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Data Analytics Contributes to Better Decision-Making Beyond Organizational Boundaries

We describe how GSE, a leading Chinese garment company, deployed data analytics to orchestrate a networked organization. Data analytics helps to align partners' operations with GSE's goals while simultaneously empowering partners to perform actions that optimize their local outcomes. The GSE case highlights the emerging strategic role of the IT department during the adoption of data analytics. Based on the case analysis, we provide nine recommended actions for using data analytics to orchestrate a networked organization.^{1,2}

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Orchestrating Networked Organizations Through Data Analytics

Digital technologies are reducing transaction costs in working with external parties and enabling sophisticated cooperation across organizational boundaries. As a consequence, many companies are transforming themselves from a pipeline model, where a business owns and controls everything internally, to a networked organization that relies on a network of external partners.

Networked organizations first emerged in the 1990s, when companies such as Li & Fung and Benetton achieved significant financial success by outsourcing tasks to small manufacturers and distributors around the world.⁴ However, the move to the networked model did not catch on more broadly, perhaps because the required coordination makes it challenging to implement.

The growing availability of big data and data analytics tools can help with inter-organizational coordination and thus make the networked model more viable. This article describes how GSE, a leading Chinese garment company, applied data analytics to orchestrate a networked organization. (The in-depth case study we conducted at GSE is described in the Appendix.)

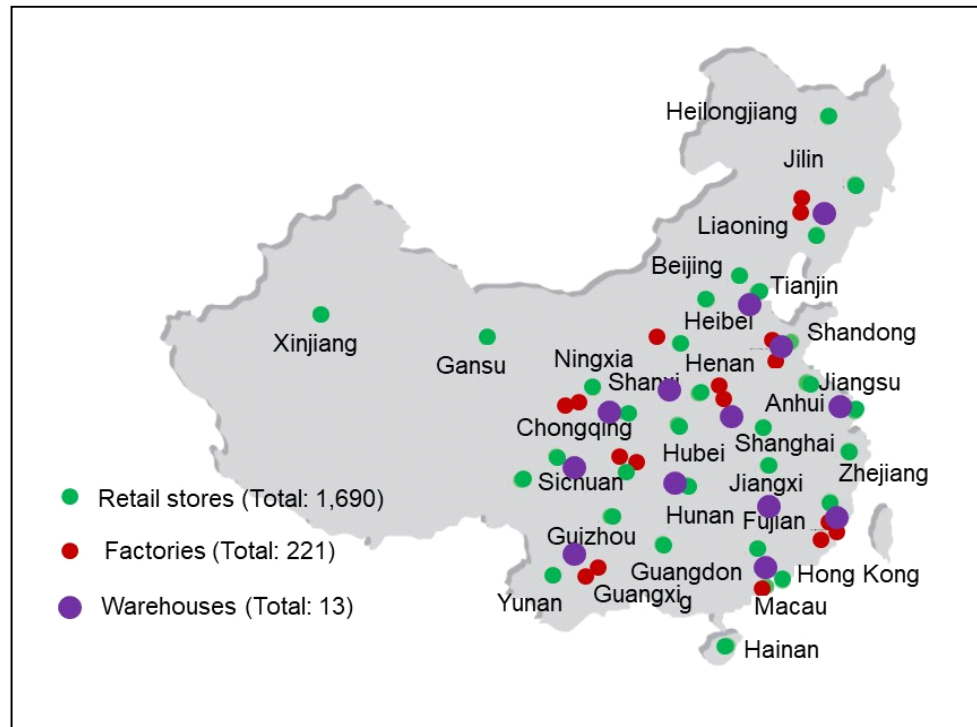


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² This research is supported by the National Natural Science Foundation of China (grant nos. 71402187, 71529001, 71632003, 71832014, 71771223).

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⁴ Camuffo, A., Romano, P. and Vinelli, A. "Back to the Future: Benetton Transforms Its Global Network," *MIT Sloan Management Review* (43:1), October 15, 2001, pp. 46-51. This article describes how Benetton outsources tasks to a global supply chain network and the benefits of doing so.

Figure 1: GSE's Networked Organization, as of 2014

Big data and data analytics tools can provide significant support to business decision-making. Data analytics allows leaders to shift decision rights to business divisions by providing them with access to larger amounts of data.⁵ Changes in decision rights have a profound impact on network orchestration because decision rights define the power dynamics of a networked organization.

Orchestrating a networked organization through data analytics is not easy. The hub company can encounter many challenges, such as employees' resistance to change, shortage of data science skills, and lack of integrated data management.⁶ Moreover, external partners may not cooperate with the changes because they

possess different levels of readiness, interest, and commitment.

GSE has over 1,000 retail partners and more than 200 manufacturing partners. The company began investing in data analytics in 2010 and used the technology to "rewire" its network. These investments have provided significant benefits. GSE designed decision rights to align partners' operations with GSE's goals while simultaneously empowering partners to perform actions that optimized their local outcomes. As a result, both the retail and manufacturing functions became more efficient, coordinated, and responsive to changes.

