

Beinert, Markus; Nies, Heiko; Vermehren Schmiedel, Andreas

Article

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Marketing im Internet der Dinge



IoT in Execution at John Deere

Innovation Leadership in What is Perceived to Be an Old Industry

Firms should not only focus on technological issues of the Internet of Things (IoT) for further enhancing the customer experience. They should also deal with implementation issues in their IoT ecosystems. For John Deere, one of the major players in the agricultural equipment industry, dealers have a critical role in the ecosystem. Besides offering advanced IoT technologies, John Deere also deploys innovative methods for advancing IoT services and experimenting together with its distribution channel partners. This article outlines challenges of implementing IoT-related services together with dealers, success factors and lessons to be learned from this case study.

Prof. Dr. Markus Beinert, Heiko Nies, Andreas Vermehren Schmiedel

It is no secret that IoT is changing industries worldwide. In the agricultural equipment sector, original equipment manufacturers (OEMs) have a long record of accomplishment in utilizing the power of IoT-related services to accelerate their customers' ability to capture productivity gains on the field. In the agricultural equipment industry, the T stands for ten-ton tractors or combines. They all are equipped with two-way communication systems, have 4G LTE modems with WiFi, GPS and Bluetooth. The machines can communicate with one another on the field, can collect data off the farm, send it to the cloud and then receive instructions from farmers, dealers or even software companies.

As one of the major players in the industry, John Deere is utilizing IoT to help farmers improve the productivity of their daily operations. John Deere's roots date back almost 200 years in the mid-western corn belt of the United States of America. Ever since, the company has stood for four core values: quality, commitment, integrity and innovation. Those values have guided John Deere through peaks and crises in a business that has, since biblical ages, been known to be cyclical. With net sales in 2018 of \$ 37.358 billion and a net income of \$ 2.368 billion, this manufacturer of agricultural and construction equipment ranks as a Fortune 500 company.

The Journey Towards Agriculture 4.0

Due to the development of precise and inexpensive sensors for the collection and processing of data the sector has evolved to what is known in the field as Agriculture 4.0. The umbrella term Agriculture 4.0 comprises many of today's popular terms like IoT technologies and AI, which relate to a system of systems that interlinks an array of product sys-

tems (figure 1). Porter and Heppelmann (2014) used the agricultural equipment industry as an example in their series of articles describing how smart, connected products change competition.

For farmers, the change process started with headland management systems. These systems could execute a series of tasks when turning a tractor at the headland of a field, automating tedious tasks like gear changes, lifting and lowering the implement or turning on/off the differential lock. In the past all these tasks had to be performed by the operator. The most significant milestone, however, was automated steering, which – with the help of high-precision geolocation technology – can perform precise steering with low to no track overlapping. It also allows the farmer to save costs, increase productivity and perform tasks with extreme accuracy so the data generated can be used to pinpoint locations for further processes, opening the field for what is known as precision agriculture. Today, machines perform field work in straight or curved tracks, including headland turns, without operator engagement. Nowadays, besides the increasing autonomy, the machines are connected to each other, with implements or combines/harvesters from different manufacturers all being synchronized to perform at peak installed capacity throughout changing conditions during the day and season.

An example of such a system of systems is John Deere's Manure Sensing system. In times of nitrate contamination in ground water and rising fertilizer costs, this system is a way to not only help comply with more stringent regulations, but also to help increase yields with a more precise distribution of organic and synthetic fertilizers. Based on near-infrared (NIR) sensor technology, inhomogeneous organic fertilizer is distributed accurately on the field. The appropriate amount of

Prof. Dr. Markus Beinert

Professor of Marketing
for Capital Goods,
University of Applied Sciences
Weihenstephan-Triesdorf

markus.beinert@hswt.de

Tel.: +49 (0) 8161 71-6495

<https://www.hswt.de/>

Heiko Nies

Manager Aftermarket Sales,
International Sales & Vertrieb
Deutschland, Österreich, Schweiz
John Deere Walldorf GmbH & Co.
KG, Walldorf, Germany

