Community of Interest

MARCH 2021

CAMBRIDGE SERVICE ALLIANCE

At the forefront of service transformation in the digital era

UNIVERSITY OF CAMBRIDGE
Cambridge Service Alliance

IfM MANAGEMENT TECHNOLOGY POLICY

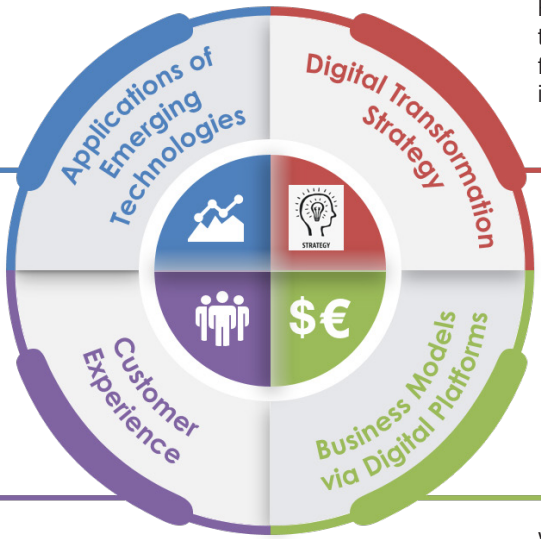
The future of digitally-enabled business

At the Cambridge Service Alliance's March Community of Interest, Deputy Director, Dr Mohamed Zaki, reminded partners of the Alliances's four overarching research themes (see below). In the course of the morning, we heard about two of those themes from CSA researchers and our impressive guest speakers. In the first session, CSA researcher Faisal Rashed followed by Erwin Bakker and Fatema El-Wakeel from Jaguar Land Rover tackled head on the challenges of harnessing big data and machine learning in order to achieve digital transformation. The second half of the morning was concerned with creating new business models through the development of Industry 4.0 technologies. Erika Pärn presented her latest research on digital twins and Don Kinard from Lockheed Martin shared some fascinating insights from the cutting edge of engineering and advanced manufacturing.

Cambridge Service Alliance research themes

How do digital traceability technologies such as blockchain impact production and smart service innovation?

How can firms formulate a strategy to successfully mobilise capabilities for data-driven business model innovation?



How can firms assess and predict customer behaviors (thinking, feeling, doing) using AI?

Which components of the business model are most sensitive to change/ innovation from DT services?

Mobilising capabilities for data-driven business model innovation

Dr Faisal Rashed, *Research Associate, Cambridge Service Alliance*

Maximising the value of data is not, Rashed reminded us, a new topic. Advances in machine learning, big data, cloud, and Internet of Things (IoT) technologies, have put data for business development and innovation at the top of the agenda for many large companies seeking to improve operations and decision-making, enhance their products and services, and ultimately, create new business models.

Rashed cited a study by Accenture showing that by laying firm foundations for data management and application through more efficient systems, greater trust and quality, firms can realise 20 per cent improvements in the value of their data. However, if they are then able to use that data to achieve operational excellence, business growth and develop new data-driven business models they could increase the value of that data by as much as 80 per cent.

What are data-driven business models?

