

# Business Models for Smart Machines

## White Paper

Revision 0

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### Executive summary

The key question for the market of machine suppliers is not who is developing and providing all the nice concepts and technologies, but who is creating them in the right way so that they can be turned into revenue.

New Business models for Industry V4.0 must be seen as unique new opportunities for differentiation and open to new ways instead to purely fix operational efficiency.

## Introduction

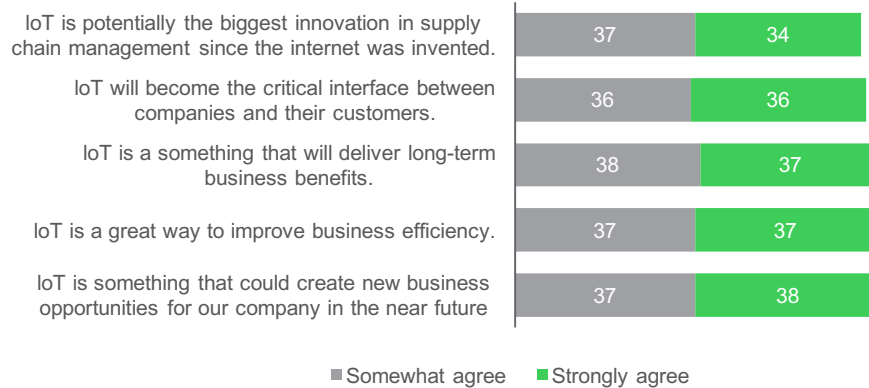
After buzzing Industry 4.0 all over the media by all OT and IT experts, today, a few key concepts seem to unveil the potential that the industry believes is behind Industry 4.0. These include: Smart Machines, Smart Factory, cyber physical systems, Everything-as-a-Service and a few technologies like OPC UA, cloud and data analytics.

Clearly they are the innovation drivers and must-haves for every vendor of automation products that want to be recognized as leaders or challengers. But sooner or later they will become standards and used by followers and niche players. But the key question for the market of automation suppliers is not who is first in developing and providing all the nice concepts and technologies, but who is creating and combining them in the right way so that they can be turned into new revenue streams.

We keep in mind, that competitive advantages can be achieved through increasing operational efficiency but the better way is through strategic uniqueness. Companies which are heavily focused on operational efficiency are facing growing competitive pressure from very different sides. Therefore, existing business models are now put in question.

Or are we sure, that the ones who create all the nice and innovative technologies for Industry 4.0 are the same that will make the business?

### View on IoT and Operations



### Horizontal Integration of Industry 4.0 into Machines

Of course there is a strong need for a full vertical integration of new functions towards Smart Factory which form the overall view of Industry 4.0. Smart Machines integrated in adaptive manufacturing processes and connected to supply chains is not only a technical question but also a challenge for the organization in Schneider Elec like:

- Machine and Process monitoring
- Machine and Process diagnostics
- Process optimization through analytics
- Smart Supply Network
- Processing of mass-customized products

Smart Machines are representing all values of Industry 4.0 functions focused on discrete machine level. Many of the new functions that are required to build Smart Machines are heavily focused on horizontal level and therefore with restricted scope and dependencies to external systems:

- Centralized Real-Time Data and Information Management

- Machine Self-Awareness
- Standards, openness and consistency for hardware, system and soft-ware
- Smart decisions based on Edge and Cloud computing
- Collaborative Engineering
- Machine Simulation and Virtualization

## Data & Business The value of data and IT

*“It might happen, that we did not have the chance to get these data in the past and we will not be able to get if we lose the opportunities of Industry 4.0”*

In contrary to the classical machine automation approach with selected data, which was very locally concentrated, the high availability of actual historical usage data combined with contextual data of Smart Machines, offers new opportunities for innovation and development of new innovative products, services and corresponding business models.

Contextual data and even more the combination of them with other data like operation, process, environmental, diagnostic, historian or current usage data opens the door towards many new opportunities. **Data specialists** can interpret relevant data and monetize them by bringing high value information about efficiency and reliability of machines, devices and interconnection with processes.

