

E-Supplement to Chapter 3

Processes, Systems, and Models

Case study “How to select management information systems?”

Evelyn was looking back at her industrial training in a medium-size company in the food industry. At the beginning of the training period, the company decided to introduce a new information system to manage warehouse activities within the firm and at the interface with suppliers and customers. First, Evelyn had to prepare a market overview. She knew from her operations management course at university that she had to consider WMS. She has had offers from five software firms. These offers comprised prices for the software itself, business process modelling, installation, hardware, and technical support. In some offers, software costs were lower but business process modelling and support costs were higher. Evelyn knew from the operations management course that all these stages are very important. She brought the offers to Frank, CEO of the company.

Frank had no experiences with management information systems. Having gone through the offers, he said: “I have \$15,000 for this task. Our processes are good. We can perform installation by ourselves. Technical support in future is not really important. Let us select the software at the lowest price.” Evelyn tried to convince Frank that standard business processes in the WMS system could differ from the company processes. She said also that if other functions in the enterprise, e.g., production, should also be integrated with inventory management, technical support would be very important. However, Frank decided to buy standard software at the lowest price.

Problems came right from the beginning. Business processes in the WMS system were different as compared with the company processes. So Evelyn should start a business process analysis and re-engineering. But she failed here since it was not possible to perform such a complex task alone. Second, it became clear that production planning should be interconnected with inventory management. However, the software firm did not have any modules for production planning. Third, the e-business module for collaboration between customers and supplier was not compatible with their software. Here a customization of the WMS system was needed but this was very expensive since no support agreement was signed with the software firm.

Evelyn suggested to Frank two solutions. First, an ERP system could be installed instead of WMS. ERP allows integration of all business processes in an organization in different departments. ERP also contains modules SRM (supplier relation-

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ship management) and CRM (customer relationship management). Second, production planning and e-business software could be bought from other software firms. But in both cases, the costs of buying new software or interconnecting different software packages with each other exceeded Frank's budget. The project failed.

Looking back, Evelyn tried to define the main mistakes. She wrote down the following:

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After graduating, Evelyn got a position in a software company that developed ERP systems. The experiences from her industrial training were really invaluable. She became very quickly one of the most successful consultants in the firm and reached the group manager position in only three years.

Case Study Macy's Inc

The objective of the case study is to understand how the retail supply chain is changing to comply with the change in consumer behaviour. Macy's Inc is the second largest department store in the United States today, holding both Macy's and Bloomingdale's department stores. Founded in 1858, it currently has over 840 stores located across the country.

The company has managed with the help of RFID (radio frequency identification) technology and BIG DATA collection to keep up with the current "power-shift", namely the shift of power from the retailer to the empowered tech-savvy customer. In 2011, Macy's adopted the RFID technology at source to better track and manage inventory. The stores are now tagging and reading allows the replenishment items it sells. This increased inventory accuracy has helped Macy's to optimize inventory for customers to shop across all channels. The company has equipped its department stores to fulfil online orders both from inventory at warehouses and from stores. Prior to this implementation, Macy's was experiencing overstocking and out of stock of the same collections across the country. In one state a certain collection could sell out in a matter of days, whereas in another, few items were sold from the same collection and ended up being marked down, resulting in big revenue losses. However, today 300 of Macy's 840 locations are equipped to handle direct-to-consumer order fulfilment.

Even though Macy's found it difficult at first, it has now successfully managed to push the tagging process downstream to its suppliers, since they succeeded in showing that RFID enabled higher sales, greater efficiencies and lower costs. In this way both the internal and external information visibility have been improved. Moreover, RFID has the potential for streamlining processes and improving communication among all parties in the extended supply chain. As the volume of

RFID tagged items in the supply chain increases, the technology can be leveraged to reduce costs and increase profitability for all parties involved.

Inventory turnover has been increased from 2.98 in 2005 to 3.12 in 2013 and is expected to further increase, as more stores will pick online orders. Further, both net income and ROI (*return on investment*) have been steadily increasing over the last years.

To conclude, it is apparent that investment in IT is highly necessary for retailers to stay competitive and manage their supply chain successfully. Macy's Inc has accomplished this so far and is converging more and more towards the demanding and tech-savvy customer. Moreover, Macy's Inc is a good example of information sharing in the retail supply chain being a key success factor.

Alibaba: Electronic Supply Chain Management (e-SCM)

E-commerce is a business field that has grown considerably in recent years and is expanding further. The main reason for that development is the advancement in technology along with an increase in customer demand.