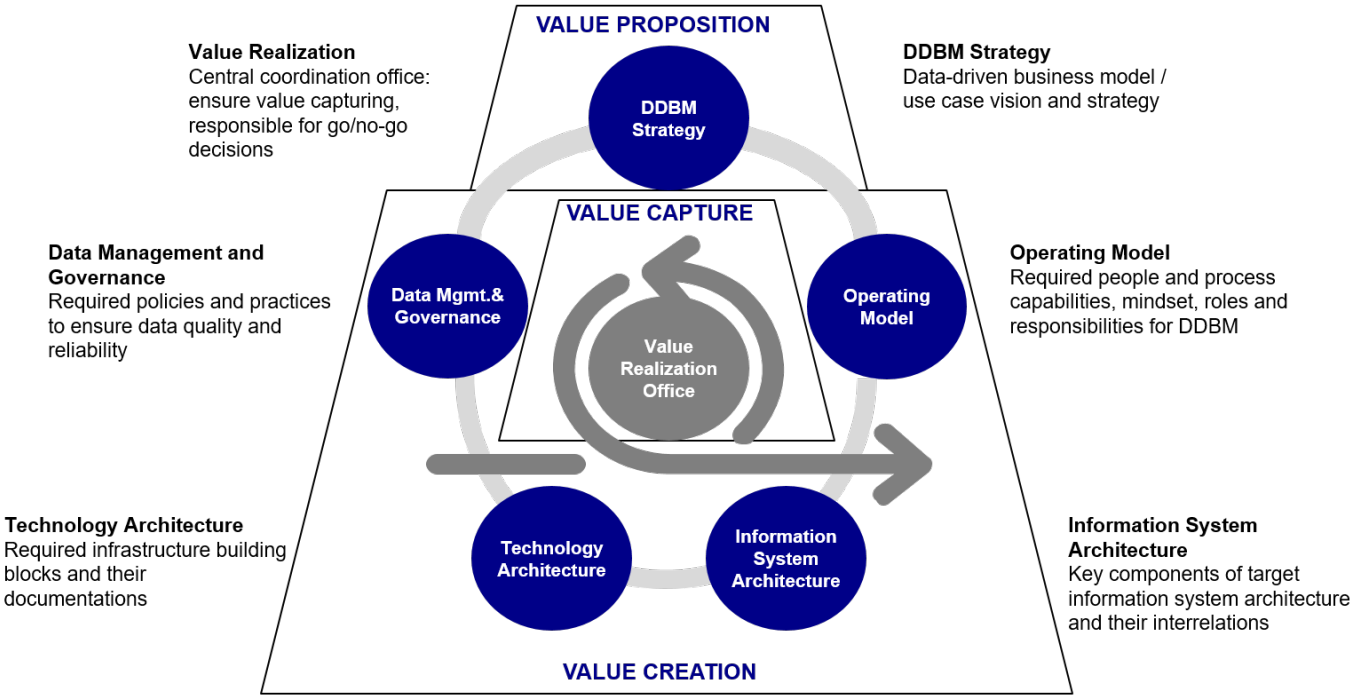
The one thing they have in common is that data plays a central part in their customer value proposition, whether it's the likes of Amazon, Google, Facebook and Alibaba which were created as data-driven companies or incumbents that are developing new data-driven products and services. Examples of the latter include pharmaceutical distributor, Tamro, which has created new revenue streams by providing customer insights to pharma companies. Similarly, Vodafone sells anonymised customer location data to satnav company, TomTom, which uses the data to provide a congestion monitoring service to its customers.

Big data analytics is already driving change to core business practices across all major sectors with, according to a recent McKinsey report, sales and marketing having undergone significant transformation in half of the companies surveyed while R&D has experienced fundamental changes in a third. This trend is set to continue. But – and it's a big but – it seems that 85 per cent of big data related projects are failing, according to Gartner. In most cases, it is not the technology that's the problem, it is challenges relating to culture and scaling capabilities.

Where next?

To help overcome these challenges, Rashed introduced his research focus: understanding how companies are going about data-driven business model innovation and how they can take an agile, dynamic approach to it. Through case studies he identified the key enablers required for value capture and creation (see figure below). But this is a static view of what's required. His aim is to evolve this into a dynamic approach to the principal elements of strategy formulation and execution across the four key stages of design, minimum viable product, implementation and renovation, supported at every stage by a 'Value Realisation Office'.

By testing this framework with firms and through a workshop with CSA partners and clients, Rashed aims to develop a new approach that will guide firms through the strategy formulation process and help them to overcome the barriers which many organisations face today.



Credit: Jaguar Land Rover

From hindsight to foresight: Setting up a data analytics centre of excellence - in a pandemic

Erwin Bakker*, Head of Operations and Risk* and Fatema El-Wakeel*, Data Analytics and Reporting Manager, Jaguar Land Rover*

As part of Jaguar Land Rover's Global Financial Services team, Bakker and El-Wakeel described how they set about creating an analytics-driven decision-making team from scratch – during a pandemic.

Their ambition is impressive: by building their data analytics capabilities they want to change Jaguar Land Rover's Global Financial Services culture so that it uses data to not only monitor historical performance but also to drive future sales and improve the customer journey.