Turning raw data into informed actions on machines is a field of operation of specialists that is not harvested today completely. It is likely that beside all the well known operational business in the automation market by selling devices, accessories, software licenses and supportive services a new business around data management is growing as a niche. This niche can easily be conquered by non automation players, maybe innovative start-ups or even big IT players. Many of them establish technical foundations such as cloud technologies to find access to industrial market. So the consequences might be that even without producing and selling automation products like PLCs, Panels or Drives those challengers can become a new type of competition in automation just because of an innovative usage of IT services in our context.

The values which will get lost for Schneider Electric Industry in such a scenario is not only the potential new business from data management or the technologies around it. The much more painful part will be the loss of access to user data from OEM and manufacturers. In the given scenario this data would only be input for data specialists, but for automation suppliers it is high value usage data that help to prioritize future development. This data is essential to extend our knowledge about how our products are used, where we can innovate in hard- and software and which services are required by our customers but not yet available.

It might happen, that we did not have the chance to get this data in the past and we will not be able to get if we lose the opportunities of Industry 4.0.

### Data – the new currency

The value of data seems to be clear, but how can this value be turned into revenue? First of all: New business models do not necessarily mean new cash flow. Even maybe reduced or something entirely in place of cash flow can be highly compensatory:

#### 1. Shared data

Data gains more differentiating value the higher level of detail, its structured nature, over longer timelines, level of completeness or its source. Examples of data that can be combined usefully are machine usage, user data, environmental, process or energy data.

2. Customer loyalty  
Intimacy and deep knowledge create loyalty through long-term services that is required and very relevant to gain value from collected data. The better we understand how the customer is using our products the higher the intimacy will be.
3. Revenue stream with lower volatility  
Through long-term service contracts or subscription of valuable soft-ware functions a constant flow of revenue can be generated which have a low volatility as long as the services are useful and bring value- in other words: as long as they are not replaced by better offers in the market.
4. Customer expertise  
For example, shared ideas in innovation processes or shared expertise about optimization of the operation can enable us to create the right services and products. Then in return the customers can hand over to us the need and development costs.
5. Deeper insights  
Better information on the use of products and thus building application knowledge to further improve the business model and of course the services and products.
6. Planning reliability  
More data means also better information about the state of the products in use and with this a better reliability during business planning and forecasts of service assignments and storage of spare parts.

All of these compensate our costs either by increasing loyalty or reducing our costs e.g. to not succeed because we did not know well the usage of our products. But none of it generates new cashflows.

## Data service platforms

Another link between data and business is the idea of data service platforms. Wouldn't it be useful to have access to a platform that shares production process data from connected companies to get them analyzed by data specialists which propose recommendations to optimize the process and machine configurations for a yet to be defined compensation?

This network now could be enlarged with further partners. For example with other manufacturing companies, which although they could be not willing to share production process data by themselves but maybe be willing to buy the optimization data for machines that they use for a correspondingly higher amount of money. The data for these "third partners" are digital waste products of the business model of a data service platform.

Blurring boundaries between physical products, interoperability with connected systems and services need products supplements in all phases of a machine lifecycle.

The development of new smart products either digitally "augmented" like appropriately expanded sensors and actuators or offering smart services that represent much more complementary intelligent services will really increase the value of the complete offer from a customer perspective.

New technologies, new requirements, transformations and new business models will come with manifold impact. But of course there are also many exciting opportunities for new business models which can increase the attractiveness of the complete offer.

For many years business models in automation have been very similar, but existing business models are founded on assumptions that probably become invalid.

## New values for new Business Models

## Creating new collaborative values

Very often customer value can be achieved for products by smartly adding a few major Unique Value Propositions. For example, the intelligent heating regulator of the company Nest -now part of Alphabet (Google). Here the existing functionality of an isolated, dumb heating control was extended by adding network technology and product intelligence so additional services can be offered for example the remote control of the resident temperature using a mobile phone.

Transposed to machine industry the vast width of the German industrial market, is only -if at all- significant activities for digitization happening only on process optimization. Very often, the added value in production, logistics and sales, or after sales processes can be integrated with existing or increasingly becoming available Software and Hardware products. Adding connectivity, analytics or the simplification of use-cases in a smart environment is of course very useful but related only to one common value which is operational efficiency. This is comfortable, because it is very well known and understandable but in the long-term the opportunities for strategic differentiation will be relatively small.

