

This case was prepared by Associate Professor Hsin-Lu Chang and Doctoral Candidate Wan-Chu Yen of National Chengchi University, Taiwan, as a basis for class discussion rather than to illustrate either an effective or ineffective handling of an administrative or business situation.

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WPG Holdings: Electronic Integration of Supply Chain Network

INTRODUCTION

On a summer night in 2013, Steve Chen,¹ chief operating officer (COO) of WPG, finished a long day of meetings and wearily returned to his office. He took a coffee break and read the annual statistical report of Electronic Buyers' News (EBN) regarding global electronic components distributors. That reminded him of how he had led WPG to successfully address several management challenges and allowed WPG to continuously maintain a leadership position in the electronics industry's supply chain system. The first challenge came with the vertical integration efforts of World Peace Industrial Group, Inc. (WPI Group) back from 1999. The manual transaction modes (including the website, facsimile, e-mail, telephone, etc.) restricted the amount of information transmission among partners, and the validity and timeliness of information and efficiency are severely limited. In order to maintain a tight relationships with WPI Group's suppliers and customers and further create mutual benefits, WPI Group needs to find out a more flexible and efficient way in place of the manual mode. Facing the increasingly competitive market due to globalization and fast development of information technology (IT) in the electronics industry, WPI Group determined to consolidate its position through continuous mergers

¹The name used in this case study is a pseudonym.

and acquisitions (M&A) of complementary and competitive companies in the same industry. The establishment of WPG (an integration of WPI Group, Silicon Application Corporation Group (SAC Group), and RichPower Electronic Device Co., Ltd. (RichPower Group)) in 2005 is the result of such horizontal integration efforts. However, the integration with additional subsidiaries in WPG not only increased the complexity of B2B transaction and communication in the supply chain network but also caused employee resistance to changes of integration. This is the second management challenge faced by WPG. Specifically, information systems and information exchange standards (e.g., RosettaNet, EDI, XML) used by subsidiaries and their suppliers and customers vary. Besides, the services that the subsidiaries provided to suppliers and customers overlap. Moreover, B2B integration with corresponding increased workloads caused IT staff to consider quitting their jobs. Furthermore, purchasing personnel were forced to learn computer skills to process purchases and were forbidden to profit from the open pricing mechanism, thereby causing a resistance to B2B integration.

To overcome the first challenge, Mr. Chen determined to adopt RosettaNet (the business-to-business (B2B) protocol standard), which is built upon an open structure and emphasizes standardization of B2B processes. It can enable transaction information linkages of business partners' back-end ERP systems for achieving the purpose of system-to-system integrations and thereby can overcome the limitations of manual transaction and communication modes. WPI Group has become the first company that collaborated with Intel Corporation to build RosettaNet connection in the Asia-Pacific region. The collaboration with Intel on RosettaNet connection has enriched WPI Group's experience and enhanced its competitive advantage to collaborate with more suppliers and customers.

To address the second challenge, Mr. Chen adopted both technological and managerial approaches. From the technological perspective, Mr. Chen standardized the subsidiaries' external communication windows, ERP systems, and information exchange standards. From the managerial perspective,

Mr. Chen developed key performance indicators (KPI) and provided education and training to reduce the resistance from purchasing personnel in using electronic purchasing systems. To overcome the resistance from IT staff, in addition to providing different types of assistance from supervisors to address various employee needs, Mr. Chen also promoted a mentoring system and training to reduce IT staff's frustrations at work.

WPG had recently been selected for the 2013 Forbes Global 2000 List. However, the continuously declining gross margin in recent years was an alert to WPG. Facing the market rules of "the bigger the stronger", Mr. Chen and his team need to prepare for a more complicated and dynamic supply chain network. Despite these challenges, Mr. Chen remained confident that WPG had the necessary IT assets and skill sets to keep the company to excel at B2B electronic integration, which is a major competitive advantage in the electronics industry.

COMPANY AND INDUSTRY BACKGROUND

Industry Background

According to the World Semiconductor Trade Statistics (WSTS)'s² report, the global semiconductor industry's annual sales in 2014 reached US\$335.8 billion in which the Asia-Pacific market totaled \$194.2 billion, a share of 58% of the total semiconductor market. Gartner report³ indicated that the top 25 semiconductor suppliers' combined revenue increased 11.7% over the previous year, which was more than the overall industry's growth. According to the WSTS's forecast, the global semiconductor market is expected to maintain steady growth over the next few years, especially Asia-Pacific, has robust demand, is still the fastest growing region. Gartner report⁴ indicated that the growth momentum of the

²<https://www.wsts.org/PRESS/Recent-News-Release>

³<https://www.gartner.com/newsroom/id/2955617>

⁴<https://www.gartner.com/newsroom/id/3034518>

semiconductor market is driven by increasing demand for consumer electronic goods, especially smartphones, solid-state drives (SSDs) and ultramobiles.

