Neely [1] defines servitization as the process by which firms provide services along with the products they manufacture and supply. In Neely’s view, servitization is a process of innovation that enables companies to create real added value by selling their products – such as machines, aircraft engines, cars, or television sets – with high-value accompanying services.

Servitization is made possible when products such as machines or engines are connected, allowing companies to collect data and information about how these products operate and how they are used. This information can then be used to create new services, such as predictive maintenance. Neely (2008) identified Rolls-Royce as an example of a company using servitization: “Rolls-Royce Aerospace no longer simply sells aero engines. Now it offers a total care package, where customers buy the capability the engines deliver - “power by the hour” Rolls-Royce retains responsibility for risk and maintenance, generating revenues by making the engine available for use. [2]” The servitization innovation process is made possible by developments such as the Industrial Internet of Things (USA-GE), Industries 4.0 (Germany-Siemens), and the Fourth Industrial Revolution (World Economic Forum), which connect growing numbers of machines and devices in networks and allow them to communicate and interact. An interesting question is whether the servitization of products could be supported by another new phenomenon [3]: the blockchain.

Servitization of Manufacturing

The process of servitization naturally leads to peer-to-peer information transactions, which are performed based on a relationship of trust between the manufacturer or supplier and their customer. As they become increasingly connected, machines gain ever greater intercommunication capacity, producing new and thus far unknown data and information streams, which, in turn, can engender new products or services. Evans and Annunziata of GE [4] describe this process thus: “Over time, these data flows provide a history of operations and performance that enables operators to better understand the condition of the critical components of the plant. Operators can understand how many hours a particular component has been operating and under what conditions. Analytic tools can then compare this information to the operating histories of similar components in other plants to provide reliable estimates of the likelihood and timing of component failure. In this manner, operating data and predictive analytics can be combined to avoid unplanned outages and minimize maintenance costs”.

Based on this data and information, customers pay a per-unit fee for uninterrupted use of the product and associated services. This unit can be a unit of time or volume. The supplier provides the equipment and makes sure that it works as promised, based on data and information that has been gathered and analysed. Customers only pay for the actual operation or use of the machine. Opresnik et al. [5] put it as follows: “Informatization and the exploitation of data and information through the information ecosystem have together the potential to create an additional revenue stream for the information ecosystem’s members, including the manufacturer”.

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However, the complexity increases as more data and information has to be shared between more suppliers and multiple customers, for example when it comes to billing for products and services. As the number of machines increases, as in-house machines and third-party machines become increasingly interlinked, and as data is shared with other parties, such as maintenance providers, questions are being raised about user rights, transparency and cost calculation based on this data and information. Aspects such as security, reliability, and ownership of the gathered and analysed data and information will also play an ever more important role in the process of servitization.

**Servitization and Blockchain**

Interconnections and interactions between an increasingly diverse range of machines and organisations on the Internet of Things will not only fire up the debate about the implementation of the process of servitization, but will also make it more complex. This is certainly due to the growing role of consumer electronics in this development. Min, Wang, and Luo [6] pointed out that for Chinese manufacturers developing a servitization strategy “it should be the key point that providing high value-added complex services for consumers, rather than rushing to expand the service business scope by a large number of superficial services”.

Throwing consumer electronics into the mix only increases the complexity of the process of servitization. The development of interconnected systems of distributed operating combinations of humans and machines is bound to raise new questions about the reliability of and confidence in information transactions between machines and humans in these networks, which will ultimately lead to monetary transactions. Not only will ‘fault tolerance’ need to be high, but the transparency of performed information transactions also has to be unquestionable. The large number of interconnected devices and the relationships between them means that context-based ‘consensus and decision-making procedures’ are essential when it comes to information transactions between a broad range of machines and devices.

The level of transparency needed to inspire confidence calls for a form of ‘distributed ledging’ where devices and their users can continue to control their own data and information and remain aware of who it is shared with. Decisions made by a device concerning the performance of information transactions are known as ‘blocks’, due to the distributed manner in which devices store data and information. Together, these form a ‘blockchain’.

Depending on the context and the kind of information transactions, separate protocols can be designed to set requirements for consensus and decision-making procedures and, for example, for security, by means of the ‘encryption’ of performed information transactions.

**Conclusion**

In the words of Martinez [7]: “Services are the key to creating a more diversified business and to building stronger customer relationships. In the future the interactions of systems, processes and technology will provide a route to ‘total solutions’ for customers”. As the (Industrial) Internet of Things and the process of servitization continue to develop, it will increasingly become standard practice for devices and machines to autonomously exchange and share data and information. By thinking in terms of the possibilities offered by a blockchain, we can keep the information transactions performed between these devices reliable, secure, and transparent and thus retain trust in a system of systems that is going to be of great benefit to human beings.


3) Lier v. B (2017) Philosophy of Blockchain


Ben van Lier works at Centric as Director Strategy & Innovation and, in that function, is involved in research and analysis of developments in the areas of overlap between organisation and technology within the various market segments.