The world's largest so-called global electronic marketplace (GEM) in terms of user numbers is Alibaba.com, in short Alibaba. In 2008 30 million users were registered on the Alibaba website, originating from more than 240 countries. Jack Ma, a former English lecturer, founded the company in his apartment in Hangzhou, China in 1999. At present, it holds about 60% of market share in the Chinese market alone. It is said to be larger than global players Amazon and eBay together.

Alibaba is the early adopter of China's changing foreign trade policies. The enterprise focuses on small and medium-sized enterprises (SMEs) from China and matches these with buyers overseas. The products from China, commonly known for being produced at comparatively low cost, are popular everywhere in the world. Nowadays, Alibaba is a common brand name for e-commerce. The company launched at HK\$13.1 billion on the Hong Kong stock market. In 2014, Alibaba was planning its global launch on the New York Stock Exchange, which is assumed to be the largest stock market launch in history.

Surgical instruments, a T-Rex dinosaur robot, super spaceship outdoor park equipment or a snack food machine producing a two-colour chocolate filling are just a few examples of what Alibaba has to offer. And the enterprise is continuously expanding its extremely wide product portfolio.

Commonly successful global companies are equipped with a charismatic leader that has a vision for the enterprise. This applied to Apple and Steve Jobs but is different for many other Chinese companies including for Jack Ma and Alibaba. Ma's philosophy is correspondingly "Ordinary people can do extraordinary things". Unusual is that Alibaba's success is not based on technological advancement but much more on improved services at different levels.

Basically, the company built its own market environment. Alibaba is the only e-marketplace offering business-to-business (B2B), business-to-customer (B2C) and customer-to-customer (C2C) platforms. Domestic trade is on Alibaba.com.cn,

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while global business takes place on the international Alibaba.com website. The consumer platform is called Taobao. One of the main challenges in e-business Alibaba faced was mistrust among vendors and buyers. Buying on the internet is viewed with suspicion, which is stressed by cross-border trading risks.

Unlike many other businesses, the company managed to change the market to its advantage. Alibaba discovered that trust in business relationship is extremely important to its success. The so-called Trustpass[®] is a mean that can be acquired on Alibaba. Vendors need to provide their identity card and bank details and are additionally verified by a third-party credit agency. Moreover, it is possible to rate vendors online. Both measures increased trust and confidence among sellers and buyers, immensely enhancing business in China and globally. Since 2008 the Trustpass[®] option also exists for individual vendors on Taobao. Another tool created by Alibaba is Alipay, an independent payment platform. Alipay makes transactions safer again. The customer makes payment to the platform while the payment is only transferred once the customer has received the goods. Chinese banks as well as VISA International now support Alipay.

Other aspects of Alibaba's portfolio are cooperation with the Yahoo search engine and the ownership of Alisoft.com. The latter provides a software tool, which is used to enhance management of SMEs.

Moreover, Alibaba has put its focus on providing logistics solutions for customers. In 2000, four global logistics companies signed contracts with Alibaba to provide an online platform where quotations can be drawn up and contracts can be signed. On the logistics website a wide range of third-party suppliers are listed, which can be chosen from. The buyer needs to choose the preferred logistics solution, place the order, pay the freight, pay taxes and receive the goods. Advantages are that buyers can compare prices directly, transparency is increased and goods are easier to track. Moreover, comprehensive logistics solutions are offered. These include services from pickup to packaging, customs, transport and delivery. These solutions are particularly offered to SMEs taking advantage of Alibaba's economies of scale. Alibaba is able to provide these services due to the large network of suppliers, which are handled by a successful data management system. To manage the increased complexity Alibaba also invested US\$360 million in the distribution and logistics network by the Chinese enterprise Haier.

Summing up, the Alibaba's success factors are high customer service with a superior buying experience, a well-known brand name and last but not least handling massive sales volumes while taking advantage of economies of scale. But because of the last issue, Alibaba will be facing increased complexity in the future. Moreover, the market is highly aggressive and competitors from overseas might learn from Alibaba's individual success story. It is up to Alibaba to remain innovative to keep their success story running.

Questions

1. What are the particular challenges for e-commerce?
2. What are Alibaba's core values?

3. What made Alibaba so successful compared to its competitors Amazon and eBay?
4. Which characteristics relate especially to the Chinese market?
5. Which other challenges is Alibaba likely to face in the future?

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Case study Hamni: RFID in Logistics

Hanmi Pharmaceutical, a producer of pharmaceuticals in South Korea, faced a number of challenges that can be addressed with RFID (radio frequency identification) technology: managing more than 500 different medical products in a highly fragmented distribution market with multiple distribution channels (via drug wholesalers and direct distribution) and preserving the company's reputation for high-quality products through high precision and accuracy in shipping. To achieve this, Hanmi would have to be able to determine inventory levels of any product at any customer site in order to improve production forecasts, detect any expired pharmaceuticals and further develop return and recall processes (closed-loop supply chain).