With his in-depth Financial Services knowledge, Bakker hired El-Wakeel to support with creating the analytics strategy and ecosystem for this data analytics transformation – just before COVID-19 struck. Suddenly, she was working remotely, without a deep knowledge of the business or of the team's key stakeholders. Colleagues were, understandably, overwhelmed with a global pandemic. The pair decided it would be sensible to scale back their ambitions and focus on two things:

- Value-driven data analytics – where could they add value, quickly?
- Developing a strategy and roadmap at the same time, again looking for quick, incremental gains.

Stakeholder management was a priority: how do you get the whole team in the same car, driving to the same vision destination? This would be vital, if they were to achieve the vision of analytics-driven decision-making.

Deciding what to do, in a rapidly changing landscape was challenging. El-Wakeel described three characteristics they were looking for in the strategy they decided to pursue when prioritising projects. First, is it business-critical? Second, is there a business case? Third, what are the right technology and tools needed to deliver?

Next, they had to address the existing data landscape – multiple Excel files – to improve the quality of the data and create a data asset through which they can build on and use effective analytical tools as well as visualise data on Tableau. They knew they were sitting on a data goldmine that had not been previously utilised.

After a year spent combining Bakker's Financial Service expertise and El-Wakeel's Data Analytics experience, users can now visualise the data, slice and dice it and get value from it. In the process, they developed automated pipelines and utilised robotics. In time, they want to be able to benefit from data science and machine learning techniques in-house so they made sure that any data solution used would be able to support that.

From Bakker's perspective, the project has been a huge success. His key learnings were that you need to:

- Set a vision and strategy but be ready to adapt
- Build trust by delivering quick wins
- Generate value.

In 12 months, by doing those three things, they have transformed reporting and fundamentally changed the way the company interacts with and extracts value from its data.

THEME | CREATING NEW BUSINESS MODELS THROUGH DIGITAL TWINS/PLATFORMS

Digital twins and business model archetypes

Dr Erika Pärn, *Research Associate, Cambridge Service Alliance*

Understanding how digital twins can drive business model innovation is the focus of Pärn's research. It is not, she explained, concerned with the technology but with what that technology can deliver for businesses and their customers.

The definition of a digital twin

The term was originally coined by US researcher Michael Grieves, as a product lifecycle management (PLM) related concept. His definition emphasised the importance of maintaining a product throughout its entire lifecycle using data generated from physical assets and, more recently, from virtualised assets.

However, the concept of a digital twin has since evolved to the point where we no longer need a physical asset to be twinned. Today, we have twins of, for example, systems, processes or databases. They range from the simple to the extremely complex, and can mirror everything from an individual component through to a network of systems.

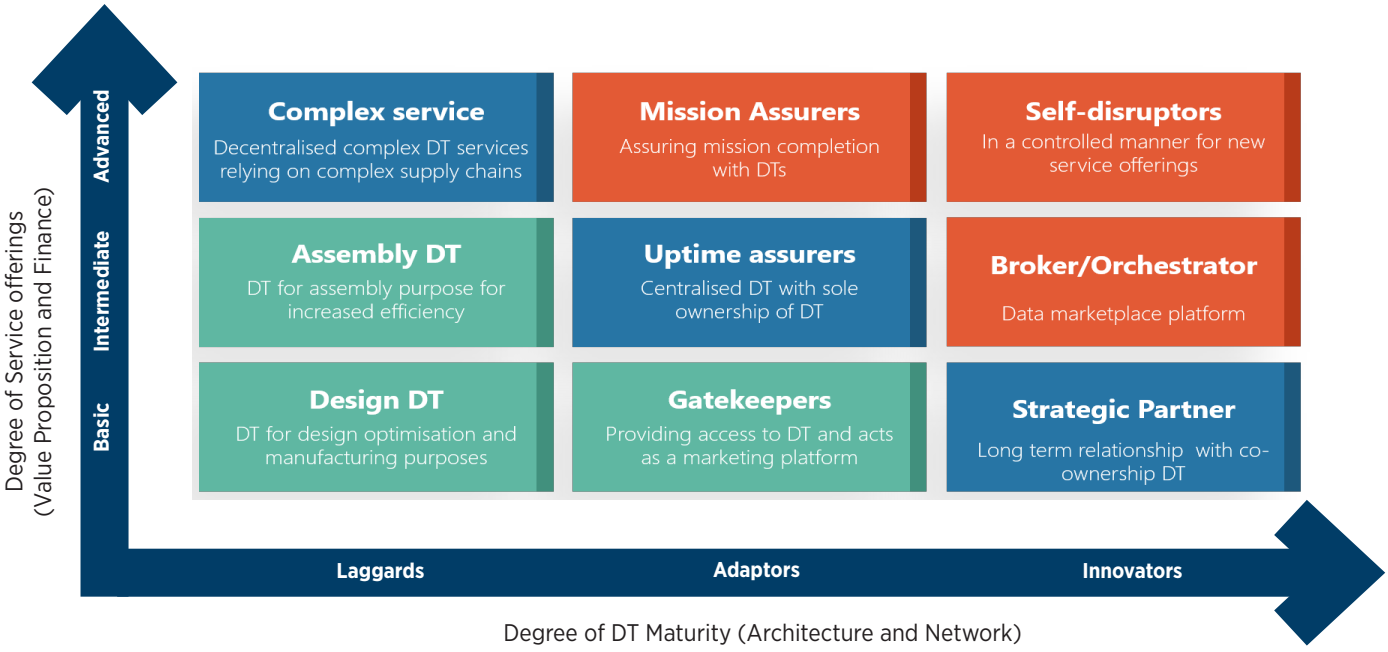
Digital twins, Pärn reminded us, have developed more quickly in some sectors than others. Defence is a relatively mature sector, for example, while construction is lagging behind. In manufacturing, digital twins tend to be adopted to improve assembly and maintenance practices.