During the adoption of data analytics, GSE's IT department also evolved from an auxiliary department that installed and fixed employees' computers to a strategic department that integrated technology, processes, people, strategy, and data.

We have distilled the lessons from the GSE case into nine recommended actions for using data analytics to orchestrate a networked organization. The networked model is widely

5 Schrage, M. "How the Big Data Explosion Has Changed Decision Making," *Harvard Business Review*, August 25, 2016. This article postulates that big data and its associated analytics can lead to changes in decision rights but does not examine those changes.

6 Gust, G., Flath, C. M., Brandt, T., Ströhle, P. and Neumann, D. "How a Traditional Company Seeded New Analytics Capabilities," *MIS Quarterly Executive* (16:3), September 2017, pp. 215-230. This article describes the challenges faced by a traditional company in adopting data analytics.

applicable; it's not limited to businesses that outsource their operations. Companies that own their production and distribution networks and that allow their internal business units to operate as independent partners can also operate as a networked organization. Our recommended actions therefore also apply to such companies.

GSE Background

Evolution of GSE

GSE was founded in Hong Kong in 1974 as an original equipment manufacturer (OEM) for Western garment brands. In the 1980s, it moved its factories to mainland China to leverage the low labor costs. The company began its retail business in 1993, targeting a clientele between the ages of 18 and 25 and offering smart-casual designs. In 2016, GSE employed over 8,000 people and reported revenues of 3.3 billion HKD (approximately \$422 million).

By 2008, GSE had opened 527 retail stores in first-tier cities in China. To expand into second- and third-tier cities, GSE launched a franchise model in 2008 and recruited retail partners in those cities. Meanwhile, to support the distributed retail network, the company recruited manufacturing partners across China. It also began to outsource manufacturing to these partners because labor costs in mainland China had been rising, and it had gradually become difficult to profit from manufacturing.

By 2014, GSE had built a network of 1,690 retail stores and 221 factories. Partners ran more than two-thirds of the retail stores and most of the factories. The company had also built 13 warehouses across the country to coordinate products among retail stores and factories. The networked organization built by GSE (as of 2014) is depicted in Figure 1.

Moving to a Networked Organization Increased the Importance of Planning

As the networked organization evolved, GSE's leaders changed some roles in the company's internal business divisions. The manufacturing division changed from managing the company's factories to managing partners' factories. The retail division changed from just managing the company's stores to managing both its own and partners' stores. For both divisions,

effective planning became important. As one manufacturing manager explained,

"When we manufactured products in our factories, we had more flexibility and could be a bit more relaxed in the plans. But when we work with partners, plans need to be as precise as possible."

Managers relied on two types of plans: season plans and adjustment plans. Before each season, GSE devised plans for all the retail stores, manufacturing factories, and warehouses. The purpose of the season plans was to make the best use of market opportunities and production capacities in the network. They also helped partners prepare resources beforehand. Manufacturing partners used these plans to prepare raw materials, and retail partners used them to prepare storage spaces and sales staff.

However, the preconceived season plans could not cope with the reality of the fast-moving garment industry, where unexpected threats and opportunities abound. To respond to emergent situations, GSE devised another set of short-term plans that adjusted their ongoing season plans. For example, a sudden drop in temperature in the autumn can reduce the demand for thin jackets in northern cities, but at the same time make them popular in warmer southern cities. An adjustment plan would therefore include transferring thin jackets from northern to southern cities and increasing the production of thick jackets for northern cities.

GSE managers and partners had previously created the season and adjustment plans based on experience. However, experience-based decision-making became ineffective as the network grew and the data volume increased. GSE adopted data analytics to help managers and partners make these decisions. As an engineer responsible for implementing data analytics for production planning explained,

"There are over 100,000 products, sold at over 1,000 retail stores and produced by over 200 factories. Each factory is specialized in a different set of products and has different inventory levels. There are too many factors for humans to process. We must use data analytics."

The Networked Organization Meant that IT Became a Strategic Department

As data and analytics played an increasingly important role in decision-making, the role of the IT department also became increasingly important. Although GSE outsourced many business functions, it maintained the IT function in-house and expanded it significantly. In 2008, the IT department had less than 30 people; by 2014, that number had tripled. IT also changed from an auxiliary department to a strategic department. As one senior IT manager recalled,

“Before 2008, we were called the computer department. People came to us when their computers or printers broke down. It’s like when there’s a power failure, and you look for an electrician. That was how people saw us.”

GSE also increased IT staff salaries, especially for those with data analytics skills. Initially, the company suffered from a shortage of these skills. The garment industry, in general, was a latecomer in adopting digital technologies and there were few people with data analytics skills in the industry. The company therefore had to seek talent from outside the industry. To attract such talent, GSE offered high salaries; a data scientist could earn as much as a senior designer. This was unusual in a garment company. Some business managers complained about IT staff being among the highest-paid employees in the company.

