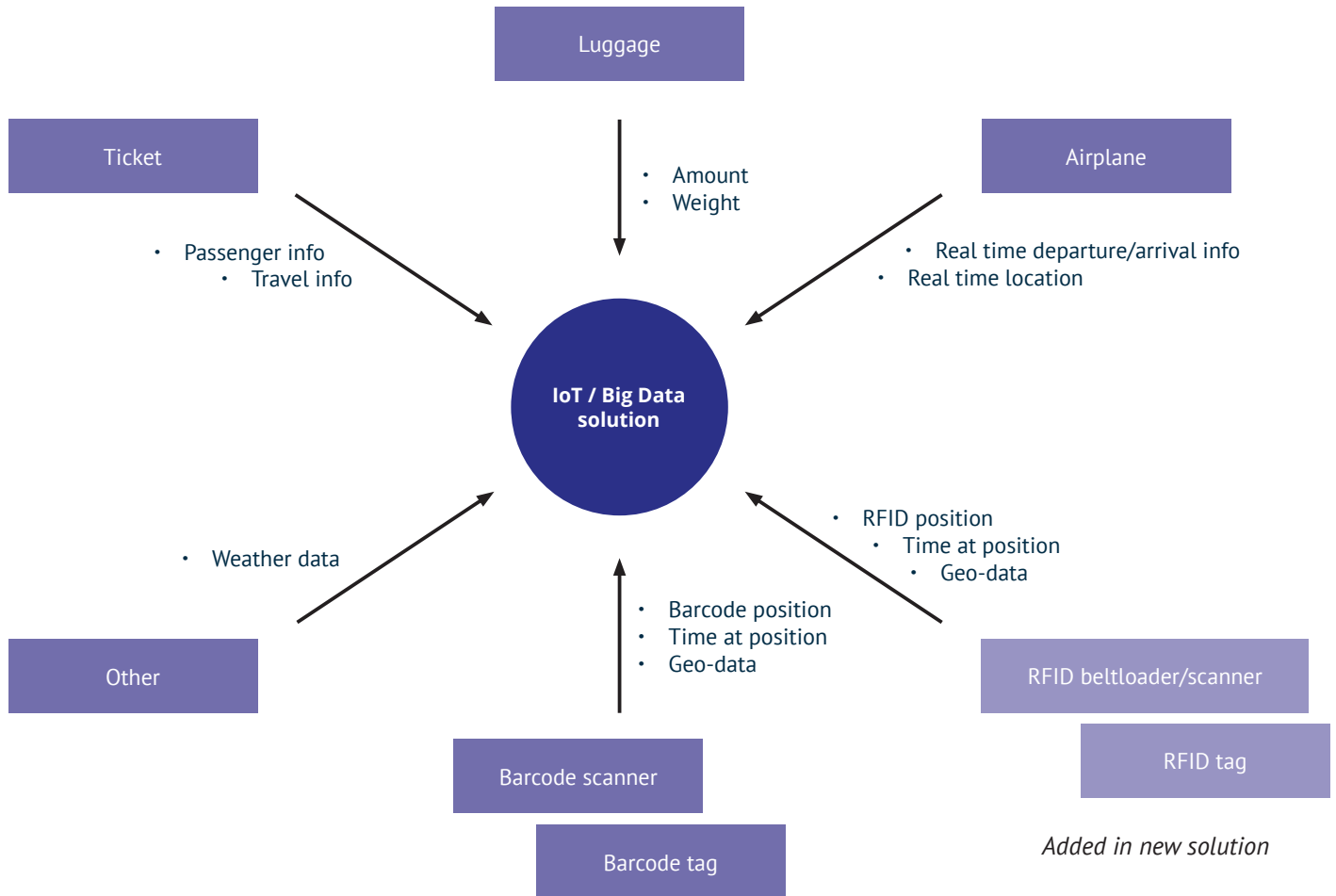


Figure 5. Map of products and data related to a new IoT solution

3. The IoT maturity model

To create IoT solutions it is important to understand the different potentials of IoT, but also to understand that to take a big step it is often important to start with the smaller ones. A maturity continuum can be used to describe the potentials of IoT, where companies often need to climb the earlier steps in order to be able to reach the subsequent steps.¹