Implementation

Before implementation, a comprehensive RFID system was designed by a cross-functional team. During the design phase they dealt with technology selection,

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software integration (middleware), usability, scheduling and budgeting. Part of the project cost was paid for by the Korean government, which saw an opportunity to help reduce nationwide healthcare expenses in the future. One major design challenge was the packaging of products like tablets and capsules consisting of metal foil which would distort the RF signals. The redesigned packaging with an additional compartment only for the tag solved the problem, reaching reading accuracy of 100%. Similarly, the large variety of different product packaging materials proved to be a cause of reading errors; only through trial-and-error could the ideal tag location for each packaging type be found, while some containers had to be redesigned.

The automated picking system is capable of identifying, collecting, boxing and shipping products that on arrival are picked, sorted and dispensed without human involvement. Only in cases where the reader fails to read a tag, staff may use a handheld reader and identify the problem. The system uses EPC (electronic product code, the global standard for Gen 2 passive ultra-high-frequency RFID tags and readers as hardware. The tunnel readers can interrogate the tags at a rate of 150–200 tags per minute and forward the data to the software. Hanmi uses self-developed (by Hanmi IT) Edge Plus RFID software and UniA Plus middleware to connect the RFID system with Hanmi's back-end systems (i.e. ERP, etc.).

During the first year of implementation, the benefits of the new system had not become too obvious, mostly due to a lack of worker training. But subsequently, Hanmi achieved ordering and shipment efficiency of 99.9%, which had been impossible when those processes were done by hand and eye. Time efficiency reached 300–400% improvement leading to shorter lead times and better streamlining of manufacturing processes. In addition, expired drugs in-side stores can now be detected by Hanmi representatives using handheld readers.

Hence, apart from enhancing cost efficiency along the supply chain (which has not been quantified yet), the company can also improve its customer service through fewer expired products offered to customers and higher product availability as a result of more efficient inventory management. Thanks to full product traceability and item-level granularity of inventory management systems, companies using RFID technology can reduce safety stock; and with optimized information systems along the supply chain, the bullwhip effect can be minimized, resulting simultaneously in overall lower inventory levels and higher customer service.

Discussion questions

1. What benefits of RFID can you identify?
2. What drawbacks/limitations of RFID can you identify?

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Case Study: Business Intelligence

Barnes & Noble: Helping suppliers track sales and inventory in real time

America's bookseller, Barnes & Noble, uses IBM's Netezza data warehouse appliance to boost its business intelligence (BI) capabilities. Due to a lack of upstream supply chain integration, publishers, i.e. Barnes & Noble's suppliers, had insufficient information on sales and inventory levels at bookstores. Consequences such as stock-outs and losses from overproduction would affect all suppliers. Especially for small publishers with limited capital resources, inefficient inventory management could put their existence at risk. Despite the theoretical trade-off between inventory levels and service levels (i.e. probability of having a demanded product in stock), better and timelier information along the supply chain could help improve both metrics at the same time. Hence, timely and detailed information on sales and inventory levels had to be accessible for suppliers using easy-to-use reporting tools.

Implementation

Data had previously been distributed over 13 databases impeding data integrity across departments and efficient use of BI. The new solution stores all relevant data at a single data warehouse and offers suppliers insight through a number of analytic tools showing big supply chain views, geographic views, stack charts and heat maps. The tools used by the Tableau BI software have high drill-down capabilities for time-specific, individual store or product sales information. The high granularity of insight into inventories and processes also helps identify bottlenecks.

Queries requesting some specific and complex piece of information that would have taken weeks in the past can be run within seconds. The necessary massive computing power would not be affordable to single suppliers if they had to use their own resources but their empowerment through access to advanced BI tools ultimately serves the entire supply chain, including its biggest player, Barnes & Noble.

Discussion questions

1. What benefits of BI application can you identify?
2. What challenges of the BI application can you identify?

Reference

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Case Study: Big Data for Locational Decisions

Vestas: Turning climate into capital with big data

Vestas, a Danish company that manufactures, sells and maintains wind power systems is among the leaders of its industry. Nevertheless, the company felt a need for better decision making in finding the optimum locations for their wind turbines and higher confidence in return on investment (ROI) prognoses for new turbines. A better understanding of wind patterns could not only improve the energy production of a single turbine but also help avoid locations with high turbulence where turbines are prone to getting damaged and extend turbines' service life.