NiesHeiko@JohnDeere.com

Tel.: +49 (0) 7251 924-8820

<https://www.deere.de/de/>

Andreas Vermehren Schmiedel

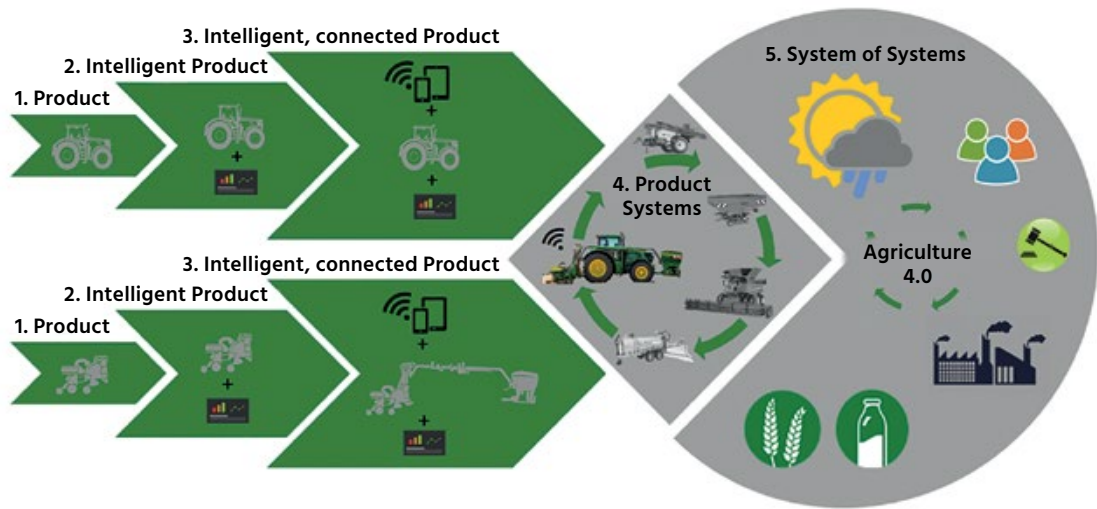
John Deere GmbH & Co. KG,
Mannheim, Germany

VermehrenAndreas@JohnDeere.com

Tel.: +49 (0) 621 829-8022

<https://www.deere.de/de/>

Fig. 1: Stages of the Development From a Product to a System of Systems



Source: Illustration adopted from Porter/Heppelmann 2014 and adapted to the situation at John Deere in 2018.

fertilizer may vary based on soil and crop conditions or yield data from previous crops. Exact data collection and flow are generated by harvesters that measure the yield and its quality correlated to its geolocation or by drones with sensors capable of detecting deficiencies in plant foliage from above. They all send this data stream via the cloud to the tractor. With the help of the NIR sensor the tractor analyses the exact nutrient composition

of the organic fertilizer and applies the appropriate amount for covering plant and soil needs.

The data exchange between the smart connected products can in turn open up opportunities for automatic decision making and efficiency maximization. In the end it is all about the individual plants, autonomous machines and pre-planned execution in the field while adjusting to rapidly changing

weather, plant or soil conditions. All these applications offer farmers value in the form of performance enhancements or cost savings. At the same time, these technologies must be implemented and serviced by John Deere and its dealers, which offers a good opportunity for John Deere to further strengthen the aftersales business of its dealers.

IoT Deployment During the Products' Entire Lifecycle

Farms are professional business operations that value optimal machine performance, long uptimes and low operational costs. John Deere Connected Support™ utilizes automation and digitalization technologies to generate algorithms that adjust machine settings for peak performance or to preventively maintain and repair machines while not impacting the operating window on the field and avoiding serious repair costs in case of potential failures.

Management Summary

1. IoT is transforming the agricultural industry towards Agriculture 4.0, which relates to a system of systems that interlinks an array of product systems.
2. The implementation of IoT-related concepts at the dealer level is critical for success as such systems must be adapted to the local context.
3. Compared to other modes of interorganizational coordination, virtual workings groups offer a new way for problem solving in IoT implementation processes.

John Deere markets these proactive services under the umbrella term FarmSight Services. These comprise services like Expert Check inspections, PowerGard maintenance and warranty extension. Some proactive services are highly technological, such as: connected customer support through Service ADVISOR™ Remote, Remote Display Access and Remote Machine Monitoring. Based on telemetry technologies and sophisticated programs, dealers help customers set their machines to the most efficient settings for a specific job or precheck a machine remotely to increase productivity in repairs or to anticipate potential problems. In the area of connected customer support, John Deere markets its service Expert Alerts – a system of early warning algorithms to prevent failure and breakdown. This innovation in the field of

preventive repair and maintenance is not only saving farmers' money but also helps John Deere's dealers to further enhance the customer experience. Furthermore, FarmSight Services also offer solutions like machine optimization, logistics optimization and, to some extent, agronomic support.