As distributors of electronic components, according to the EBN's report, in 2014, almost all of the top ten distributors had the sales growth from a year earlier. The top three distributors' sales had a larger gap than others. The top ten global distributor sales ranking for 2014 included four distributors that are headquartered in the U.S., two in Taiwan, two in Europe, one in Japan, and one in Canada. WPG is a sole distributor in the Asia-Pacific region on the top three list. Although WPG was ranked number three of the electronic components distributors, WPG has continued to capture strong growth, reporting a 9% increase in consolidated sales over the previous year (see Table 1).

Table 1. Top 10 Global Electronic Components Distributors by Revenue, 2014.

(Millions of Dollars)

2014 Rank	Company	Headquarters	2013 Revenue	2014 Revenue	2013–2014 Growth (%)
1	Avnet	U.S.	26,660	28,120	5
2	Arrow Electronics	U.S.	21,357	22,768	7
3	WPG Holdings	Taiwan	13,684	14,927	9
4	Future Electronics	Canada	5,054	5,205	3
5	WT Microelectronics	Taiwan	2,922	3,390	16
6	Macnica	Japan	2,388	2,545	7
7	Electrocomponents PLC	Europe	1,920	2,118	10
8	TTI Electronics	U.S.	1,675	1,950	16
9	Digi-Key Corporation	U.S.	1,556	1,764	9.8
10	Premier Farnell	Europe	1,590	1,445	–9

Source: EBN (May 2015).⁵

⁵http://www.ebnonline.com/author.asp?section_id=3219&doc_id=277631

Avnet and Arrow Electronics, as WPG's competitors, have long dominated the electronics distribution market. Avnet is the world's largest distributor of electronic components. In 2014, Avnet⁶ achieved US\$28.1 billion in revenues in which the Asia-Pacific market totaled US\$8.9 billion, a share of 32% of its global market. Avnet currently has 383 locations in 115 countries, with over 18,600 employees and 100,000 customers. Avnet is focusing heavily on developing the Asia-Pacific market. Avnet Electronics Marketing Asia,⁷ has leadership position in the Asia-Pacific region. It has headquarters in Singapore and has extensive coverage in Asia-Pacific with offices in over 50 locations including Australia, China, India, Korea, Malaysia, New Zealand, Philippines, Singapore, Taiwan, Thailand, and Vietnam. In addition, it operates 5 logistics centers and 7 design centers.

Arrow Electronics⁸ is the second largest distributor of electronic components, which has more than 460 locations in 56 countries, with over 17,000 employees and 100,000 customers. In 2014, Arrow Electronics achieved US\$22.8 billion in revenues in which the Asia-Pacific market totaled US\$4.6 billion, a 20% share of its global market. With significant presence in Asia-Pacific, Arrow Aisa,⁹ as a business unit of Arrow Electronics, is one of Asia-Pacific's leading electronic components distributors. It is headquartered in Hong Kong and operates 62 sales offices, 4 distribution centers and 5 local warehousing facilities in 13 locations across the Asia-Pacific region. In addition, it serves more than 10,000 original equipment and contract manufacturers and commercial customers in Asia-Pacific.

Company Background

WPG started in 2005 as an integration of WPI Group, SAC Group, and RichPower Group. Later, it integrated with

⁶<http://www.avnet.com/en-us/Pages/default.aspx>

⁷<http://www.em.avnetasia.com/>

⁸<http://www.arrow.com/>

⁹<http://components-asiapac.arrow.com/>

leaders in the Asian Pacific semiconductor distributors, including Pernas Electronics Co., Ltd. (Pernas Group), Asian Information Technology Group (AIT Group), YOSUN Group, and AECO Technology Co., Ltd. (AECO Group). WPG currently has a workforce of approximately 6,000 employees and represents more than 250 product lines for companies in which eight of them were ranked as global “top 10” semiconductor suppliers in 2014 (see Table 2). WPG’s products include a variety of electronic components, mainly semiconductor components, including core components (e.g., central processing units (CPU), disc random access memory (DRAM), and motherboard chipsets) and basic components (e.g., static random access memory (SRAM), field programmable gate-arrays (FPGA), and diode-transistor logic (DTL)).