The CEO addressed these complaints with a highly visible and symbolic informal gesture. In southern China, during Chinese New Year, business owners give employees red envelopes (a monetary gift) as a token of appreciation. For the past few years, GSE’s CEO has given the first and largest red envelope to the CIO. This gesture sent a strong message to the company that IT had become a strategic partner of the business and that IT employees deserved high compensation.

Another way of covering the increased salary costs was to charge partners for IT services. Most partners were willing to pay because they benefited from using the systems, especially the analytical systems. After using the systems for a while, some partners requested additional services and paid consulting fees to the IT department. The IT department used those fees to cover the cost of building an analytics team.

We now describe how GSE used data analytics to support new decision-making processes.

Adopting Data Analytics Allowed GSE to Redefine Decision Rights

Decision rights concern who makes what decisions. In GSE’s network, there are six major types of participants, and data analytics allowed GSE management to redefine the decision rights of each type of participant (See Table 1).

Changes in Retail Managers’ Decision Rights

For the retail function, GSE shifted decision rights from the company’s external partners to GSE’s in-house retail managers. Before adopting data analytics, the retail managers were not involved in partners’ procurement decisions, such as which products to procure, when to procure them, and how much stock to keep. Retail managers merely collected procurement decisions made by retail partners and provided new partners with suggestions about how to make procurement decisions—for example, explaining to them the factors that could be used for a sales forecast.

Once GSE could provide retail managers with more data and analytics tools, company leaders shifted retail managers’ roles from coordinators/advisors to decision makers who created both season and adjustment plans for retail partners. The analytics tools automatically generated recommendations that helped retail managers make planning decisions. Initially, managers had to make major changes to these recommendations because the algorithms were not robust. The data scientists refined the algorithms by diagnosing and addressing the root causes of inaccurate results. Automated recommendations later became more accurate, and sometimes retail managers only had to make minor changes to the recommendations. This automation was especially useful in the creation of adjustment plans that require real-time responses.

However, GSE did not rely solely on automated recommendations. Decisions still required some tacit human knowledge that could not be easily codified and incorporated into the

Table 1: Redefining Decision Rights Through Data Analytics

Participants	Decision rights before adopting data analytics	Decision rights after adopting data analytics	Summary of change
Retail managers (Internal)	Collect retail partners' procurement decisions and advise new partners on how to make procurement decisions	Create procurement plans for retail partners by reviewing and fine-tuning algorithm-generated recommendations	Coordinator/advisor -> data-informed decision maker
Retail partners (External)	Make their own procurement decisions	Execute procurement plans created by retail managers	Decision maker -> executor
Manufacturing managers (Internal)	Create batch orders for manufacturing partners	Create production plans for manufacturing partners by reviewing and fine-tuning algorithm-generated recommendations	Coordinator -> data-informed decision maker
Manufacturing partners (External)	Make their own production decisions	Execute production plans created by manufacturing managers	Decision maker -> executor
Warehouse managers (Internal)	Create logistic plans based on experience	Create logistic plans by reviewing and fine-tuning algorithm-generated recommendations	Decision maker -> data-informed decision maker
IT managers (Internal)	<i>IT decisions</i>		
	Develop systems requested by business divisions	Decide which systems to develop	Executor -> decision maker
	<i>Business decisions</i>		
	Not involved in business decisions	Provide support for business decisions	Outsider -> advisor

algorithms, such as retail managers' insights into emerging fashion trends and the popularity of certain designs. These factors affected sales and procurement plans.

Changes in Retail Partners' Decision Rights

GSE shifted retail partners' role from decision makers to executors that implemented plans that GSE's retail managers created for them. Initially, some partners were skeptical about letting GSE create procurement plans for them and insisted

on reviewing and modifying those plans. As an engineer responsible for implementing data analytics for retail planning recalled,

"Many retailers thought our recommendations were there to trick them into buying more products. They did not believe our systems could produce better planning than their judgments. But evidence showed that stores following our recommendations performed better than those that did not."

Our study revealed that many retail partners executed GSE's plans with minimal changes. Instead of planning which products to procure, when to procure them, and how much stock to keep, partners focused on execution. Enabling retail partners to focus on execution was also an effective way of empowering them. For small partners with limited resources, a wrong purchasing decision could be very damaging. As GSE's CIO commented,

"There are two kinds of tasks in running a store: the knowledge ones and the manual ones. We have taken care of the riskier knowledge tasks so that our partners can focus on the manual tasks, which are more straightforward."

Changes in Manufacturing Managers' Decision Rights

For the manufacturing function, GSE shifted decision rights from local partners to in-house manufacturing managers. Previously, manufacturing managers were not involved in partners' decisions such as production schedules and inventory levels. They merely created batch orders for partners and ensured that partners fulfilled them. With the help of data analytics, manufacturing managers were responsible for creating production plans for partners. They created both season and adjustment plans. As an IT manager responsible for production planning explained,

"If a crisis occurred at one factory, its order would be transferred to nearby factories based on those factories' schedules, inventory levels, and idle capacities. Once decided, those factories' production plans would be adjusted."

