# Digital Transformation in the Use of Organizational Assets

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*Abstract. Many companies have been operating for business systems for a long period of time and have therefore accumulated a large amount of data. The data were originally accumulated on the premise that they would be used for business purposes, and they can be said to have achieved their traditional purpose. By combining these data with various internal and external data, it may become possible to create new value. For example, General Electric (GE) provides new value to its customers—such as reducing operating costs and offering just-in-time maintenance—by using data that had been collected for the purpose of jet engine maintenance and for flight route optimization. In order to utilize data as in the preceding examples, it is necessary to have knowledge about data, to realize the value provided by combining it with existing data, and to understand the digital technologies that make it possible to materialize. This research examines cases in which digital transformation has been successfully realized by combining existing data with other data, considers the characteristics of these cases and the impact of tacit knowledge on them, and explores the effective use of organizational assets in digital transformation.*

*Keywords: Digital Transformation, Knowledge Management, Lean Development.*

## I. INTRODUCTION

Since the late 2010s, the importance of digital transformation has been touted by global companies. The importance of digital transformation in global competitive strategy is particularly significant, and Japan is promoting digital transformation at a government initiative, while Germany has been promoting Industry 4.0 since 2012. Other countries are following the precedent cases.

The background of this topic is digital technology centered on information and communication technology, specifically, the Internet of Things (IoT), big data acquired through IoT, and the development of Artificial Intelligence (AI). By utilizing acquired data, companies have been able to take a new approach that differs from their traditional business approach by combining efforts linked to technological advances toward AI teacher data, future predictions, and independence. GE is a pioneer in this area. This company used information on the operation of an internal asset, the jet engine, to optimize flight routes and predict maintenance and servicing needs, and used it as a means to optimize the operating and maintenance efficiency of its airlines. This initiative, which began in 2011, continues to attract attention today.

Building a profitable business utilizing data from existing businesses cannot be achieved simply by introducing digital technology. It is necessary to consider whether the data from the existing business are ready to be utilized and be effective in digital transformation. Especially in terms of doing something different from a conventional purpose, it is considered to be an unexpected use of the data. Bughin et al. [1] pointed out that we should review our business portfolio and, in some cases, even cannibalize existing businesses to get ahead. Schumpeter [2] defined five types of innovation, and production innovation is a category that is closely related to digital transformation. As a result of innovation, competition with existing businesses is considered to be similar to the innovator's dilemma presented by Christensen

et al. [3]. Ideally, new services should be incorporated into the portfolios of existing businesses through digital transformation.

This study proposes effective ways to promote innovation by examining examples of the effective utilization of organizational assets, differentiation from existing domains, and synergistic effects.

A preliminary survey on the data inherent to organizations and how they utilize them to realize digital transformation by applying organizational assets obtained from previous businesses. We will investigate how organizations use the knowledge that they have to leverage data that already they possess.

## II. LITERATURE REVIEW

Data are an organizational asset traditionally accumulated for use in systems developed to improve internal work and operational efficiency. As a result, the data within an organization exist in a form that is considered business data. These data in such systems are called "big data" and are used to consider the business strategies of companies. According to Mikalef et al. [4], there are 16 definitions of big data. And Akter et al. [5]point out the importance of an organization using different types of information for different purposes.

As a concrete example, Cao et al. [6] showed that a company that changed from batch processing to real-time processing of drill data at a drilling site and, as a result, were able to correctly understand the conditions and course of the drilling, which enabled them to optimize their operations. This example shows how a drilling team streamlined its workflow and saved engineering time by reducing the traditional data acquisition interval and developing applications to increase the value gained by reducing this interval.

However, the assumption is that these data must themselves be ready for transformation. The existence of the data does not necessarily mean that it can be used for digital transformation. As a prerequisite for their use, Müller et al.

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[7] suggested the importance of data quality, which requires some understanding of the business and operational flows from which the data are generated, and how they can be used in digital transformation. This includes the importance of data cleansing, the quality of the cleansing, and the proper management of the data in terms of quality.

In the case of Cao et al., it was a review of the data cycle, not the data itself, so the fact that the data was in a format that could be used beforehand made it effective for digital transformation. In its application to project risk management, human interpretation of the prediction/estimation results of AI models will enable us to recognize the influence of unexpected factors on project failure and unknown similarities between different projects. It will enable us to make decisions about how to respond to ongoing projects based on failure probabilities. Human experience and knowledge can be also reflected in the AI model to continuously improve its accuracy and the efficiency of model-building work.