Table 2. Top 10 Semiconductor Suppliers by Revenue, 2014.

(Millions of Dollars)

2014 Rank	Company	Headquarters	2013 Revenue	2014 Revenue	2013-2014 Growth (%)	2014 Market Share (%)
1	Intel	U.S.	48,590	50,840	4.6	15.0
2	Samsung Electronics	South Korea	30,636	35,275	15.1	10.4
3	Qualcomm	U.S.	17,211	19,194	11.5	5.6
4	Micron Technology	U.S.	11,918	16,800	41.0	4.9
5	SK Hynix	South Korea	12,625	15,915	26.1	4.7
6	Toshiba	Japan	11,277	11,589	2.8	3.4
7	Texas Instruments	U.S.	10,591	11,539	9.0	3.4
8	Broadcom	U.S.	8,199	8,360	2.0	2.5
9	STMicroelectronics	Europe	8,082	7,371	-8.8	2.2
10	Renesas Electronics	Japan	7,979	7,249	-9.1	2.1
	Others		147,883	155,679	5.3	45.8
	Total Market		314,991	339,811	7.9	100

Source: Gartner (January 2015).

WPG's sales and service offices have spread across the world to nearly 120 locations such as Taiwan, Mainland China, Singapore, Malaysia, Thailand, the Philippines, India, Japan, Korea, and the U.S. Of these, approximately 70 locations are in the Asia-Pacific region. In addition, WPG has warehouses in Taiwan, Hong Kong, Shanghai, Singapore, and the U.S. Table 3 and Figure 1 shows WPG Holdings' company profile and organization structure respectively.

As a distributor of electronic components, WPG is the bridge between suppliers and customers in the electronics industry. According to Mr. Chen,

Table 3. WPG Holdings's Profile

	WPG Holdings						
Established	November 2005						
IPO	November 2005 (TSE: 3702)						
Number of Staff	More than 6,000						
Number of Sales Offices	120						
2014 Revenue (\$Million)	\$14.9 Billion						
Customers	More than 30,000 domiciled in APAC						
Number of Warehouses	Seven in five cities (Taiwan/Hong Kong/Shanghai/Singapore/United States)						
	WPI Group	SAC Group	RichPower Group	Pernas Group	AIT Group	YOSUN Group	AECO Group
Established	1980	1987	1995	1984	1993	1980	1975
Joined WPG Holdings	November 2005	November 2005	November 2005	July 2008	February 2009	November 2010	March 2012
Number of Front-End Staff	1450	650	300	180	530	1320	270
Number of Total Staff	1540	680	330	200	570	1600	370