But Pärn wants to understand if digital twins can support the development of transformational new services: can they be the engine of organisational 'self-disruption'? She considered this first through the lens of transformational forces, to understand how far businesses have travelled on their digital twin journeys. From a business perspective, have they made the transition from products to services, is their goal to be agile rather than simply efficient and how successful are they in accurately replicating the physical with the digital? Alongside these business-focused forces, are three technology-focused forces: how great is a firm's dependence on human intervention or has it reached the point where machine speaks directly to machines? How advanced is it in terms of the insights it gains from its digital twins and how accurate are those twins, particularly in terms of data quality.

As the research progressed, however, Pärn recognised the need to augment this framework with a more structured approach to business model analysis. She adopted the 4Vs business model framework which looks at the value proposition (what it delivers to the customer), the value architecture (mechanisms that deliver the value), the value network (or ecosystem) and value finance (the revenue model).

Using this framework, Pärn and team interviewed 31 senior managers from 21 mostly multinational companies in a wide range of sectors and geographies. From these interviews, she has identified nine different approaches to digital-twin enabled business model innovation (see figure below), categorised according to their levels of service and maturity.

For example, for a defence contractor building warships, the model is 'maintenance optimiser' where the value proposition lies in providing improved support and maintenance to its customers



and better insights for the ships' operators. However, it is also a good example of the challenges firms still need to overcome if they are to fully realise the benefits of the technology. The firm operates in a complex landscape which requires the integration of different digital threads to maximise the opportunity. However, this is a highly secure environment where data-sharing poses security questions. Nor has the business model been fully developed, with firms not yet able to generate platform-based revenues.

Battery charging stations for electric vehicles is an example of 'complex services'. Being able to provide a service to customers by predicting when their battery will need recharging and directing them to the nearest charging station, clearly has potential value. Again, however, a lack of clarity over data ownership and the value financing model are creating barriers to implementation.

Manufacturers of heavy goods vehicles have been categorised as 'uptime assurers'. The technology and the sector are still relatively immature with digital twin technology deployed in a limited fashion, mainly to reduce delivery times and to support fleet maintenance contracts.

Next steps

During 2021, Pärn and team will be validating their qualitative findings through a quantitative study. While digital twins are one of the technologies capable of underpinning business model transformation, many firms are still using them to optimise internal operations and provide maintenance services for customers.

At the moment, there is no clear framework to help firms structure a service business model using digital twin technology, especially within engineering and manufacturing firms. This research will help partners to delve deeper into understanding how to assess and configure different ways to create and capture value, to explore new services, sustain a competitive advantage and generate new revenue streams.

Advanced manufacturing, digital thread and Industry 4.0

Dr Don A. Kinard*, Senior Fellow, Lockheed Martin*

F-35 factory: Credit: Lockheed Martin

Dr Don Kinard, our final guest speaker described how advanced fighter engineering and manufacturing company, Lockheed Martin is already deriving significant benefits from digital twins, digital threads and Industry 4.0.