Collaborative value in Industry 4.0 for Automation Suppliers, OEMs and Manufacturers is based on binding, reliable and transparent cooperation right from the start. New values focusing not only on the classical product or solution sales but on all aspects on a product life cycle (automation components and manufacturer products) must involve all potential stakeholders. From Business Units to Sales organizations but also from partners, OEM and manufacturers to Automation Suppliers.

This approach to new values follows Resilience-by-Design principle. Through collaboration of all stakeholders the chance to fail is drastically decreased.

The consequence of this type of development is for companies to discover new insights on the specific needs of existing customers and win new partners. This collaborative evaluation is also particularly interesting regarding the use of a product by a third party. For example, if it interferes with something outside its regular use or in unexpected ways that it is being used.

This additional knowledge has so far been very difficult to obtain and the base of developing new business models and in many cases also new or improved products and services be found that you maybe did not even expect.

## Everything-as-a-Service

With a very revolutionary approach Xerox generated over 20 years annual growth rates of more than 40% every year. In 1959 the technology of xerography was very new and highly expensive. Even that it became much easier to copy papers without handling chemicals, nobody could afford this. Just by taking risks and defining a new business model to this technology it became a huge success.

Instead of selling the copier machine, Xerox decided to lease it at a low cost and then charge a per-copy fee for copies that exceed the number of 2,000 copies per day. Xerox provided all the required supplies service and support and the customer could cancel the lease on only 15 days notice. This was a hard move given that the average business copier at that time produced an average of 15-20 copies per day. Xerox took a large risk as customers were only committed to the monthly payment and paid no more unless the performance of the copier enabled them to make more than 2,000 copies.

So when products (Software and Hardware), solutions and “physical” services (maintenance, support, consulting) are showing a limited growth potential (even through adding additional features, more performance, or new ideas) it comes to looking for new opportunities. Certainly innovating by improving something existing can make products, services and solutions very successful as seen with many Schneider Electric products in the past.

For a machine builder the situation is more difficult. To not be forced to compete only on price level or functional level of a machine a more intensive analysis of his end-user’s pains is mandatory. Reduction of the Total-Cost-of-Ownership (TCO), CAPEX-TO-OPEX transformations, order of one-time-investment budget and know-how management are pains on end-user side. More and more machines are not sold but provided as a service ([Machine-as-a-Service](#)). While virtually everything can be a service (platforms, machines, virtualized hardware, software, data, etc.) the common idea is to outsource the technical responsibility and compensate it with either a low regular payment or a pay per use to the provider of this service. This was a very successful model already 60 years ago with Xerox and it is still today growing in popularity.

The consequent question for us is should we consider Machine-as-a-Service as an Automation supplier, or if it is just something the OEM can manage by himself?

## Transformation of businesses

Most obviously for Smart Machines which are communicative and connected to IT world, the transformation of OT providers towards OT providers with IT competencies is already ongoing.

But new Business Models on the OT market should not be just seen as somehow a way to monetarize new technologies or concepts. If we expand our view properly, totally new business opportunities can be opened.

The paradigm of service orientation brings more transformational power in combination with new technologies. Technologies are turned into services that speak and listen to other services.

The introduction of X-as-a-service, pay-per-X and subscription models can for example change financing needs for a company that provides these services and influence the distribution of risk between business partners though they offer also new opportunities for the role of financial services as an enabler and service providers in Industry 4.0 projects.

Analytics and predictive maintenance concepts can be a great source for negotiations for much better conditions from insurances that have to pay for unintended production stops. Do we think about offering product leasing? Machine Project financing? Schneider Electric rates with insurances?

Machine-as-a-Service requires a profound transformation of the self-understanding of a company ("the machine builder towards a machine service and financing specialist"). With any consequence on us.

## Software Services

Although I said previously, that companies that are heavily focused on improvements in operational efficiency will be under pressure from different sides, it does not mean, that values in this area have not been followed properly.

A piece of software tomorrow can be one of many new services that bring high value and create significant revenues with the right business model. Software services are relatively easy to distribute, extend or improve and therefore are very interesting new business opportunities.

