
Industrial Smart Services Facilitated by the Heidelberg Cloud

Tom Oelsner

1 Introduction

Heidelberger Druckmaschinen AG is the leading manufacturer of sheetfed offset printing presses, the most important technology in industrial printing. With annual sales of approximately 2.5 billion Euros in the 2019–2020 fiscal year, Heidelberger Druckmaschinen is represented in 35 countries by its sales and service units (SSUs). In addition to printing presses, Heidelberg also sells all equipment for the modern print shop from prepress to postpress, as well as industry software. As a partner to the print media industry, Heidelberg provides lifecycle services in addition to the equipment business. These services include technical services ranging from installation, maintenance and repair to the retrofitting of machines. Heidelberg is also supplying customers with consumables for all aspects of industrial printing. The lifecycle business now accounts for around 50% of Heidelberg sales.

1.1 Industrialization Changes the Print Media Industry

Within the last 30 years, the production of printed products has developed from a family business, which was mostly handcraft-based, to industrial production. Digitalization has been taking place in this sector since the early 1990s and began with the complete conversion of the pre-press stage to computer-to-plate (i.e., the digital exposure of printing plates). For smaller and personalized runs, digital printing is becoming increasingly important. This is all happening under the sign of a constant printing volume worldwide, with the printing palette shifting away from advertising material and brochures to the ever more elaborate packaging. Today, a modern printing plant has a production volume many times greater than that of recent

T. Oelsner (✉)
Heidelberg Digital Unit, Wiesloch, Germany
e-mail: tom.oelsner@heidelberg.com

years, is operated in three shifts, and requires the highest level of machine availability.

2 Pioneering the Internet of Things

Heidelberg introduced the networking of printing presses via the Internet back in 2004. Why did we do so?

A press machine is a piece of high-tech equipment. More than 1000 sensors ensure the proper operation of the machine. The repair of such a high-tech vehicle in combination with local software installations became harder and harder. In 2004 the on-site intervention index per service case was at 2.8—in other words, a technician had to travel 2.8 times on average to fix a problem. The first visit was usually required just to clarify the faulty parts. A second visit was scheduled within 24 h to fix the issues with the delivered part. If something went wrong, another visit became necessary.

The original idea of a remote service network had a strong business case: If we were able to do the parts clarification remotely, we could save more than 10 million Euros per year and increase the machine availability significantly. Today, quick response times with a high first-time fix rate are no longer possible without a global IoT solution. This idea was at the origin of the Heidelberg Cloud, which is the largest Industrial Internet of Things (IIoT) network in the print media industry today.

In addition to the technical benefits of this remote diagnosis and instruction option, the new approach marked a milestone to build trust in the customer relationship for the lifecycle services of Heidelberg. Even in 2004, there were concerns about data privacy and IT security, which reduced the acceptance of such a remote service.

Hence, we decided to integrate a “personal touch” in our remote services (see Fig. 1). If a technician accesses a machine for diagnosis reasons, the customer must approve the remote access case by case. As a result, the customer stays in control of the process. Once the connection is established, we transfer the name and a picture of the technician to the machine desk. Usually, our technicians work in a rotating model—provide some on-site service and serve some days at the remote back office. The operator typically knows the technician in person, and a trusted relationship can be continued over the remote session. In complicated cases, a third-level expert must support our service engineer in the country. Executed through a conference call, the local technician stays in the session and mediates between the customer and the third-level expert. Additionally, it was the best remote training approach we ever developed. Local technicians learn case by case from our third-level experts helping the customer together remotely.

Although the service was now a remote service that allowed parts clarification and partly a remote fixture of electrical issues, as well as remote guiding of operators (it was still a reactive service), the customer had to call Heidelberg after a machine breakdown.