## III. UTILIZING AN ORGANIZATION'S ASSETS

### A. Study on how to utilize existing data

The realization of digital transformation lies in the use of digital technology to provide new value from existing businesses and to generate additional revenue. When this is done based on an affinity with the existing business, utilizing the assets of an existing business is only a means to an end. Launching a new business requires resources such as people and funds. The example provided by Cao et al. is a good fit in terms of data acquisition that has succeeded in capturing new value. The question behind this is, "What are the benefits of changing the timing of data synchronization?" [6] After understanding the usefulness of existing data, it is required to consider what can be done to create value, and examine whether it is feasible. For data acquisition, we will examine the feasibility of sensor technology used in cameras and the IoT, due, in part, to the evolution of digital devices. By utilizing the data acquired from digital devices, Porter [8] and others have shown the process of value creation through data
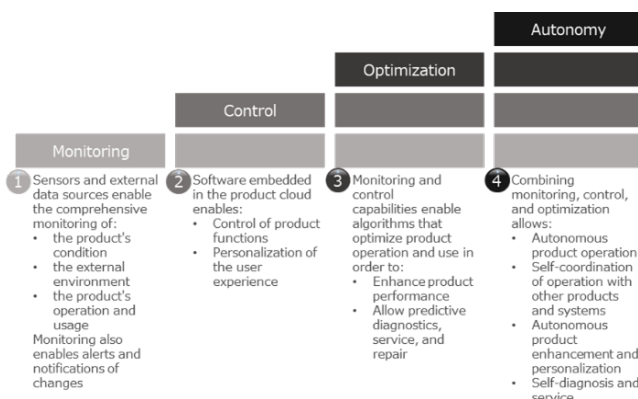


Fig. 1 Capabilities of smart, connected products.

Porter, Michael E., and James E. Heppelmann. "How smart, connected products are transforming competition." *Harvard Business Review* 92.11, 2014.

combination.

Control, optimization, and ultimately autonomy are possible by utilizing accumulated data. It is important to determine which data are effective for monitoring. The most important data are not necessarily the only data being collected. In the case of GE's jet engines, it was important to have knowledge of the jet engine logs so that the possibility of using the data could even be considered. In addition to the actual log data, it was also important to have the knowledge to combine information about the flight itself, such as the weather and the number of passengers on the flight. The result of combining the information held by the company with the information provided by the customer will enable the company to provide higher value to the customer.

### B. Utilizing data and knowledge in an organization from successful digital transformation cases

The importance of intra-organizational data and knowledge can be observed when examining several case studies. The German automobile manufacturer Audi started using data in the marketing area in 2013, demonstrating the fact that they gradually expanded their use of data from marketing to enable their use in the process of strategic decision-making. Organizationally, the innovation hub has taken the lead in expanding related departments and sharing knowledge, and each department has succeeded in using data not only in the marketing area, but also in creating a process in which members involved in data analysis participate in vehicle development to improve performance. It was also noted that Audi was able to improve its performance. For a case in point, they used data from an online car configurator and existing business sales data to acquire potential customer needs and share the results with the design department to create a process for designing vehicles to better meet customer needs [9].

The American retail giant Best Buy, a major electronics retailer, examined how the data could provide a new customer experience by leveraging its physical stores, and how this new experience could be applied digitally. The company began a complete overhaul of its warehousing, software, and supply chain, and implemented a data-driven strategy to break away from price competition with e-commerce companies like Amazon.com and re-examined the strengths of its stores. It reinstated a special discount program for employees that had been discontinued to train employees to be more knowledgeable about the products. In an effort to provide a better experience for its customers, the company rented out some of its stores to manufacturers such as Apple and Samsung, successfully securing new revenue sources and adding new value to the stores for customers [10].

The Walmart Corporation was a pioneer in introducing the point-of-sale system and supply chain in 1968 and operates "Walmart's Retail Link" [11]. The company has had great success using this system and understands the importance of data. Based on their understanding of the effectiveness of the use of these data, there is an organization called Walmart Asset Protection that is aware of data intelligence and has achieved digital transformation [12]. Data-driven with external data, these data are used in combination with 200 internal and external data, including event information near stores, weather data, economic data, viewership data, social media data, and gas prices. As a private cloud, it has the world's largest dataset [13].

Honeywell Process Solutions (HPS), an IoT platform that supports Honeywell's industrial clients, is a service provider. It collects, analyzes, and utilizes 2.5 billion gigabytes of data every day and provides the results to its customers [14]. The

services Honeywell provides have been used extensively. As a case study, the company started monitoring an oil and gas export facility overseas in the Gulf of Mexico by providing real-time predictive analytics to the customer to quickly diagnose problems, improving their production efficiency and reducing downtime as well as saving $10 million annually. In another case, Honeywell connected multiple plants for a mining company in South America, improving reliability, energy usage of monitored industrial equipment, and reduced shutdowns, saving them $2 million per day in lost revenue.