Values in  
Operational  
Efficiency

Many software players prepare to leave the era of licensed based models which relies on new functions to be attractive enough to motivate a customer to pay again for a new version.

Here a few out of many possible examples:

- Virtualization services

For some OEMs virtualization technologies can help to simulate and optimize the machine building. At the same time they might not have the proper know how or hesitate to take the risk for the investment. A prepared virtualization service for our products can increase the value of our products for OEM drastically by removing those impediments.

- Code Quality Management services

It is difficult today for OEMs and their End-User to know if the code that has been handed over with a machine is robust, maintainable and well performing. Even more difficult is to find out and to prove that the quality of the code improved over time. Coming from IT development there are several standards that now find the way into OT world. Any single one of them would be difficult to sell for high price, so a service based model can enable to monetarize this value for an acceptable price.

- Data Analytics, Condition and Event Management services

The most obvious example that is also usually referenced when it comes to Cloud Data is of course “Predictive Maintenance”. But analytics of (Big) Data leads to many other typical values of Industry 4.0 like “preventive maintenance” or productivity and workflow optimization, constant condition monitoring and event triggering. Analytics is the base for end-to-end automated decisions.

## End-to-end automated decision-making

Big data analytics wave is in full swing in the consumer world. Take Google Maps as an example. Google stores people’s favorite destinations, knows the current location and combines the data with real-time traffic flows, peak time estimations which leads people to take faster alternative routes to their destinations. Google is facilitating the decision-making for getting to your destination.

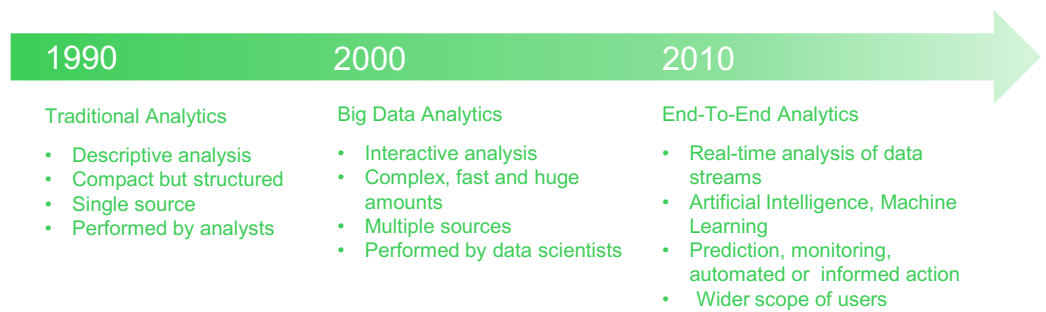
This kind of analytics is entering the smart factory but -when proved reliable- ending up in fully automated decisions. Below there are listed a set of scenarios where it might be applied in a useful way:

- Finding the best production setup (Auto-tuning)
- Optimizing the current schedule (Self-Awareness of Machines)
- Managing quality problems (Machine Speed adaptation)

So the processes in a smart factory become completely automated based on smart algorithms and machines communicating with each other.

Turning data collected from industrial machines and into automated decisions is a further evolution of data analytics that started in the 90s.





## The different models

### Business Models for Legacy Machines

While we design innovations having green field projects in mind, the biggest potential is maybe behind creating a new offer that can be used by loyal customers with our legacy products. In a simple manner this could be done by offering an IT/OT Connectivity as a physical device to connect machines/automation with IT services over Ethernet without reworking the complete machinery.

Many of those solutions are existing from also many vendors in this market- From fully wired to 3G modem integrated solutions. From physical to virtual solutions-but only if the connection could be done in out-of-the-box, then there is huge value.

Here being in traditional automation scope, the offer of physical hardware can be very successful. It is the enabler to access to all the new services for operational efficiency to any machine.

### Licenses

While licenses usually are used only for software products and functions, the business model behind that goes back to the late 60s. As the digitization with mobile devices transformed not only consumers' complete habits of using internet but also the willingness to pay a high price for software. Intelligent offers started to focus not on the one-time low price payment but to create value through additional services with affordable price (e.g. seen at Evernote).