Fig. 1 Trusted customer relation: personalized remote session and over-the-shoulder support. Own illustration

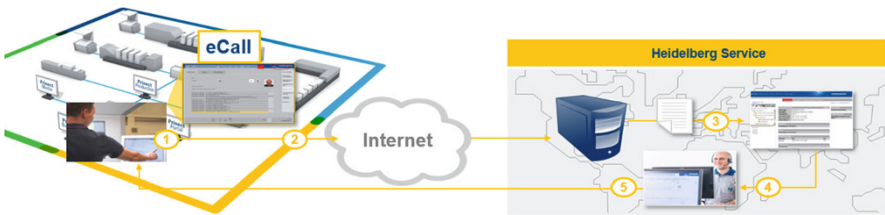


Fig. 2 eCall®—The first proactive, digital service model. Own illustration

The logical next step to achieve a smart service was the eCall® system invented in 2008 (cf. Fig. 2). It is the first proactive service approach in the industry. We realized that in case of a machine breakdown, it took the customer, on average, 30 min to pick up the phone and inform Heidelberg. Usually, the customer tries to fix the issue by rebooting the machine before calling Heidelberg. Often, this behavior wastes time. Since the machine is already connected, why not let the machine send the information about the service issue and open a service incident message at the Heidelberg help desk automatically? Establishing the eCall® approach changed our customer relationship radically. Before eCall®, our help desk was the first (reactive) contact point. The customer was emotional and angry when calling and provided the incident details verbally. Often, we encountered statements like: It is the same as last time. You can train your call desk personnel for this kind of situation, but it will always remain stressful. Essentially, it will not be getting better until you provide a real proactive approach.

With eCall®, the machine is calling Heidelberg on its own and sends all diagnosis data within the same message. A trouble ticket number is replied in seconds to

inform the operator that we are working on it. This new contracted service level guarantees that we call back the customer within 30 min and provide a remote solution or a scheduled on-site visit as soon as possible. These are exactly the 30 min that the customer formerly needed to call us initially.

3 Smart Services and New Business Models

The Heidelberg Cloud—the name of the IIoT solution that now connects over 13,000 presses with Heidelberg service—became a catalyst for the digital change. The introduction of eCall® in 2008 had an unexpected side effect: From this day on, we could configure machines to define which data the machine is sending us at what time. Originally defined to support field test scenarios, this capability is the key to agile, adaptive development of new smart and data-driven services. Since an IIoT platform has a very long lifecycle, we used this instrument to invent new services in months and not in years. Customer requirements for machine availability continued to grow, and big data-based services have been added to the Heidelberg portfolio since 2012.

By establishing the predictive monitoring service, we can forecast breakdowns and schedule appropriate maintenance work for maximum machine availability. The Heidelberg Cloud now collects data of the connected machines to detect anomalies in time series of sensors of a single machine, as well as deviations of one machine to the amount of all machines of a certain product line. This combined approach allows a high significance of the predicted cases and a replacement of unplanned downtimes to a planned service intervention—in the best case, paired with a regularly scheduled maintenance visit. The machine availability accumulates to a maximum if all the smart services are combined.

In addition to the services on which we focused to increase technical machine availability, Heidelberg developed a set of new services based on the existing Heidelberg Cloud connectivity.

To improve the productivity of print shops, we run our own consulting team consisting of industry experts around the globe. The Heidelberg Cloud disrupted this consulting service (cf. Fig. 3). The printing process performance data forms the basis for the team of experts who, together with customers, carry out overall equipment effectiveness (OEE) analyses and recommend and implement measures to increase productivity. More and more, a digitalized service department is thus changing from a repair workshop to becoming a partner and trusted advisor for the customer over the entire lifecycle of the press.

3.1 The Network Effect drives New Business Models

However, these smart services have another inherent characteristic: They create a network effect. The digital economy, thus, describes the phenomenon that the better the service has become for everyone, the more subscribers it has. Service providers