John Deere and its dealers offer such services mainly as fixed-fee services bundles. They are called FarmSight Services packages and comprise bundles in three different modes (called Select, Premium, Ultimate). Figure 2 gives an overview of these bundles.

FarmSight Services mainstream IoT solutions for both Precision Agriculture and John Deere Connected Support™ applications. While achieving many critical technological milestones, the user experience is still not at the

aspired levels in every region of the market. John Deere's business model relies on the specialization and service capabilities of its dealers. The IoT technologies outlined above trigger change processes, where both the OEM and its dealers have to learn new capabilities and change their way of doing business.

IoT Implementation at the Dealer Level

With all the current technological advancements, it is crucial to gain and nourish the commitment of the John Deere dealers. John Deere employs full-line distributors with guaranteed territorial exclusivity. In return, the dealers guarantee brand exclusivity. This distribution structure is the industry norm as machines like tractors or combines require field-support facilities since the

Fig. 2: FarmSight Services Packages

Service	In Base	Select	Premium	Ultimate
1. Pre-delivered inspection A thorough final inspection, installation of attachments and setup of your tractor by an expert	1st year	1st year	1st year	1st year
2. MyJohnDeere Account set-up Allows you to benefit from machine connectivity from day 1	1st year	1st year	1st year	1st year
3. Machine handover training Easy start-up with tips and tricks from an expert	1st year	1st year	1st year	1st year
4. Remote machine monitoring Active repair and diagnostic notifications in case of irregularities increase uptime	■	■	■	■
5. Automatic maintenance notification Scheduled maintenance notifications relieve you from maintenance planning	■	■	■	■
6. John Deere operations center introduction Time efficient initial training to get you started on managing your field and machine data	-	1st year	1st year	1st year
7. Seasonal phone support Quick resolution of questions or issues by phone	-	■	■	■
8. Expert check and software update Detailed after season machine inspection for maximised next-season uptime	-	■	■	■
9. Remote machine setup support Immediate remote resolution for display set-up questions	-	-	■	■
11. Set-up support / optimisation visit Reduced fuel consumption and full utilisation of all installed technologies	1st year	-	■	■
10. Remote performance check Utilisation analyses and efficiency improvement suggestions to cut down operating costs	-	-	■	■
12. Back-up Tractor Drop-in-back-up tractor if your machine cannot be repaired within 48 h after break down	-	-	-	■

Source: Beinert/Nies/Vermehren Schmiedel, 2019.

machines experience much wear and tear. They also require spare parts and repair. The after-sales business is therefore an important part of the dealers' profit equation. At the same time, competitive pressures in the after-sales business are numerous, e.g. coming from cooperative dealer groups that invest heavily in advancing their digital capabilities, but also from e-commerce hubs that offer spare parts at low cost.

Not all dealers embrace the advancements that IoT has to offer. This is due to several reasons that are outlined below, utilizing theoretical aspects that can be found in the literature on dealer incentive systems, sales force ambidexterity and transformational sales. We will briefly discuss these theoretical concepts and explain their suitability in the context of John Deere and its dealer network.

Incentive systems try to make partners conform to special goals by using different power bases such as coercion, rewards, legitimacy or expertise (Coughlan, Anderson, Stern & El-Ansary, 2008). Suppliers invest in tangible equipment such as IT systems, intangible resources like trainings and coordination support, monetary and nonmonetary incentives to gain the channel partners' commitment (Gilliland & Kim, 2014). Incentive systems should be adaptable to the dealer context, giving channel partners the chance to find different ways for their business to

grow and thrive (Kalyanam & Brar, 2009). The latter is particularly true for IoT-related services, as such services must be adapted to the individual context to reach their full potential (Restuccia, de Brentani, Legoux & Quellet, 2016; Adner, 2017). John Deere employs all the forms of channel incentives mentioned above and embraces a culture of open dialogue with its

dealers. For the implementation of its IoT-related service FarmSight Services, John Deere has learned that a standardized way is not the best strategy.