We can assume that the business with one-time payment licenses will disappear completely over the next decade and replaced by low frequent payment for premium services.

Of course it's some years to go... and today additional software services are not yet on the level of acceptance to replace licenses.

### Pay-Per-x and subscription

Many new business models on the market are created to reduce the investment on a product or function that you do not use every day. For example several car sharing companies allow citizens in cities to use a car if they need it. The customers do not own the car, but pay a relative low price to have access to it. Of course if you exceed the usage of such a model it may happen that it would be cheaper to lease or buy a car, but if you (as a customer) are aware about your needs, it allows you to access individual mobility for a low price. This model can also be used for specific functions in our products in the context of Smart Machine. Very often this could be the case for software functions or services eventually in combination with SaaS (Software-as-a-Service) as a variant in addition to subscription.

### Freemium

Freemium business model is a hybrid of free and premium. A (basically) free version of a software, service or software service is available for a nonmonetary price for which you can also pay the price to get premium access without paying with data for



example or extended services. Such a model is especially relevant for virtual products and services typically offered in pay-per-use. Such virtual products are basically realized as Everything-as-a-Service, especially Software-as-a-Service (SaaS).

### Low Budget Innovation Business Model

The target of such a Business Model is the most possible successful introduction of a new and innovative product to the market. To achieve such a target, the critical key is high customer acceptance right from the start during market introduction. So if this is the goal, why not try collaborating with one of your innovative customers that is asking for a specific function or product during development?

This implies to observe customers' behavior and include them in the process to generate products. With this approach it is easy and relatively cheap to innovate (creating new products/services/functions unavailable today) because the chance to fail is lowered. Additionally you can turn trends on the market to customer expectation up to customer specifications. At the end you receive new products with high acceptance because it is co-created with the market.

### Industry Platform Business Model

One central pattern of Industry 4.0 business models are industry platforms ("Business Eco Systems"). Platforms represent accessible frameworks that allow you to use or combine data and services to create values for the OEM and manufacturers by concentrating information from mass data collected from many machines that are connected to the platform.

The platform leadership in an industry can be crucial for competitiveness in the long term. However, only those platforms that are a fair balance between supply and value distribution between platform operators and users will be accepted. Established Platforms are the drivers of other new business models.

The success of platforms depends certainly strongly on the number of users, so in consequence those platforms should be open towards all machine supplier components to increase the amount of data that is accessed.

Nevertheless, to convince manufacturers to contribute data (even in anonymized ways) it needs a certain level of trust and higher value that can be returned than the risk of granting access to very private data.

The difficulty to establish new Business Eco Systems on a market lies in the ramp-up phase because mass data create reliable values only from a certain amount of input data. Therefore in many business areas a group or consortium of companies with same or similar products in the same context create those platforms to provide a critical mass of accessible users and data.

### Revenue Models

Having a well-structured business model is necessary for the success of any business adding value to a product or service for customers. This will consequently include having a clear and tailored revenue model which will ensure its financial health. This provides the owners of the business with a necessary understanding of cash flows as well as how it will generate revenue and maximize profitability.

People often confuse "revenue model" and "business model" as being synonymous, or as being two completely different kind of models. But a revenue model is one elementary component of a business model. A business model shows the framework for an entire business and allows any stakeholder to evaluate that

business. Business models can be viewed in many different ways. However, they are generally composed of the following elements:

- Segmentation and acquisition of high value customers
- Key values offered to customers
- Margins evaluation
- Customer needs & satisfaction
- Positioning on the market
- Business funding

Revenue models cannot be viewed as being identical to the business model as it does not influence all the six elements but more should be viewed as an inner component of it.

## Conclusion

Before creating new technologies, we must think about how to create the right values to be also able to sell it. Of course there are sometimes many good reasons to be the first on the market. But in the history there were many examples, that being the better on the market is much more sustainable in terms of business.

All the technology that is required for “Industry 4.0” is available today already. So in fact Industry 4.0 can be seen more than an innovation driver for new businesses that are not exploited today, than an innovation driver for technology.

If these existing technologies are assembled properly together and combined with the right business models, there is really good chance to profit from Industry 4.0.



## About the author

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