In order to find wind patterns and predict the performance of turbines at a given location, Vestas had been collecting data from 35,000 meteorological stations around the world as well as data from its operational wind turbines into a “wind library”. With data growing towards volumes of 18-24 petabytes, Big Data hardware, software and expertise was necessary. IBM's solution, using its InfoSphere BigInsights software, with Apache Hadoop and Big Data experts, enabled Vestas to manage the vast amounts of data and use massive processing power to gain valuable knowledge for better decision making.

The wind library allows the user to *drill down* to look up specific weather information by time and exact location. As a result of the big data solution, the grid for locational weather information could be intensified from a resolution of 27x27 km to 3x3 km (making it 81 times more accurate). With the use of *computational fluid dynamics models*, a grid of 10x10 m can even be simulated to calculate wind patterns with high precision. The solution uses the historical and newly generated data from the library with more than 178 parameters, such as temperature, pressure, humidity, precipitation, wind direction and wind velocity (on different altitudes), some of which are unstructured data, such as satellite images, sensor data, maps, etc. As Vestas installs on average six new turbines per day, finding the optimal turbine placement within 15 minutes is a crucial and valuable improvement compared to the three weeks it would have taken in the past.

A higher level of power generation due to better adaptation to wind patterns, and lower maintenance costs and extended service life due to the avoidance of turbulence areas, both help reduce the cost of each kWh produced. In addition to that, financial and sales benefits can be achieved, as customers can receive better and more reliable predictions on ROI. Also, energy consumption for IT is reduced.

Discussion questions

1. What benefits of big data application can you identify?
2. What drawbacks/limitations of big data application can you identify?

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RFID in retail

Wal-Mart, a U.S. public corporation that runs a chain of large discount department stores, has required from its most important suppliers (more than 100) the placing of tags in all shipments to improve the *inventory management*. As a consequence, the company managed to reduce stockouts by 16% by the use of RFID technology. This decision triggered waves of RFID applications in various industries.

Similar applications can be found in *car shipment yards* where RFID is used to build the shipment loads. The fact that information are provided in real time by the wireless tracking system reduces drastically vehicle dwell time, improves customer satisfaction and increases transportation resource utilization.

Most significant industrial sectors that can take advantage of RFID technology to manage specific supply chains are mentioned hereafter. The application of RFID technology in this area is often limited to specific activities related to manufacturing. The reason is the use of systems based on AutoID technology that requires a specific environment. Among the usual applications we note product tracking, collection of new data encountered during the production process, the provision of parameters required for quality control, among others.

To improve the benefits of RFID technology, it is necessary to extend the cooperation with *logistics and warehouses*. In this context, one could use the tags for carrying information from production to warehousing and logistics to facilitate their business.

Among the expected benefits, there is storage optimization in warehouses and easier transport programming thanks to a more detailed and precise information that become available in real time.

The *retail industry* currently uses RFID technology the most intensively. For example, Metro Group Logistics (MGL) is a provider of logistics services in 25 countries in 2007 and employed 3,800 people. The use of RFID technology in its stores and distribution centers reduced losses during transit by 11 to 14%.

RFID is also widely used in *air transportation systems*. There are lots of RFID applications in *processed food supply chains*. More generally, the objective is to guarantee food safety of temperature sensitive and perishable products by optimizing temperature monitoring and control through all the stages of the cold chain, from agricultural production to harvest or slaughter, storage, processing, transportation, distribution, etc.

M- Commerce – Domino’s Pizza UK

The main challenges that m-commerce poses to companies are the fast-changing habits and preferences of consumers. Only those companies anticipating consum-

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ers' needs will be able to succeed in the long run. Domino's Pizza UK is an example of how to pioneer fast-food orders through mobile devices. Domino's m-commerce success still remains.

Domino's Pizza is an American pizza company founded in 1960. The company owns more than 850 stores in the UK. As for 2013, 53% of UK sales were online out of which 31% were satisfied via mobile device (mainly through their own app and the mobile web site). The company's Facebook profile counted more than 1 million fans (Domino's, 2014).

After a dramatic drop in sales after a 2009 viral video showing two Domino's workers "playing" with customers' food in a store kitchen, the company decided to overcome this by changing their image using m-commerce.

The company decided to launch an augmented reality campaign in a joint venture with Blippar Company. Blippar developed an augmented reality app through which more than 6,000 posters located all around the country could be read. Customers could not only order a pizza, but also locate their closest store, connect to the company Facebook profile or even download Domino's own app. The campaign was a complete success and helped to clean up the company image, and made Domino's the leader it still is in mobile pizza orders.