Manufacturing managers were also enabled by data analytics, which automatically generated planning recommendations. As with the retail

function, these recommendations augmented managers' decision-making instead of replacing managers altogether.

Changes in Manufacturing Partners' Decision Rights

Manufacturing partners welcomed the shift from decision makers to executors because it gave them concrete instructions about how to manufacture the products and allowed them to focus on improving operational efficiency.

Changes in Warehouse Managers' Decision Rights

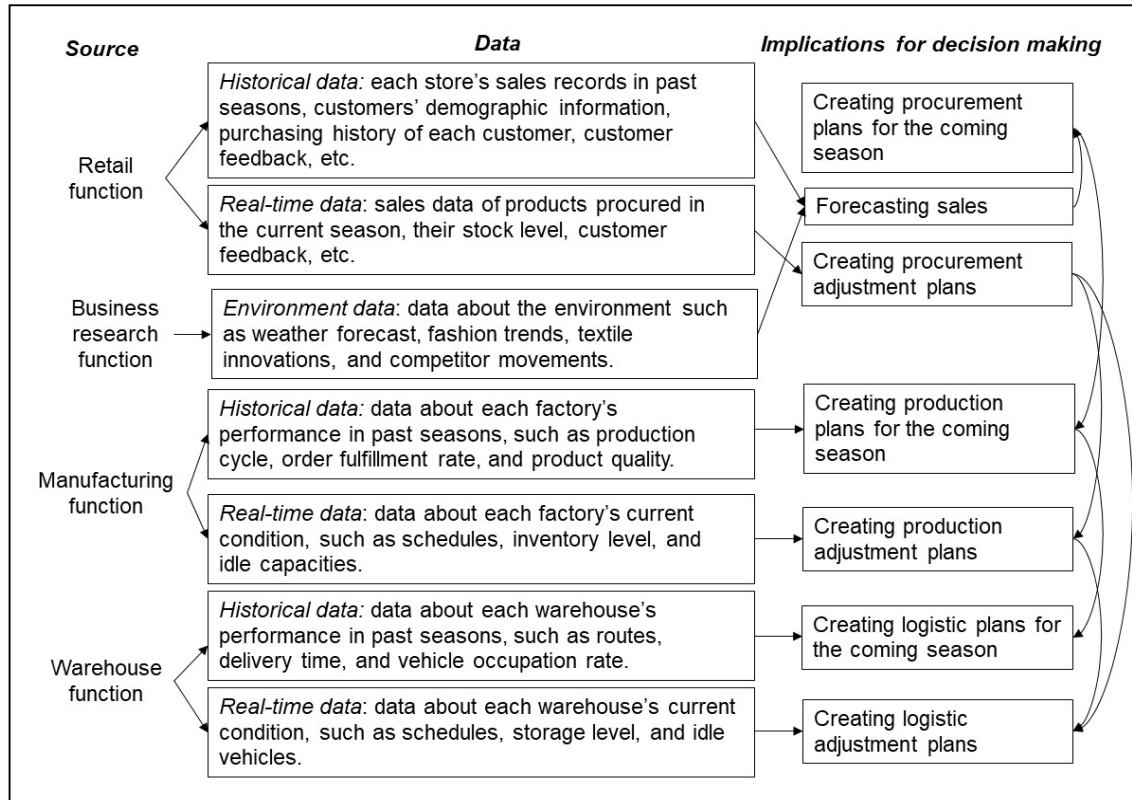
GSE's warehouse managers' decision rights did not change as much as those of retail and production managers. Before adopting data analytics, they were responsible for creating logistic decisions such as shipment schedules, routes, storage arrangements, and vehicle assignments. Data analytics changed the way they made these decisions. Previously, they made logistic decisions based on experience. Now, they make them by reviewing and fine-tuning algorithm-generated recommendations.

This change met with some resistance because, although automated recommendations did not replace humans, they reduced the need for experienced employees. For example, after the adoption of data analytics, there was less need for "conductors" (respected warehouse management employees who were responsible for creating shipment plans and making fleet arrangements). Some conductors were reassigned to other roles.

Changes in IT Managers' Decision Rights

The adoption of data analytics also changed IT managers' decision rights for both IT decisions and business decisions. IT managers had previously developed systems requested by business divisions. They had limited power and no domain knowledge to influence decision making. During the adoption of data analytics, IT managers worked closely with data from different business functions, which gave them a thorough understanding of various business domains. They could thus propose new systems that leveraged data from different functions and benefited the entire business instead of only one function. Hence, IT managers shifted from executors to

Figure 2: Sources and Implications of Historical and Real-Time Data for Decision-Making



decision makers for IT decisions. As a senior manager in the IT department explained,

"IT employees now understand the business domains well, and we have a cross-functional view of all the domains. We can thus propose systems that create synergies across different functions."

