Blockchain

Driving productivity, traceability and customer experience in supply chains.

UNIVERSITY OF CAMBRIDGE
Cambridge Service Alliance

IfM | MANAGEMENT TECHNOLOGY POLICY

Dr Veronica Martinez, Lecturer at the University of Cambridge and Senior Researcher at the Cambridge Service Alliance, working with Caroline Burstall and Andrew Noblett at Caterpillar, has used a pilot project to show that blockchain can deliver significant supply chain benefits.

Since blockchain burst onto the scene in 2008, its evangelists have told us that – just like the internet– it will fundamentally change how we all live and work. And it clearly does have that potential. Having a resilient, secure and traceable distributed database through which data – and payments – can be shared within and across organisations will be transformational. Firms are worrying about the consequences if they don't get on board.

So why are we not seeing a race to adopt it? One major hurdle is the cost of implementation (particularly for those firms who have recently invested millions in state-of-the-art ERP systems) which currently outweighs its perceived but as yet unquantifiable benefits. Another is the sheer scale of the task needed to integrate it into existing company-wide systems and processes.

On top of that, most firms lack blockchain expertise and think they need to bring in consultants to help them implement it. Some of these consultants are being a little overenthusiastic in their sales pitches which is resulting in even greater circumspection among their potential customers.

"We are fed up with them trying to sell us expensive, cut-and-paste blockchain solutions which don't integrate with our organisation," is a regular refrain.

Even those firms that are convinced of the benefits are wary of embarking on an exercise which cedes control of the technology to a third party. Outsourcing is not only costly throughout the whole life of the implementation (making minor mods in line with changes to the business quickly gets prohibitively expensive), it also prevents organisations from developing their ownership and understanding of the technology. With that comes the risk that it doesn't become properly integrated into the business and fails to deliver on its promises.

Caterpillar is typical of many of the firms I talk to: very interested in what blockchain can offer but not willing to take an expensive leap into the unknown. This presented us with an exciting opportunity. Could we build our own blockchain in such a way that Caterpillar could see what it is capable of and learn from the experience without having to make a huge organisational commitment to it?

Taking a supply chain focus

Many of blockchain's applications to date have been focused on secure financial transactions but its potential for connecting partners across a supply chain, with all the benefits of transparency and traceability it confers, is immense. But it is also, arguably, the most challenging environment in which to implement a new technology, involving huge numbers of firms with different technological and organisational capabilities.

To demonstrate blockchain's potential benefits, therefore, we decided to focus on just one part of Caterpillar's supply chain which involved a limited number of participants and where there was an opportunity to make a real difference.

One part of Caterpillar's business sells a range of diesel and gas engines which tend to be customised to meet each customers' needs. Managing these customer orders has remained a largely manual process over the years with modifications to the customer's specification coming in through a variety of channels including phone, fax and email. These requests would then be checked by Caterpillar's production team to make sure they were deliverable.

This back and forth process of specification and negotiation could last several days, involving six employees and, with information being stored in different formats, in different places by different people, was both inefficient and had plenty of potential to go wrong.

Our mission was to build and use blockchain to automate the interactions between the customer [demand] and the manufacturing site [supply]. We wanted the customer to be able to place orders and make modifications easily, in other words to have a better customer experience. For Caterpillar, the aim was to harness the control and traceability that blockchain offers both to deliver that enhanced customer service while reducing the time and cost of providing it.

Do-it-yourself blockchain

The project had two key elements: programming the blockchain and simulating the business process. For the programming, we were starting with a blank sheet of paper.

With no prior experience, our first task was to decide which technologies to use,

What we achieved:

65% reduction in time taken to process customer orders

90 hours of manual work eliminated

48 hour or faster response time

50% saving on jobs

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Greater trust from customers and other supply chain partners

Less frustration for customers and account managers at Caterpillar

Insight into **new technology** and its capabilities

Opportunity to redeploy staff into more **fulfilling roles**

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bearing in mind that one of Caterpillar's requirements was to keep everything as simple as possible so that its employees could learn how to do it themselves. We reviewed the options and picked the most basic: Hyperledger Composer for the back end (building the blockchain) and React for the user-interface. Both applications happen to be free.

It took four of us (three students and myself) six weeks and a lot of coffee to learn how to do it (mainly from online videos) and to write and de-bug 5,000 lines of code. The other part of the process was to map the complexity of the existing system – identifying all the touch points between the firm and their customer and where the data was being stored – and to specify a more streamlined, blockchain-enabled approach. After much trial and error, we achieved our goal: a real-time method of sharing and managing data in a single record.

Achieving supply chain benefits

Once we had our blockchain in place and had tested it with one of Caterpillar's customers, we carried out a 'before and after' analysis to show what we had achieved. By automating the process, we had reduced the number of storage points from twenty to two, we had reduced the time taken to process a new order by two thirds and we had halved the number of people needed to carry out the task. And we had a very positive response from the customer who was now using a bespoke

user-interface which we had co-designed with its procurement team.

The final part of the project was to identify a number of potential blockchain developers (and evaluate their costs) who could work with Caterpillar to take this project forward.

What did we learn?

The pilot showed that it is possible to implement blockchain in-house at a small scale and manage its growth within your business in a way which starts to give you quantifiable benefits but without introducing massive disruption and cost. Of course, there were challenges along the way, but the benefit of this approach is that you are able to learn from those challenges, grow your own expertise in-house and develop the technology in a way that integrates with your existing systems and processes.

"Outsourcing [blockchain] is not only costly throughout the whole life of the implementation (making minor mods in line with changes to the business quickly gets prohibitively expensive), it also prevents organisations from developing their ownership and understanding of the technology."

To find out more about our blockchain prototype and other research in this field, contact:
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About the authors

Dr Veronica Martinez is a lecturer at the University of Cambridge and is the CSA research lead for the shift to services. She has been working in the strategy management field since 1998. Before her academic career, she worked in the automotive industry, where she coordinated the launching of a new manufacturing quality assurance system.

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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 2019 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

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