Before building an aircraft, Lockheed Martin develops a digital model (or twin) which it can study using computational fluid dynamics. One of the challenges it faces is that building an aircraft is something of a 'team sport'. Components are designed by specialist manufacturers around the world and their properties and behaviours need to be integrated into a single simulation. Data is the key here – and not just for developing the physical model. Supply chain management and traceability is also critical when you have thousands of parts being sourced from different suppliers. Kinard reflected that there is currently both too little emphasis on the data requirements supporting engineering and an insufficient understanding of how data can be used or consumed downstream.

He also described some of the ways in which the digital thread supports engineering activities such as automated spraying and drilling. Lockheed Martin's mechanics, meanwhile, benefit from 3D models projecting data directly onto the aircraft. Augmented reality is also being used to guide their work both in the factory and remotely, enabling experts to connect from around the world and view the same problem on a tablet, securely. While these technologies have some significant advantages, they still have some challenges. With AR, for example, people do not want to wear headgear all day and tablets need to be held, and hence restrict movement. Automation is a good solution in certain circumstances, when the volume of tasks to be carried out justifies it.

Another Industry 4.0 technology, additive manufacturing, has also been adopted by Lockheed Martin for the manufacture of tools. While thousands of tools have been made in this way, Kinard suggests there is still some way to go before additive will be used for making parts.

Using laser-scanning to compare as-built to as-designed is in development. It is now possible and will soon become standard practice for parts, tools and assemblies if not, at the moment, for real-time monitoring of production and sustainment activities.

The data revolution

For Kinard, data is a powerful resource. Firms are spending millions of dollars on huge systems to capture and exploit it. But these systems are often data siloes, created, managed and owned by different business functions and they don't talk to each other. There is often a cultural resistance to making the data accessible. Functions such as engineering, finance, operations want to control who sees what data in order to manage perceptions. This kind of data hoarding is very difficult to overcome.

But the rewards for doing so are significant: the connected enterprise enables automated metrics, financial reporting, data analytics, integration with factory equipment, and real-time management visibility.

It will enable them to see the status of every part in every plane in every country from their desktops or even their phones. And the data will be able to tell them not only how they are doing, with machine learning, it will also be able to tell them what they should be doing in the future.

COMING UP: CSA EVENTS 2021

22 April	Digital Twins Workshop
05 May	Second Community of Interest
24 June	Digital Strategy Workshop
01 September	Third Community of Interest
06 October	Digital Traceability Workshop
03 November	Partner Day (if we return to in-person meeting)
04 November	Industry Day

CAMBRIDGE SERVICE ALLIANCE (CSA)

A unique collaboration between the University of Cambridge and some of the world's leading businesses to design and deliver the services of the future. Its focus for 2020 is service transformation through digital innovation.

"Our partnership with the CSA will create a wealth of new opportunities for HCL and our customers. Working alongside the world's foremost academics and leading organizations, we aim to pioneer new digital solutions for the next decade, today. Through these efforts, we will uncover new ways in which digital technologies can empower and transform businesses. We are also excited to be able to uniquely offer our customers the benefits of being a member of such a prestigious alliance."
Ashish Gupta, CVP and Head of EMEA, HCL Technologies

"CEMEX has started its journey to design new services focusing on improving our customers' experience. The Design Lab Services was launched to research, diffuse and implement new approaches and best practices for service design. We are also committed to collaborating with the best universities and experts around the world on applied research and innovation projects to get prepared for the digital revolution."
Martin Adolfo Herrera Salado, Digital Enablement, Business Consulting Services

"One of the key things about the Alliance is the non-competitive nature of the partners within it. That allows us to move away from some of the more traditional IP and confidentiality rules, to openly share our challenges, dig beneath the surface of some of the hype about digital and get into the nuts and bolts about how we really deliver it and the challenges we all face.'
Caroline Burstall, Supply Chain Manager For Industrial Power Systems, Caterpillar

- Email: contact@cambridgeservicealliance.org
- Web: cambridgeservicealliance.eng.cam.ac.uk
- Twitter: @CamServAlliance
- LinkedIn: linkedin.com/groups/386613