GSE leaders also encouraged IT managers to be involved in business decisions. Prior to the adoption of data analytics, they were rarely consulted about business decisions. As these decisions became increasingly data-driven, more and more business managers needed to collaborate with IT managers to derive insights from data. For example, a retail manager launching a promotional campaign may work with IT managers to analyze the purchasing behaviors of customers from different regions and identify regions that are more receptive to the campaign. And a designer working on a new line of products may work with IT managers to

launch a prototype design on social media and analyze customers' perceptions of that design through data analytics.

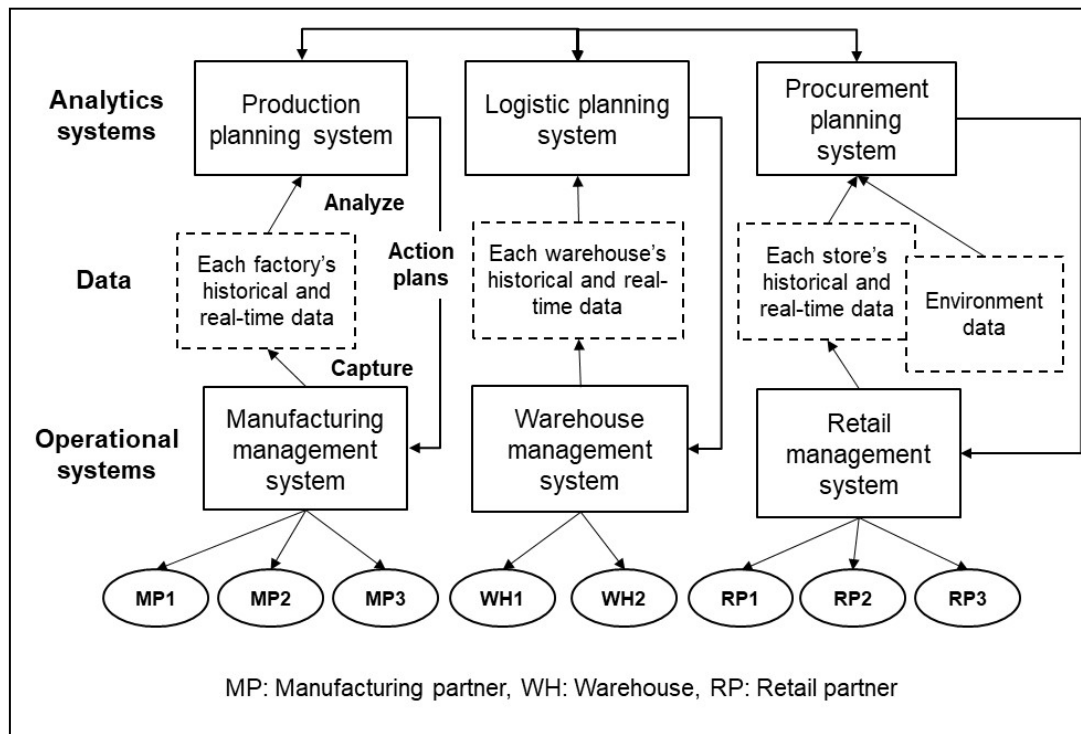
How Data Analytics Supports Decision-Making

Data analytics also enables network orchestration by supporting decision-making. We begin by describing data that supports decision makers in GSE and then describe systems that help to capture and use that data.

Data that Supports Decision-Making

At GSE, effective data-informed decision-making relies on the availability of retail data, which can be broadly divided into historical and real-time data (see Figure 2).

Retail and Business Research Data. GSE's in-house retail managers rely primarily on historical retail data to create sales forecasts for the coming season. However, environment

Figure 3: GSE's Systems for Capturing and Using Data

data (e.g., fashion trends) is also important for creating sales forecasts. Environment data is provided by the business research function, which monitors changes in the climate, economic, social, and competitive environments, and analyzes how those changes would impact sales. Some experienced retail partners can make a reasonable forecast based on a store's historical records, but they cannot factor in the business environment. Hence, when there are major changes in the environment, their predictions will be inaccurate. Based on sales forecasts that factor in environment changes, GSE's retail managers create procurement plans for each store for the coming season.

Real-time sales data is used to create adjustment plans for the current season. Sales data for a product during the first two weeks is particularly important because it determines whether that product is popular, slow-moving, or popular in some regions but slow-moving in others. Products that fall into different categories are subject to different adjustment plans.

Manufacturing Data. GSE's manufacturing managers convert the procurement plans of the retail network into production plans for

the factory network. This planning process also considers the historical performance data of each factory. For example, factories with higher fulfillment rates and product quality will be assigned more production tasks.

Manufacturing managers also use procurement adjustment plans from nearby retailers to adjust the production plan for a factory. For example, additional procurement of certain products could lead to additional production at a factory, provided that the factory has idle production capacity and raw materials to fulfill the extra orders. Adjustment plans can also be triggered by real-time changes in other factories' production plans. For example, if one factory were to fail to deliver as planned, its production workload would be redistributed to nearby factories with idle capacities and extra raw materials.