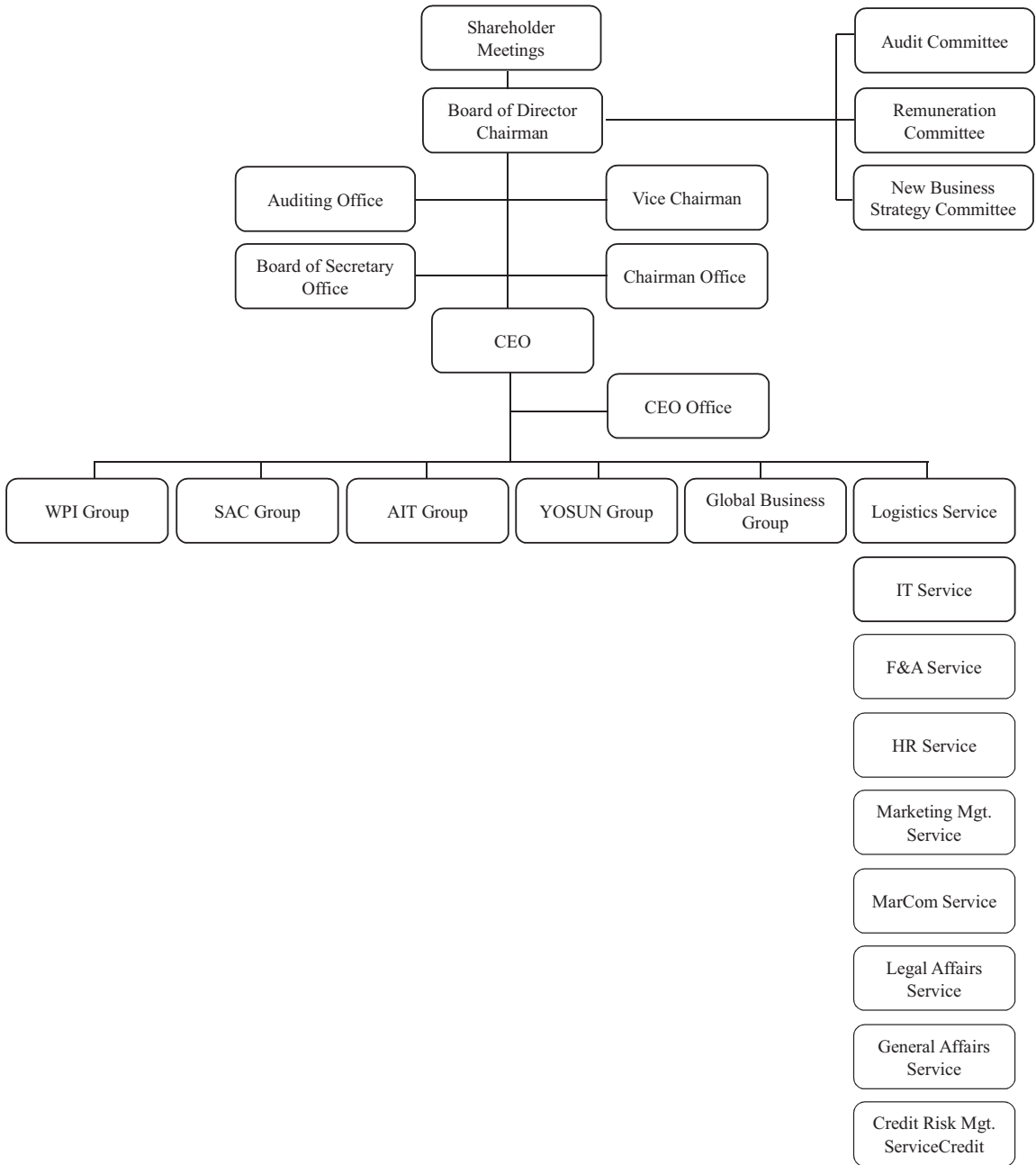


Figure 1. WPG's Organization Structure.

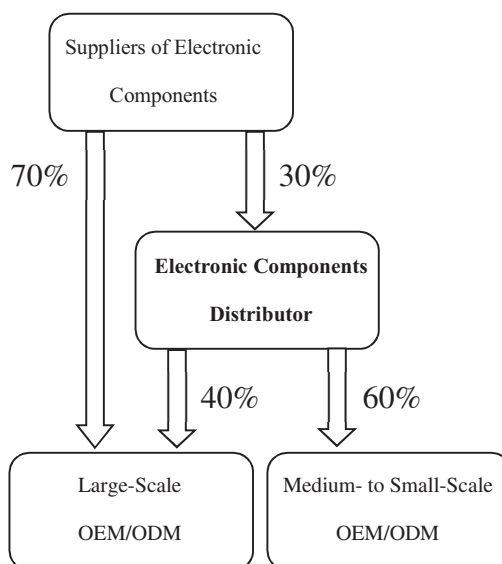


Figure 2. The Role of an Electronic Components Distributor.

“Most of the original suppliers of electronic components sold 70% of their products directly to large-scale original equipment manufacturers (OEM) and original design manufacturers (ODM). The remaining 30% of the products was sold indirectly to large-scale, or medium- to small-scale OEM and ODM through electronic components distributors (see Figure 2). Therefore, it was a huge challenge for us to maintain an intermediary role in the supply chain system.”

WPG’s major task is to act as an agent for representing a variety of electronic components from its suppliers and to provide a one-stop, convenient shopping service to its customers. WPG also provides customers value-added services such as high-tech, industrial, and manufacturing technical support and solutions. To maintain close and interactive relationships with its suppliers and customers, IT has become an imperative for WPG. IT can help WPG transfer instant and accurate information with trading partners. The enhanced data transparency and synchronization improve WPG’s suppliers’ capability for production planning and inventory management. WPG’s customers also upgrade their capability in demand forecasting and demand creation.