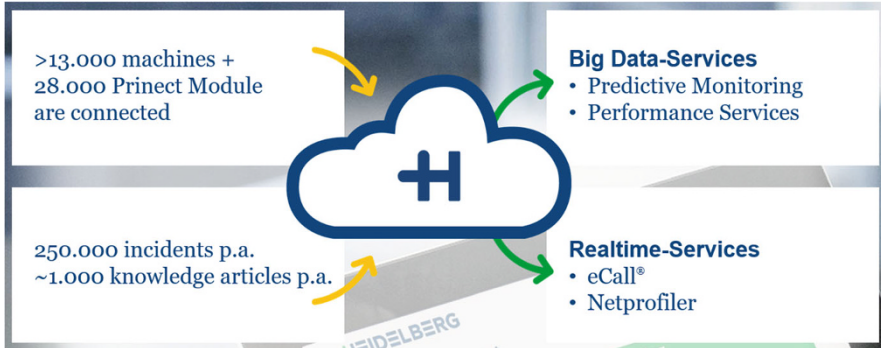


Fig. 3 Heidelberg Cloud—IIoT base for smart services. Own illustration

like Uber offer good examples of this: Many customers create a dense network of drivers, which leads to fast reaction times, attracting more customers. The same is true for Heidelberg's performance consulting services. For instance, the database now contains the technical OEE information of over 60 million print jobs worldwide, making it the largest database of its kind. This lays the foundation for the best advice, because the more comparable jobs are available, the better the potential for improvement can be identified.

While the early remote services, such as remote diagnosis and eCall, worked on a one-on-one level with limited scalability, smart services such as predictive monitoring and performance consulting profit from their network effect. We realized that it was a clever idea to build a foundational network with easy-to-entry services, but root for services built on the network effect. These services create a unique value-add for the customer, which is very hard to copy by followers in the competition. In this case, an early start ensures the pole position in the race and mostly ensures that the winner takes it all.

Until this point, we have developed new services under the model of service contracts. Today, more than 200 million Euros per year are generated from this business approach, which is profitable, but not a new business model in the sense of the word. Service contracts existed already for a long time before the smart service era and ensured the customers a certain service level at fixed calculated costs. Most of the service industry still operates this way.

In 2018, Heidelberg started an all-new business model—the subscription model for industrial print.

All traditional contracts were calculated cost-based with a markup. Reliable service cost with a high service level is a real asset for the customer. Nevertheless, if and how the customer receives benefit out of such a contract is mainly on his side. If we want to elevate the customer relationship to the next level, we must ensure that the delivered value of our contract is turned into a profitable business at the customer side. Linking customers' success and that of contractors leads to a new partnership, which is typical for new digital business models, such as subscription and pay-per-use.

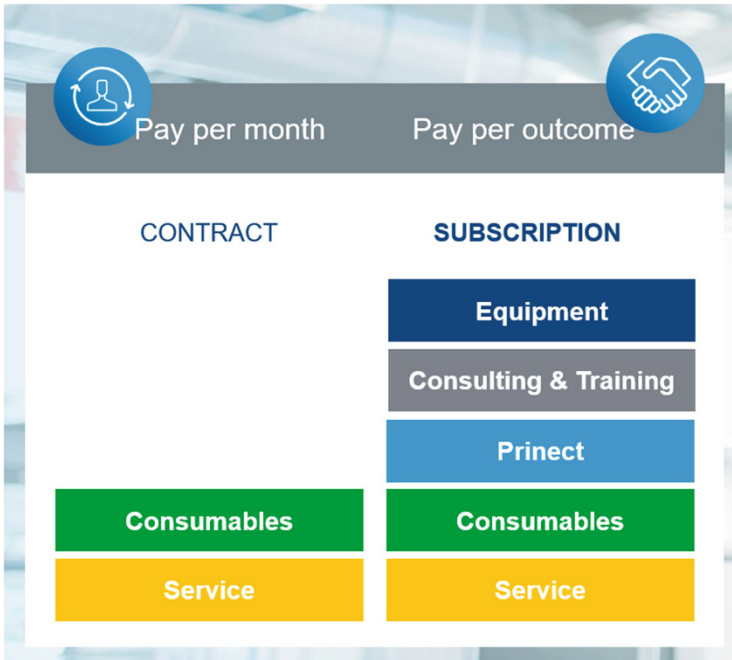


Fig. 4 Subscription business with a pay-per-use model. Own illustration

We achieved the transition toward an outcome-based remuneration by combining all our smart services into a new model. The customer no longer cares about the input factors of the production but focuses on the output performance. From the viewpoint of payment, it is a “pay-per-outcome” business model (see Fig. 4). Operationally, the new model requires a subscription to our performance consulting, which delivers the outperforming results. Driven by the network effect, the better the consulting service gets, the more customers subscribe to it. Previously, customers made separate purchasing decisions for machine investment, service, and consumables and then focused solely on performance and performance enhancement. The subscription approach combines these offers into a lifelong service package. Only the printed sheet is billed according to an individually negotiated agreement with the customer. The customer “subscribes” to the performance know-how and thus receives an economical optimum of his production. All services are included, such as predictive monitoring and eCall, to ensure maximum press availability. Consumables are provided via vendor-managed inventory with optimal reordering depending on the consumption.