Warehouse Data. GSE's warehouse managers convert the production plans of the factory network into logistic plans for the warehouse network. This planning process also considers the historical data of each warehouse. By analyzing the historical data, warehouse managers ensure that existing capacities can fulfill the logistic

plans. Otherwise, the production plans would need to be amended or the warehouse managers would be asked to acquire new resources.

Warehouse managers create logistic adjustment plans based on adjustments in production and procurement plans. This planning process takes account of the real-time data from warehouses. By analyzing this data, warehouse managers ensure that the adjustment plans are feasible. For example, if there were a need to transfer a slow-moving product from one location to another but the warehouse did not have the idle capacity to handle that need, an adjustment plan could not be formulated.

Data Governance. Effective data-informed decision-making in all of GSE's business functions relies on effective data governance. GSE's leaders view data as a strategic asset of the company and have established a data committee led by the CEO to govern data use. One of the committee's important duties is to ensure that all data is integrated on one platform and that all systems are built on that platform; proposals to build systems that create data silos are not approved.

Systems for Capturing and Using Data

GSE built both operational and analytics systems to capture and use data (see Figure 3).

Retail Management and Procurement Planning Systems. GSE's retail management system monitors the operations of each retail partner and captures operational data, such as a store's inventory level, execution of promotional campaigns, and customer feedback. Before this system was deployed at retailers' premises, GSE had no effective means of controlling partners and partners often acted on their own. For example, they set their prices and launched promotional campaigns, which did not always align with corporate objectives. After the system was deployed, retail transactions could now only occur through the system, and the system provides each retail partner with specific action plans. Actions that do not align with these plans cannot be executed. These action plans are produced by the procurement planning system; both season and adjustment plans are based on data collected by the retail management system.

Manufacturing Management and Production Planning Systems. The manufacturing management system monitors

the operations of each factory and captures all operational data, such as a factory's production schedule, product and material inventories, and defective product rate. Established manufacturing partners often already had their own IT systems and GSE connected its manufacturing management system to these systems. For smaller partners without their own IT systems, GSE deployed its manufacturing management system at their premises or sent GSE employees to partners' premises to collect data and coordinate activities.

Data accuracy was previously an issue at manufacturing partners' premises. Initially, many partners deemed GSE's system to be intrusive and had little incentive to ensure the accuracy of data inputs. GSE had to station its employees on-site to ensure data accuracy because inaccurate data from one factory could undermine the entire planning process and cause coordination issues. Over time, manufacturing partners realized that accurate data input could lead to effective planning and to actions that benefited them. They thus became more careful when entering data into the system.

Some manufacturing partners also disclose data about their material inventories and the prices of these materials. GSE analyzes this data to identify partners that pay more than others for the same materials and recommends changes for those partners. As one production manager explained,

"Although it is the partners who pay for their raw materials, we want to help them get the best deal. After all, our interests are intertwined, and their costs will have an impact on us."

The production planning system provides partners with specific season and adjustment action plans, such as which products to manufacture and when to produce them.

Warehouse Management and Logistic Planning Systems. GSE's warehouse management system monitors the operations of each warehouse and captures operational data, such as inventory level, delivery routes, delivery time and vehicles' conditions. The logistic planning system provides each warehouse with concrete action plans, such as shipment schedules, routes, and vehicle arrangements.

Integration of the Three Planning Systems. GSE integrated the three planning systems because the procurement, production, and logistic plans were interdependent. For example, procurement plans would require production and logistic plans to support them, and adjustments in procurement plans would require adjustments in production and logistic plans.

Shifting the Focus of IT Staff from Technical to Business Data

To enable IT staff to build systems that effectively capture and use data, they were trained to be sensitive to business data. GSE's CIO set a policy that required IT staff to use business data instead of technical data to explain the requirements, design, and functions of new IT systems. This policy forced IT staff to think in the same way as business users. During our interviews with IT staff we found that when they were describing an IT system, they often referred to business data such as repeated procurement rate, production cycle, shipment accuracy, and warehouse turnover rate. To further increase their appreciation of business data, IT staff were regularly rotated to work in different business functions. As the CIO commented,

"An IT employee must understand the business data and the context of the data so that they can communicate effectively with business employees, gain their trust and develop systems that users can use."

Adopting Data Analytics Provided Significant Performance Improvements

The major investments GSE made in data analytics produced significant returns. Key performance indicators showed major improvements from 2010 to 2014. In retail stores, the stock turnover rate decreased from 8 to 5.5 weeks, indicating that garments were sold more quickly. The likelihood that a customer purchased what she or he wanted in a store increased by 30% over the same period, suggesting an improvement in customer in-store experiences.

In factories, the concrete action plans decreased the average production cycle from 9 to 5 days, indicating an improvement in production efficiency. In warehouses, the shipping accuracy

increased from 60% to 85%, suggesting that products were more likely to be sold at retail stores and less likely to be shipped back to warehouses.

Another more strategic improvement was the increased commitment from manufacturing and retail partners. The proportion of manufacturing partners that adopted GSE's manufacturing management system increased from 70% to 95%, which indicated manufacturers' long-term commitment to GSE's business. Retail partners began to procure more products from GSE, with an average increase of 20%.