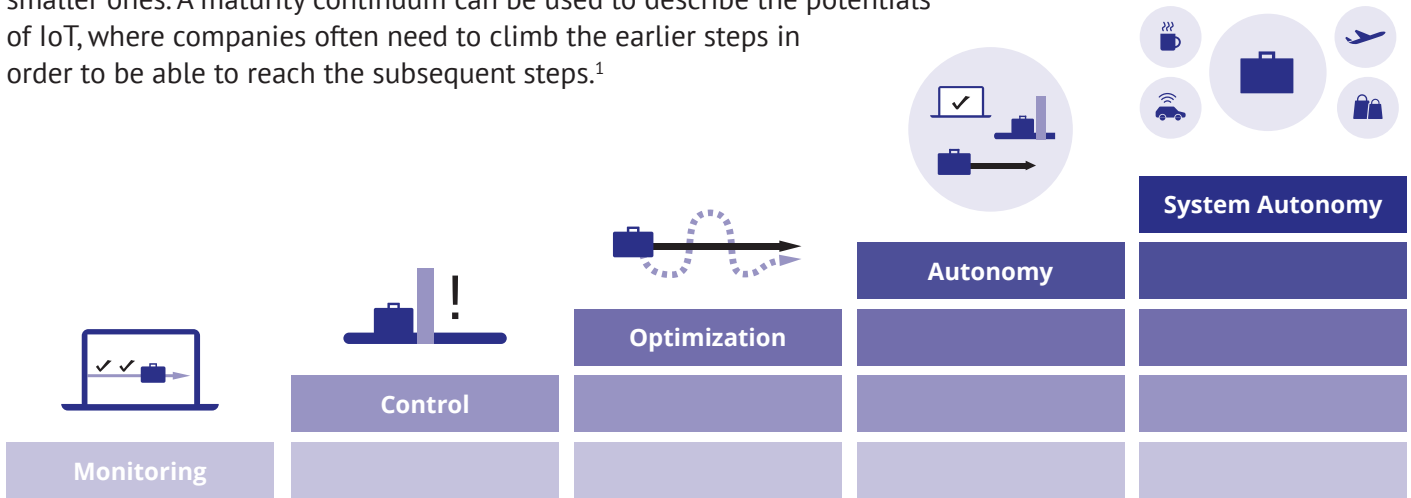


Figure 6. The IoT maturity model showing the five steps of maturity, that an IoT system can have.

Monitoring is the first step in the maturity model and the most widely used and known enabling of IoT. This is done through sensors and IoT enabled devices. Delta was already monitoring through barcodes, but using RFID-tags will make the monitoring more precise and efficient.

Control is when functions of a product responds to specified changes in its condition or environment. A bag with a tag is a “dumb” product, which cannot be directly controlled. Connected with a belt loader however it can be blocked from entering a belt or directed in another direction.

Optimization is when a product is capable of analytics enabling it to continuously and automatically optimize its performance. The data from tags can be used for optimizing how the conveyer belts are used and the routes for driving luggage, which can be used to optimise airport transportation

Autonomy is made possible by a combination of the capabilities of the three first steps and happens without human interference. An autonomous product adapts continuously to users, data and environment. An autonomous luggage system monitors the luggage, handles errors and adjusts and optimises transportation routes.

System Autonomy is when the products work autonomously and in dialogue with other connected things from other systems. When the luggage is late it will be able to connect with the system of the coffee shop, so the favourite coffee is ready for the passenger, when he or she has to wait for the luggage. When arriving the luggage is picked up by a self-driven cab, which the passenger enters when he has finished his coffee.

4. Develop your IoT Value Canvas

Generating ideas by connecting pain points, data and potentials of IoT is a creative exercise, not covered in this article, but good example cases connected with own pain points can often spark new ideas and business potentials. When the ideas are generated they can be analyzed with the IoT Value Canvas.

The main idea of the canvas is to quickly assess which ideas have the biggest business potential and should be focused on in further work.

Using the canvas you first define the product and data type the ideas have been generated from. Then you analyze the value creation, which actors or stakeholders benefit in which way from the idea. Finally you define the assessed earnings and make a rough calculation of it.

IOT VALUE CANVAS

PRODUCT	Bag tags with RFID			
DATA	RFID position			
IDEA	1 System alerts and stops, when a bag are detected in a wrong position	2 Automated RFID-scanning of luggage	3 Overview of critical spots during transport	4 Passenger info through Airline app
VALUE CREATION	Quick response in case of transfer error	Faster luggage handling by luggage handling	Optimised luggage transfer	Accurate and timely information about customer luggage and happy customers
ASSESSED EARNINGS	Less loss on late/lost luggage	Less time on scanning luggage for luggage handlers	Faster turnaround in airport	Purchases from returning customer
CALCULATED	240.000 lost/delayed bags pr. year · 25% expected reduction · \$100 (average cost pr. bag) = \$6 million pr. year	120 mio. bags pr. year · 0,25 min. scanning pr. bag in total · (23 \$/h / 60 min/h) = \$11.55 mio. pr. year	2 min. saved pr. aircraft pr. day · \$3.600 h (aircraft operating cost) / 60 min/h · 830 aircrafts = \$99.600 pr. day	20.000 returning customers · \$350 (average fare) = \$7 mio pr. year

Figure 7. The IoT Value Canvas showing some of the potentials in value creation and assessed earnings

As the IoT Value Canvas shows, the RFID system will not only benefit the passenger concerned about their luggage, but will have huge savings for the airline company regarding less lost luggage, more efficient handling and less turnover time.

Implementing a RFID system in a complex process such as luggage handling can be a big and expensive project to get started on, but it is possible to reach return on investment within a year according to Michael Vistisen, Business Unit Director at Lyngsoe System, who develops RFID systems for a range of international airports and airlines. Furthermore the data from IoT solutions also creates the necessary foundation for enabling the use of cognitive learning and artificial intelligence.

Let's exploit the potential of IoT

This article presents a simple way to assess new ideas and solutions and understand the possible value capture. The process described here using an inspirational example can be adjusted to any type of organization with its specific eco-system, stakeholders, and processes.

When the potentials have been assessed, next step is to decide which ideas to concept-develop further and to assess these concepts using more detailed business cases and proof of concepts of the most important and critical parts of a new IoT solution. Throughout a development process new ideas emerges and the IoT Value Canvas can be used continuously for a quick assessment of the potential.

References

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IOT VALUE CANVAS

PRODUCT				
DATA				
IDEA	1	2	3	4
VALUE CREATION				
ASSESSED EARNINGS				
CALCULATED				