The term ambidexterity refers to an organization's capability to address two organizationally incompatible objectives equally well. Ambidextrous firms manage conflicting demands like exploiting existing competencies and simultaneously exploring new opportunities more successfully than companies that do not have this capability (Birkinshaw & Gupta, 2013). In the sales literature, ambidexterity has mainly been discussed at the employee level. It is used to explain how sales employees cope with conflicting demands like customer service provision and cross-/up-selling during service encounters (Jasmand, Blazevic & de Ruyter, 2012) or with incompatible goals like exploring new products and customers and exploiting existing products and customers simultaneously (Lam, DeCarlo & Sharma, 2019). Such conflicts can also be found in John Deere's dealer organization. First, there is a conflict between a dealer's capacity of selling new machines and further developing the after-sales business. Agricultural machines like tractors or combines easily captivate customers, therefore sales persons love selling them. After-sales services, on the other hand, are much more abstract and difficult to explain to customers. Also,

Main Propositions

1. The implementation of IoT-related concepts offers dealers new chances in the after-sales business, but such concepts also trigger change processes.
2. Traditional incentive systems are not very helpful when it comes to stimulating such change processes. Virtual working groups can be a vehicle for promoting change as they can be used for sense-making, role-modeling and experimentation.
3. For the successful employment of virtual working groups the psychological distance between the actors has to be overcome.



a dealer needs a solid and growing machine base in his region to profit from after-sales business. In the D-A-CH region, one can also find the trend of a growing diversity among the customer base. Servicing the customer segments of large, professional farms as well as traditional, small-scale farms makes the after-sales business particularly challenging for John Deere dealers, aggravating the conflict between selling new machines and professionalizing the after-sales business.

The concept of transformational sales is rooted in the assumption that selling new products or concepts is fundamentally different from selling conventional products and solutions as the former requires sales representatives to become change agents that literally co-create with their customers and help the buyer's organization to adapt to a new way of doing business (Kotler, Dingena & Pfoertsch, 2016; Steenburgh & Ahearne, 2018). For the implementation of IoT-related services John Deere's dealers also have to transform themselves and their way of doing business. Many of the John Deere D-A-CH dealers are still functioning as reactive service organizations. This means that they normally wait until the customer comes up with a problem or query before offering them a solution or service. With John Deere's FarmSight Services they need to develop a proactive attitude and new capabilities such as a deeper economic and agronomic understanding of farm customers. Aiming for a stronger focus on customer centricity, John Deere is dedicated to provide customers with a satisfying experience throughout the lifecycle of the product. Farmers' expectations regarding machine uptime and availability, especially during peak times like the harvesting season, are high. Proactive services like John Deere's Farm-

Fig. 3: FarmSight Services 4+1 Focus Areas



Source: Beinert / Nies / Vermehren Schmiedel, 2019.

Sight Services concept are well suited to meeting such requirements. John Deere is therefore trying to stimulate a cultural change in its dealer organization towards a proactive service organization, which will offer solutions before they are required. This transformation is a journey, and it requires the dealers to constantly experiment and adapt technological innovations to their regional and diverse customer bases. As one of the most impactful stimuli towards this cultural change John Deere has implemented "FarmSight Services Working Groups".

FarmSight Services Working Groups

In order to build a platform for communication and experimentation for its dealers, John Deere implemented "FarmSight Services Working Groups" (FSWGs). The aim of this new concept was to create a podium for dealers and John Deere to share and discuss new

ideas in the form of best practice sharing and to create a network of contacts for open collaboration. Additionally, participants were to be inspired to act as proactive service organizations and become advocates that understand the potential of proactive aftermarket sales in their business. At its core, the idea was to create a project that would be simple to organize and as cost- and time-efficient as possible for all parties involved. Inspired by the Working Out Loud (WOL) concept (Stepper, 2015) and agile methodology programs, FSWGs were implemented as pure virtual working groups that comprise key personnel from different dealers and were moderated by John Deere experts to ensure the quality of the conversations.

The envisioned 12-session project was structured around five key elements of FarmSight Services (figure 3). As a result, five working groups were formed, and each group had at least one moderator. The role of the moderator was to organize and prepare the sessi-