Moreover, retail partners also used more franchising services from GSE, especially data analytics services. Although partners paid for the data services, they rated them highest during the annual satisfaction survey. Some partners requested additional services from the data analytics team. One IT manager responsible for the procurement planning system elaborated as follows:

"There is one retail partner who spends nearly one million RMB (approximately \$150,000) a year for IT services and never delays payment. The owner believes the money is well spent because she can manage more stores and make better decisions. In the past six years, this company's revenue has tripled."

Thanks to these achievements, in 2013, the Chinese Ministry of Industry and Information Technology formally acknowledged GSE's digital transformation project as one of the best practices in the garment industry. That same year, the CIO Association of the Pearl River Delta, China, named GSE's CIO as one of the most respected CIOs in the region.

Recommended Actions for Using Data Analytics to Orchestrate a Networked Organization

Based on our analysis of the GSE case, we provide nine actions for using data and analytics to orchestrate a networked organization. These actions, which are summarized in Table 2, are grouped under decision rights, decision support, and IT management.

Table 2: Summary of Recommended Actions

Decision rights	1. Design end-to-end data flows, systems, and processes
	2. Clarify decision rights
	3. Involve IT staff in decision-making
Decision support	4. Empower decision makers with data and analytics
	5. Automate recommendations to decision makers
	6. Ask what the value proposition for partners is
IT management	7. Think of the IT department as an orchestrator
	8. Train IT staff to be business data-savvy
	9. Cultivate a data-informed decision-making culture in the network

Recommended Actions for Assigning Decision Rights

1. Design End-to-End Data Flows, Systems, and Processes. To coordinate all the nodes in a networked organization, the hub company must design end-to-end processes to ensure data flows to accountable decision makers. This is equally important for a company that outsources internal functions to partners and for a company that allows internal business units operate as independent partners. Leaders need to build analytics and operational systems that enable decision makers to make key operational decisions. But technology alone is insufficient and appropriate organizational changes are needed as well. A carefully orchestrated networked organization must have clearly assigned responsibilities to ensure that decisions made by business units and partners align with corporate objectives.

2. Clarify Decision Rights. Clear decision rights allow the businesses that comprise a networked organization to navigate through the complexity inherent in such a network and ensure that those responsible for critical decisions can make them promptly. Prior literature suggests that decision rights need to be redefined in the era of big data but has provided little advice on how to do this. At GSE, the leaders shifted decision rights from retail and manufacturing partners to business units in the company. This shift was possible because business units had access to data and possessed advanced analytics skills that could align partners' and the company's objectives.

Outsourcing operations to partners and maintaining a networked organization is no longer sufficient for gaining a competitive advantage. Competitors can easily get access to the same set of partners. In the GSE case, the company differentiated itself from competitors by using data analytics to enable its partners to make better decisions.

3. Involve IT Staff in Decision-Making. The hub business in a networked organization should no longer consider IT staff as outsiders in business decisions. Because many decisions require the use of big data and analytics, managers of business functions need access to IT staff who understand how to make effective decisions using data. At GSE, the launch of a retail strategy and promotional campaigns relied heavily on the inputs of IT managers. This involvement was sometimes dictated by top management but, more often, was initiated by business managers on their own. To support business decisions, the IT department must build a strong data analytics team. This requires a major investment and one way to cover the costs is to charge for data analytics services.

Recommended Actions for Supporting Decision Making

4. Empower Decision Makers with Data and Analytics. Networked organizations should empower decision makers through data and analytics. Data is a strategic asset in a networked organization. As the GSE case shows, effective decision-making relies on rich, accurate and integrated data. *Rich data* should cover historical events and real-time situations and capture the

end-to-end information of a supply chain; it can also be used by managers to plan more accurately and identify emergent opportunities and threats. *Accurate data* is the foundation for effective analytics. Regardless of how robust analytics systems are, they cannot generate insights using inaccurate data. In a networked organization such as GSE's, the supply of accurate data requires the cooperation of all partners. Hence, it is important to ensure that partners realize that it is in their best interest to ensure data accuracy. *Integrated data* is achieved by the hub company building an integrated data platform and avoiding building systems that create data silos.

5. Automate Recommendations to Decision Makers. Data analytics offers organizations the potential to automate decision-making. First, data analytics can handle more requests and process more data than an individual is capable of. Second, recommendations from data analytics constantly improve as the root causes of inaccurate results are identified and addressed. However, data analytics cannot fully automate decision-making; some tacit knowledge from humans in decision-making cannot be codified and incorporated into the algorithms.

Rather than replace humans in decision-making, GSE used data analytics to augment and complement humans; it automated the recommendations to decision makers rather than decision-making itself. These recommendations included both long-term recommendations, which network participants can use to prepare resources, and short-term recommendations that they can use to respond to emerging situations.