Coming from a supplier-customer relationship, the new model demonstrates a true lifecycle partnership. This drives disruptive potential in the industry. Consider the “milky way” in Fig. 5 to illustrate our consulting approach.

Figure 5 provides a look into the Heidelberg Cloud from the viewpoint of a machine performance benchmarking based on the OEE. We collected the

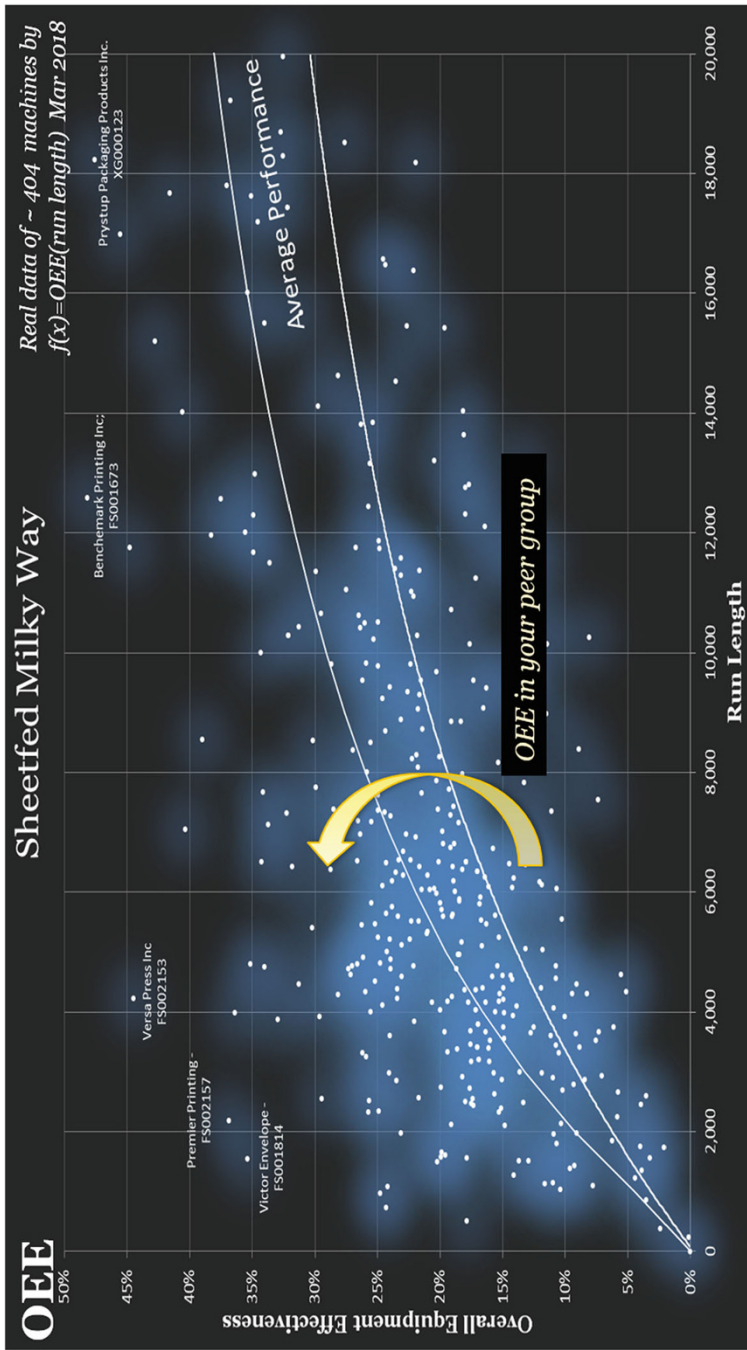


Fig. 5 Consulting database to prove performance and the potential. Own illustration