Table 1: Comparison of Various Interorganizational Modes of Coordination

Criteria	Key Account Management	Relational Contracts	Dealer Councils	Virtual Working Groups
Exemplary reference in literature	Belz, Müllner, and Zupancic (2014)	Frydlinger, Hart, and Vitasek (2019)	Diez (2015)	Breidbach, Brodie, and Hollebeek (2014)
Organizational actors involved	1:1 (one dealer, one supplier)	generally 1:1 (one dealer, one supplier)	n:1 (many dealers, one supplier)	n:1 (many dealers, one supplier)
Primary idea	Establishing an organizational capability for dealing with major accounts; also, a platform for generating value cooperatively	Defining guiding principles (interorganizational governance norms) that both actors comply with; governance norms function as a starting point and as evaluation criteria that both partners can use	Platform for conflict resolution between suppliers and dealers in franchised channel relationships; mainly for balancing out power structures and for the discussion of contractual terms	Platform for generating value cooperatively; much more focused on cooperative problem solving and making full use of concrete opportunities; application of agile concepts like scrum
Potential for riskless experimentation		high (expanding the pie)	low (representation of interests as primary concern)	high (expanding the pie)
Means for benchmarking & learning	none (Chinese walls are set up)	none (Chinese walls are set up)	yes, but not the main purpose	yes

Source: Beinert / Nies / Vermehren Schmiedel, 2019.

ons, to introduce and moderate the topic, and to create and guarantee a positive atmosphere. Additionally, the moderators served as direct contact partners for the participants, supported the exchange, recorded the discussions and ensured the interaction of all participants. Moderators were chosen from the John Deere management in the relevant subject areas.

As a basis, each meeting was scheduled for an hour with an extra hour for homework. Homework was used as a tool to set the floor for the next session or to reinforce what had been discussed during the meetings. On most occasions, homework naturally resulted out of the session's discussion. Some examples of homework in the Working Groups were: preparing a small presentation on the discussed subject and the participants' experience, brainstorming for ideas on a specific problem, creating lists of people or processes necessary to achieve success in a specific area, applying an idea or program

for a specific duration and informing the others about the results, gathering examples of documents or processes to share and discuss, etc.

Comparing the FSWGs project with other methods of interorganizational coordination at the dealer level, like

key account management, relational contracts or dealer councils (table 1), it can be observed that such virtual working groups can be utilized to coordinate many dealers simultaneously (n:1 relationships). FSWGs are a platform that generates value cooperatively for

Lessons Learned

1. Key partners in a firm's ecosystem have a critical role in advancing and implementing IoT-related business models. In the agricultural equipment industry dealers have such a critical role.
2. Standardized programs and incentive systems are not the best strategy for implementing IoT-related services at the dealer level. Complex systems such as IoT trigger change processes on both the OEM's and the dealers' side. They must be adapted to the dealers' context and their diverse customer base. Therefore, co-creation and experimentation are crucial elements in winning and advancing key partner commitment.
3. Virtual working groups with dealers provide a platform that can be successfully utilized for sense-making, role-modeling, experimentation and implementation of IoT-related services.

supportive problem solving, using agile concepts to make full use of concrete opportunities. Therefore, compared to other forms of interorganizational coordination they are especially well suited for experimentation and learning.

The project was organized in virtual groups to increase efficiency, e.g. regarding travel costs and time. Working virtually also increased scheduling flexibility which improved participation without interfering with daily business, but it also presented challenges like ensuring the members' attention and engagement as well as compensating for the loss of nonverbal information. The coordination of virtual teams is much more demanding than that of traditional working groups. A major problem of virtual working groups is that the perceived psychological distances between the actors have to be overcome. Otherwise, the participants will blame others for failures and will evaluate the project only according to its ultimate results. People in virtual working groups usually have higher expectations regarding the individual competence of their team members (Welpel, Tumasjan & Strobel, 2010).

In the context of the John Deere FS-WGs project, psychological distance between participants also had to be overcome. For example, there was a certain heterogeneity in the teams due to their differing proficiency in implementing IoT-related concepts. Therefore it was important to motivate the more innovative dealers to share their knowledge and for the other participants to learn fast. The applied agile project management concepts played an important role in overcoming such resistance.

The outcome of these working groups was very promising. Detailed proposals for structures, processes and documents for the successful marketing and implementation of proactive

services were created and made available to the entire dealer network. Additionally, the FSWGs project created a platform for the safe and constant exchange of ideas in the form of best practice sharing. It also created a network effect, so that participants within the same FarmSight Services Working Group physically visited each other. It further showcased a new digitalized and virtual way of working, showing that it is not only possible, but has great benefits, saving valuable resources with respect to human and economic

resources and time. One of the most important results of this project, however, is the inspirational aspect and the development of proactive service organization advocates. For now, the project will be continued with additional after-sales topics of strategic relevance for the dealers and the company. Although cultural change is not easy, the FSWG project started a journey of experimentation and the exchange of ideas in order to attempt to fully exploit the potential that IoT has to offer. 🚩

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