30.9% of Domino's sales in the UK were made via mobile devices. What was Domino's key factor? The company could anticipate consumers' needs (consumers are mainly young and mobile-savvy) and created a new way of approaching their products. This movement turned Domino's into a leader in its sector, a leadership that still remains. However, keeping the mobile leadership is not a trivial or casual thing for Domino's. Through the years they have been able to adapt and anticipate their mobile consumers' needs and innovate to keep on leading the market with a 102% year-on-year increase in mobile orders. Domino's last graceful movement in 2013 was the creation of the so called Domino's Tracker, a feature of the app that allows customers to follow their orders. With it, they intend to improve their customer relations and increase loyalty and brand awareness. However, the deployment and constant improvement of their mobile channel is not only good from a customer point of view, but also from a company point of view, since mobile orders (or any electronic orders) are faster, more reliable and reduce human error (a fact that finally impacts on the company's economic benefit).

Answers case study AirSupply:

Discussion questions

1. What benefits of cloud computing can you identify?
 - **scalability**: flexible IT investment with little capital investment but access to massive computing power as needed
 - **inexpensive** use of computing power

- **accessibility:** accessing and using data independently from physical location
- **customization:** infrastructure, platform and software developed in collaboration with major industry's firms to perfectly suit their needs
- **standardization:** setting process and data format standards to facilitate and strengthen collaboration within the supply chain
- **control** over confidential information and crucial processes thanks to hybrid cloud solutions
- **simulation capabilities** for enhanced decision making.

2. What benefits and drawbacks of e-procurement can you identify?

Benefits from E-procurement technology

- **collaboration:** customers and clients are connected through a common procurement and SCM platform and tools
- **transparency:** ease of comparing suppliers and offers
- **increased supply chain and demand visibility**
- **intuitive** use of the SCM platform
- **reduced manual work**
- **automatic** ERP synchronization
- **alert system** for low inventories.

Drawbacks/Limitations

- dependence on service providers
- data security and confidentiality issues
- possible higher costs than purchase if usage volume very high
- need for systems adaptation/integration.

Answers Evelyn's case:

- Business process modelling and re-engineering is the first stage in the implementation of management information systems. Automation of chaos leads to even worse chaos.
- It should be clearly defined which functions from which departments should be included in the software. An ERP system can be expensive but the extensions will be easy. Software with only limited functions like WMS for inventory or MES (manufacturing execution systems) for production are cheaper; but the integration to extend the functionality will be expensive.
- E-business and e-commerce software are needed to implement collaboration between the supplier and customers. There are also special systems for supply chain planning like APS (advanced planning and scheduling).
- Management information systems differ from the standard software for home computers. They integrate many people, departments and organizations, and change process organization; they will be updated frequently according to changes in business processes in the enterprise and in the supply chain. That is why the

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budget for such systems should not be restricted to software purchasing costs only. Instead TCO (total costs of ownership) should be analysed.

Answers Case Hamni RFID:

Discussion questions

1. What benefits of RFID can you identify?

- automation of processes leading to:
 - o reduced labour cost
 - o higher information accuracy
 - o shorter lead times as a result of accelerated workflow.
- near real-time inventory visibility and item-level granularity leading to:
 - o enhanced customer service (product availability)
 - o reduced safety stock.
- higher flexibility and adaptability to new requirements from customers or government as a result of enhanced inventory control.

2. What drawbacks/limitations of RFID can you identify?

- per-unit costs of RFID still too high for many low-margin products
- high requirements for data management and capacity
- requirements for collaboration between manufacturers and retailers (but can turn out as a benefit)
- privacy concerns.

Answers Case Barnes&Noble

Discussion questions

1. What benefits of BI application can you identify?

(near) real-time analysis and reporting
higher granularity of information (drilldown)
increased process and inventory visibility
enhanced inventory management and reduced working capital for suppliers
reduced cycle time.

2. What challenges of the BI application can you identify?

difficulty of integration of data from legacy system
need for IT talent
technology acceptance and change management.

Answers Case Vestas

Discussion questions

1. What benefits of big data application can you identify?

more **accurate information** in (depth and breadth –drill-down capabilities) on wind patterns, including more relevant parameters, smaller grid area and historical data to:

maximize wind utilization for power generation

reduce turbine damages from turbulence

lower energy production cost, increased ROI

faster calculation (by 97%) making gained knowledge more valuable

more accurate **ROI prediction**

lower IT energy consumption in spite of increased storage capacity and processing power.

2. What drawbacks/limitations of big data application can you identify?

high requirements for IT systems with massive processing power and advanced software

cost of accessing large volumes of data

scarcity of IT talent and managers with analytical skills.