performance data from any make-ready process at the machine. Hence, we can compare the performance from one machine with a peer group of machines running similar job structures. This is needed because the same type of machine can run a very broad range of job characteristics, starting with thin paper applications for instruction leaflets to consumer boards used for the folding box of medicine. Defined as the “best-in-class” machine, performance is based on the Heidelberg Cloud data. Here, we have collected more than 60 million job data and can, therefore, find a fitting peer group for any customer. Notably, a customer produces on average 5000 jobs per year—feeding into the Heidelberg Cloud database and further fostering the network effect. The more customers subscribe to this consulting approach, the larger the database gets, in turn, improving the subscription results even faster.

To summarize the new business model, it is based on two pillars:

- First: The subscription to an outstanding performance consulting driving the network effect
- Second: An outcome-based billing, which aligns the success of the customer with our success as a solution provider

4 Scaling Smart Services

If we are 100% linked to experts executing the performance consulting, the subscription model can scale only to a certain extent. Application experts are hard to hire on the market, as they usually need a master’s degree in print media technologies and 10+ years of experience. To solve this bottleneck, we integrated a new artificial intelligence solution in the Heidelberg Cloud. The “brain” in the cloud is named PAT—Performance Advisor Technology (cf. Fig. 6). PAT learns, starting from the set of expert rules, which pattern requires which performance improvement action. After applying this action, PAT observes the change of the measured KPIs and recognizes if and how good a measure improved the situation. After learning from the results, the loop starts again. PAT will not replace the highly skilled experts in the consulting job, but we expect that 60–70% of the recommendations can be executed by this artificial intelligence in the future.

Our new business model creates a very close relationship between customers and Heidelberg throughout the entire lifecycle of the product. To make it efficient and to meet the customer’s 24/7 needs, a digital customer portal is essential—the Heidelberg Assistant (cf. Fig. 7). Here, the customer can do everything that used to be coordinated by telephone with just a few clicks: ordering service, an overview of delivery status and service calls, reordering consumables, managing his subscription stock, insight into the mileage of his machines, invoices, and much more.

We see a massive change at the executive level of our customers. A young generation of digital natives gets in leadership positions, and they decide about the business. A digital customer journey is mandatory for these young executives. Remember, just 15 years ago, we introduced remote diagnosis as a remote service and waited for a telephone call from the customer to start our service process. Today,



Fig. 6 “I am PAT”—Performance Advisor Technology—the brain in the Heidelberg Cloud. Own illustration

Smart Services require a new customer experience
Digital Customer Journey

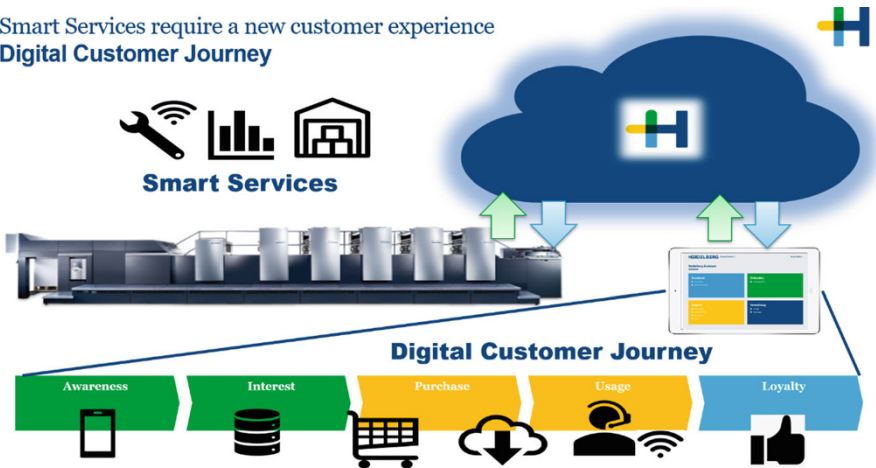


Fig. 7 Heidelberg Assistant—digital customer journey. Own illustration

a completely integrated customer portal provides real-time information about the service, supply, and performance status at any time to any role at the customer site 24/7. Considered as a wow feature, it is often expected by digital natives who grow up in the Internet age. Providing a state-of-the-art customer portal is key for a tight personal customer relationship and digital reachability. We have introduced the Heidelberg-ID—a personal account—that is the key to accessing all digital Heidelberg services. Providing this, we profile the users and can support their demand in the best way.