Honeywell also offers the IoT as a platform that combines multiple datasets. The analysis involves many experts from Honeywell, such as the head of HPS, Andrew Hird. Hird, an industrial plant expert for over 20 years, understands the customer's need for optimal project management and is driving the company's digital transformation.

These four case studies summarize data and knowledge as assets within an organization. Their existence in a core organization is illustrated in Table 1.

Table. 1 Matrix of accumulated data & knowledge, core organization

| Company | Accumulated data | knowledge | Core organization |
|---------|------------------|-----------|--------------------|
| Audi | Marketing data, Car Data | Marketing, Designing a new car model | Digital innovation hub |
| Best buy | Sales data, Logistics data, Location information | Product information | Renew Blue (Enhanced Project Team) |
| Walmart | 200 sources data | Walmart's Retail Link operations. | Walmart Asset Protection |
| Honeywell | IoT Sensing data | Data in multiple disparate systems relations. | Honeywell Process Solutions |

These cases show the use of accumulated data from the past and the use of traditional knowledge. There is an environment in which accumulated data can be utilized, and there is an organization that can operate and evaluate the results. The common point of these case studies is that data exist as a prerequisite, and the knowledge of how to combine and use the data is important for the department promoting the project.

### C. Innovation and acceleration of the utilization of organizational assets

The essence of the task is the same as that of conventional innovation: to provide new value by utilizing organizational assets. New business and existing business cannibalization occurs in the course of disruptive innovation and daring to create different needs for existing profitable businesses. What is different about digital transformation is that compared to product innovation, digital-driven innovation can be brought to market in a relatively short period of time.

Dahlander et al. [15] pointed out that no single organization can innovate in isolation. It is necessary to understand the operations of the departments that require the data and the knowledge regarding the operations as well as the fact that it is impossible to achieve digital transformation with systems alone. Innovation through digital transformation is possible through digitization, through which data and knowledge

generated from operations within the organization can be combined.

To achieve digital transformation, it is desirable to implement lean development as advocated by Ries [16] and bring it closer to the needs of customers. By repeating development and verification in a short period of time, the value provided to customers can be refined through processes such as optimizing the data used and revealing tacit knowledge. As a result, the time axis of Christensen's S-curve is shortened, and a competitive service can be realized in a short time. The same method is also used by startup companies and is considered to have a high affinity with new businesses. The method shown in Fig. 2 is considered to be a process of utilizing organizational assets and creating an actual business.
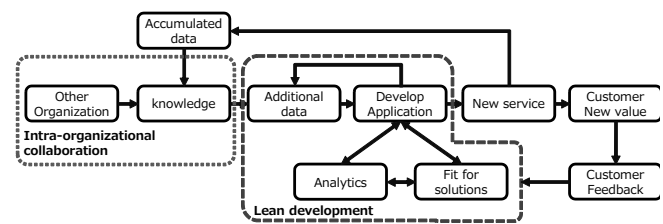


Fig. 2 A model for implementing digital transformation by leveraging data and knowledge in the organization.

Knowledge in an organization exists as a precondition for data. Based on the knowledge, we examine the feasible options by combining new data and implementing the development process using lean-driven development. When the performance of the service to be provided is confirmed, to some extent, it is provided to the customer in the form of a trial, and the value is evaluated. By repeating this process, the service can be refined.

### D. Problems with digital transformation

There is certain effectiveness in digital transformation in leveraging the knowledge and data that exist within an organization. In terms of failures, Davenport et al. [17] suggested that we must be persistent as there is uncertainty about the investment and return on technology. In addition, according to a survey by Kurokawa et al. [18], the success rate of digital transformation is as low as 16%. A lack of experts within an organization has been identified as a reason underlying this fact. Although there are personnel with specific knowledge and information system departments, there is a lack of data scientists and experts in AI for control and autonomy that can connect the process of integrating the knowledge of both parties and turn existing data into something valuable. Even if these people are hired from outside of the company or from a system supplier, they will not be able to analyze data or develop AI based on their understanding of the knowledge that the organization possesses, which will greatly reduce efficiency and productivity. Audi employed external consultants at the time of their digital transformation, but changed to training their own employees (Dremel et al. [9]). It has also been pointed out that when managers do not see the performance of their initiatives, they dismiss them as costs. In Japan, the tendency to seek short-term results is higher than in other countries, and, in addition, the amount of investment is low. Even if you have the knowledge and technology required, there are

few resources for promoting it to a new business and new value creation. It is especially difficult to utilize data except in cases, in which data can be collected in the short term. Since it will be difficult to collect the data necessary for the goal of Porter et al.'s step, there is a high possibility that the goal will not be reached. Organizations must consider what they should do about the challenge of having information unique to their company but not being able to fully utilize it.