6. Ask What the Value Proposition for Partners Is. When designing analytics systems, hub companies should have partners' interests in mind and ask what the value proposition for partners is. An analytics system must provide a high level of value for partners in the networked organization. Partners will not make effective use of systems that benefit only the hub company, and a lack of cooperation from partners will reduce data quality and the quality of subsequent recommendations. In a networked organization, analytics systems can only be effective when there is a win-win situation. GSE's data analytics systems empower network partners while simultaneously ensuring that partners' interests are aligned with those of GSE.

Recommended Actions for IT Management

7. Think of the IT Department as an Orchestrator. Prior studies have shown that IT staff can play two distinct roles in a company: toolsmiths and orchestrators.⁷ The toolsmith role provides a reliable and cost-effective IT infrastructure, while the orchestrator role brings together IT, people, processes, and company strategies. To orchestrate a networked organization using data analytics, IT staff must act as orchestrators rather than toolsmiths. GSE's IT staff had previously acted as toolsmiths: they installed and fixed computers for the company. But this role could not support the implementation of data analytics. The company's success in data analytics owed much to the IT department's ability to act as an orchestrator.

In the era of big data, the IT department's role as an orchestrator also involves capturing, processing, and distributing data in the network. Today, data has become an important organizational asset that the IT department must orchestrate. In a networked organization, the IT department must also respond to fragmented requests from both internal business units and external partners and then build solutions that benefit the entire community.

8. Train IT Staff to be Business Data-Savvy. Building analytics capabilities into a networked organization requires more than simply employing a few data scientists and deploying the latest analytics tools. Many companies have a large team of data scientists and adopt the latest technologies yet still fail to gain significant benefits from data analytics. One important reason for this is that the builders of data analytics tools do not understand the data and the contexts of the data. GSE's IT staff were trained to be very sensitive to business data and the contexts of the data. They conducted all presentations using business data instead of technical data and were given opportunities to work with data from various functions within GSE.

7 Kohli, R. and Johnson, S. "Digital Transformation in Latecomer Industries: CIO and CEO Leadership Lessons from Encana Oil & Gas (USA) Inc.," *MIS Quarterly Executive* (10:4), December 2011, pp. 141-156. The article documents the digital transformation process at an oil company, which introduced the toolsmith and the orchestrator roles for IT staff.

9. Cultivate a Data-Informed, Decision-Making Culture in the Network. Data analytics is of no value unless people use it for decision-making. Prior research has shown that companies that benefit from data analytics use a high percentage of their data.⁸ To enable a high percentage of data usage, the hub company and its IT department should cultivate a data-informed decision-making culture in the network. Creating such a culture is not easy because people are used to experience-based decision-making, and their habits are difficult to change. In the GSE case, although many retail partners had incurred significant losses due to poor decision-making, changing their experience-based decision-making habits was still challenging.

Moreover, many partners were skeptical about GSE's intention and perceived the analytics systems as a means of selling them more products. One way of addressing this problem is for a company to recruit pioneer partners for data-informed decision-making and then use their success to influence others. Today, many partners in GSE's networked organization have developed the habit of using data for all kinds of decision-making. Some savvy partners have even launched their data analytics initiatives and asked GSE to provide them with additional consulting services.

Concluding Comments

The GSE case describes how a company transformed itself into a carefully orchestrated networked organization enabled by data and analytics. This study reveals how GSE's leaders redefined decision rights both for internal business functions and network partners, and supported new decision-making processes with the help of data analytics. The case also shows that effective data analytics aligns the interests of the hub company and network partners, with partners performing actions that optimize their local outcomes while also contributing to the hub company's goals. GSE's experience also reveals that data analytics is more effective in augmenting decision makers rather than replacing them. Hence, automating

recommendations to decision makers is more desirable than automating the decisions themselves. Finally, the GSE case highlights the emerging strategic role of the IT department and its growing involvement in business decisions.

The recommended actions derived from our analysis of the GSE case are not limited only to companies that outsource their operations but also relevant for companies that adopt the networked organization model.

Appendix: Research Methodology

We began data collection in April 2012 and visited GSE four times. The company was very supportive of our research. The CIO was a student in an Executive MBA class taught by one of the authors. We interviewed 24 GSE employees, who came from the retail, manufacturing, warehouse, and IT functions. We also interviewed the owners of three manufacturing partners and four retail partners. Each interview lasted between 45 minutes and one hour. At the end of each interview, we asked the interviewee to recommend other individuals who could be important sources in helping us understand how GSE used data analytics to orchestrate its networked organization. We conducted interviews until there was no new information to add. All interviews were recorded and transcribed. The transcripts totaled 311 pages. Data also came from archival material, which included GSE's internal documents (such as progress reports and presentation slides) and public information (such as news articles and analysts' reports). Archival data totaled 210 pages.

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8 Kettinger, W. J., Zhang C. and Marchand, D. A. "CIO and Business Executive Leadership Approaches to Establishing Company-wide Information Orientation," *MIS Quarterly Executive* (10:4), December 2011, pp. 157-174. This article explains the CIO's role in helping the company to build a strong information-usage culture.

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