Fig. 8 The subscription business model as customer services in one app. Own illustration

Moreover, we experienced the creation of comprehensive, digital customer access that has a highly transformational effect on the service provider's own organization. Previous service systems were internal IT applications, performance data from the Heidelberg Cloud was only available to Heidelberg consultants, and the customer inquired about the delivery status by phone. Providing access to customers means the service provider must raise data and process quality to this digital level.

Let us come back to the performance consulting service as an element of the new business model "Subscription" to illustrate the impact of a digital customer journey (see Fig. 8).

Formerly, consulting had a very large on-site ratio. Visiting the customer to sell the consulting service started the journey. It was usually followed by a series of workshops to draw the initial picture, define the targets, and run the improvement session—in our case, every month. Action lists were typed into Excel and exchanged by email. Substituting the emails by a shared folder in a cloud repository is not digitalization in the sense of the word; it just replaces one media with another, but no process is changed. To change the game, you must rethink the consulting story from scratch. The Heidelberg Cloud, with the customer journey application Heidelberg Assistant, provides the platform.



Fig. 9 Heidelberg Assistant—customer performance benchmarking view. Own illustration

Figure 9 shows the Heidelberg Assistant with the performance benchmarking as the base for a joint consulting and performance improvement. Customers get a real-time view of their job structure, its “place in the race” benchmark, and the position within the entire industry. Finally, he gets an overview of the main performance KPIs, and he can focus on his improvement measures. If PAT is integrated, advice on how to improve a certain situation becomes automated too.

Our learning: Digitalization is NOT the continuation of offline processes and customer journeys. Digitalization requires a new design utilizing digital technologies to disrupt existing processes and business models, though it is difficult to adapt the organization to the new world.

4.1 Smart Services Are the New Normal

The COVID crisis is accelerating the digitalization of the whole industry. In 2020 we see the following immediate effects:

- Requests for smart services are increasing. The social distancing underlines the benefits of the existing remote tools and pushes acceptance on both sides—the customer and the service organization. It is the new normal to deliver technical services remotely, wherever possible.

- eCommerce order becomes the new standard channel for consumables and parts. While the overall consumption is not changing, the ratio of the digital channel increased significantly.
- A digital customer portal/app is used as a standard communication channel; this is no longer limited to digital natives, as elder employees accept the new normal and switch to the digital toolset too.
- New business models strengthen the customer relationship and make your customer and your own organization resilient in the crisis. They ensure recurring revenue, which works in the best case anti-cyclic but at least non-cyclic.

5 Executive Summary

Heidelberger Druckmaschinen started early in the digitalization of services and supply. The chapters above showed a journey of our development for more than a decade. Nevertheless, the key to success in an agile, challenging environment is stability. If you want to transform your enterprise toward a smart service organization, read these takeaways:

1. Build a lean corporate start-up team and work with agile methods. We did it and founded the Heidelberg Digital Unit as a corporate start-up. Don't limit your thoughts to improvements in the status quo. "Eat your own cake" is the message if your company is willing to disrupt the business. Merge two essential skills with an entrepreneurial mindset in this start-up: customer centricity and technology mastership.
2. Innovation is a customer-centric approach. A deep understanding of the market and customer needs is the foundation of any successful development of smart services and new business models. Design Thinking provides an ideal toolset to get customer insights. Beware of employees who know precisely what the customer needs but have never talked to one.
3. Master the technology challenge. Technology is the part of the digital story that can be bought. While that is true, keep the orchestration and the development of your core assets in your hand. An ambitious enterprise IT manager who lives the agile manifesto is a key resource for your start-up.
4. Finally, manage change resistance. Transformation of the business requires a transformation of your company. Measure the maturity of your current organization, your processes, and people for the digital change, and build a realistic roadmap. Ensure top executive support, but winning the heart, heads, and hands of the sales & service organization will make your transformation journey a sustainable success.