## IV. CONCLUSION

We examined how to implement digital transformation based on the premise of utilizing assets, mainly data, in an organization from case studies. Utilizing the data in an organization is important for digitizing and reflecting the tacit knowledge in the organization to make it effective in driving digital transformation. An organization that supports the drive for digital transformation, accelerates its use, and evaluates its results is needed. For example, even if a data scientist or an AI engineer is employed by the organization, understanding tacit knowledge does not always go smoothly. Therefore, the process of knowledge and knowledge transfer to operations becomes more important. Understanding operational knowledge is important for tackling digital transformation. Another approach is to bring processes that enable knowledge transfer into the development process and apply them to the purpose of digital transformation. We believe that it is important not only for one organization to pursue digital transformation as a goal, but also for related organizations to work collaboratively to drive digital transformation.

Uncertainty in business is always present, such as when something that was actually touted as a success story turns out to be a failure. Therefore, a company should carefully monitor successes in this regard and subsequent progress. More research is needed on how to drive and expand digital transformation to avoid the risk of failure. There is also the potential for a business to expand the value proposition by connecting with external ecosystems to drive digital transformation. Consideration should also be given to the extent to which company-specific data and tacit knowledge should be disclosed to the outside world. In the future, it will be necessary to continue research including those outside of the organization.

## REFERENCES

[1] Bughin, Jacques, and Nicolas van Zeebroeck.,: 6 Digital Strategies, and Why Some Work Better than Others., Harvard business review (2017)

[2] Schumpeter, Joseph.,: Theorie der wirtschaftlichen Entwicklung. In: Joseph Alois Schumpeter. Springer, Boston, MA, p. 5-59 (2003)

[3] Christensen, Clayton M.,: The innovator's dilemma: when new technologies cause great firms to fail. Harvard Business Review Press. (2013)

[4] Mikalef, Patrick, et al.,: Big data analytics capabilities: a systematic literature review and research agenda. Information Systems and e-Business Management, 16.3: 547-578 (2018)

[5] Akter, Shahriar, et al.,: How to improve firm performance using big data analytics capability and business strategy alignment?. International Journal of Production Economics 182, 113-131 (2016)

[6] Cao, Dingzhou, et al.,: Digital Transformation Strategy Enables Automated Real-Time Torque-and-Drag Modeling. IADC/SPE International Drilling Conference and Exhibition. OnePetro. (2020)

[7] Müller, H. & Freytag, J.,: Problems, Methods and Challenges in Comprehensive Data Cleansing. Technical Report (Humboldt-Universitt zu Berlin, Institut ft Informatik Publication No. iroB-lB-164). (2003)

[8] Porter, Michael E, Heppelmann, James E.,: How smart, connected products are transforming competition. Harvard business review, 92.11: 64-88. (2014)

[9] Dremel, Christian, et al.,: How AUDI AG Established Big Data Analytics in Its Digital Transformation. MIS Quarterly Executive, 16.2 (2017)

[10] Mcgrath, Rita, Mcmanus, Ryan.,: Discovery-Driven. Harvard Business Review, 98.3: 124-133. (2020)

[11] Marr, B.,: Walmart: Big Data analytics at the world's biggest retailer., Bernard Marr & Co., Available: https://www.bernardmarr.com/default.asp?contentID=690 (2018)

[12] D'Onofrio, T.,: The secrets to Walmart's success. The Digital Transformation People., Available: https://www.thedigitaltransformationpeople.com/channels/customer-engagement/the-secrets-to-walmarts-success/. (2019).

[13] Shichor, S.,: Walmart's Retail Link-Point-Of-Sale Data. 18Knowledge, Eighteen Knowledge Group (EKG), March 16, 2017. Available: https://18knowledge.com/blog/walmart-retail-link-talks-to-suppliers-through-data/. (2017)

[14] Aaron H.,: Honeywell Creates New Division Based on the Internet of Things" ,May 2nd, 2016. available: https://www.automationworld.com/products/networks/news/13315376/honeywell-creates-new-division-based-on-the-internet-of-things. (2016)

[15] Dahlander, Linus; Gann, David M.,: How open is innovation?. Research policy, 39.6: 699-709. (2010)

[16] Ries, Eric.,: The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses. Currency, (2011)

[17] Davenport, Thomas H.,:Westerman, George. Why so many high-profile digital transformations fail. Harvard Business Review, 9: 15. (2018)

[18] Kurokawa, M et al.,: Using digital transformation to thrive in Japan's new normal: An urgent imperative., Available: https://www.mckinsey.com/~/media/McKinsey/Locations/Asia/Japan/Our%20Work/Digital/Using%20digital%20transformation%20to%20thrive%20in%20Japans%20new%20normal_an%20urgent%20imperative_upd201223.pdf. (2021)

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