The globalization and development of IT not only accelerate the growth of the electronic components industry but also threaten the industry in an increasingly competitive market. Under pressure from the highly competitive market, WPG used M&A to continuously build its global distribution network, which helped it to expand its representative product lines and its service range. Mr. Chen commented,

“WPG Holdings’s continuous expansion has made the global distribution network more sophisticated. The integration of the information flow played an important role in coordinating subsidiaries to provide accurate information related to instant orders, inventory, and product delivery. This ensured a smooth operation among trading partners in the supply chain network to achieve greater profits.”

Figure 3 shows WPG’s timeline of B2B integration project.

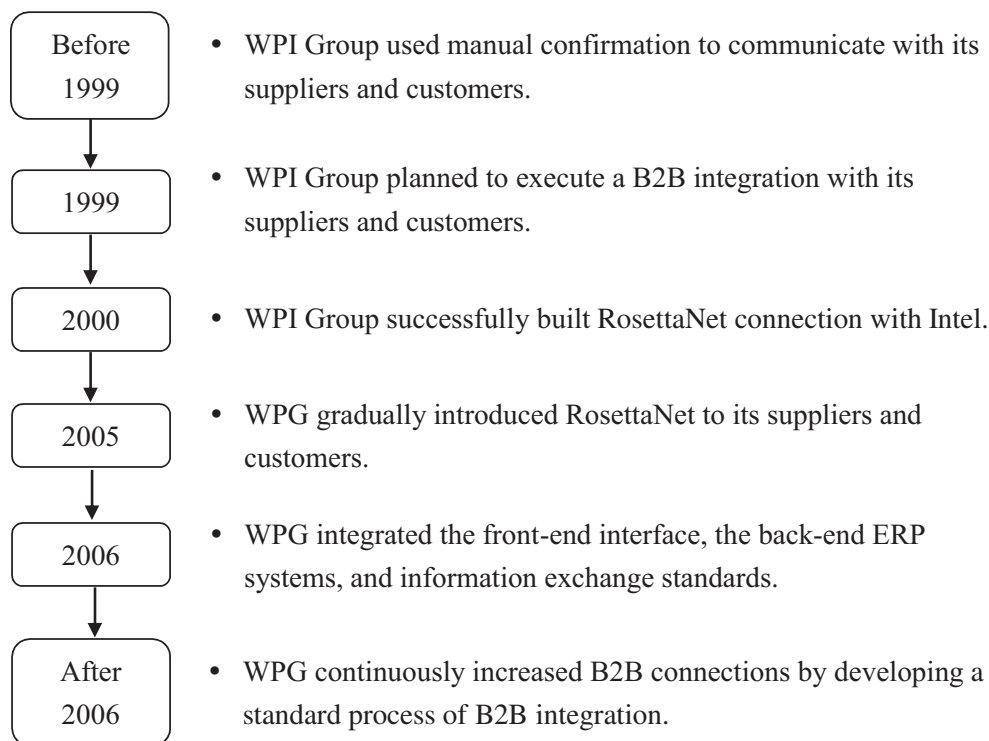


Figure 3. WPG’s Timeline of B2B Integration Project

WPG'S ELECTRONIC INTEGRATION OF SUPPLY CHAIN NETWORK

Building Rosettanet Standard-Based B2B Connections

In 1999, when Steve Chen was still the CIO of WPI Group, he read the report of KPI related to the days of response of purchase order, the order payment rate, and the turnover rate of inventory and realized that the then-current transaction modes (including the website, facsimile, e-mail, telephone, and electronic data interchange (EDI)) between suppliers and customers not only restricted the amount of transmitted information but also limited the validity and timeliness of information and efficiency. He worried that the firm could not tolerate increased trading volume without electronic integration. Mr. Chen further believed that even though EDI was the earliest standard for B2B connection, there remained some limitations on its application. For example, only a value-added network (VAN) could connect with EDI, and the costs of its implementation and maintenance were very high. In addition, EDI used batch files exchange patterns without integrating business processes, resulting in the inability to exchange instant information.

In the meantime, to overcome the limitations of traditional transaction and communication modes, the Taiwanese government was actively encouraging enterprises to establish electronic supply chains. Accordingly, Mr. Chen decided to execute a B2B integration plan for suppliers and customers. He believed that convincing and cooperating with Intel, the leading supplier of semiconductors, in establishing B2B connections would be a good start.

After long communications with Intel, Mr. Chen proved that WPI Group had a certain degree of expertise in the Internet, the intranet, enterprise resource planning (ERP) systems, and IT staff skills for the collaboration. In 2000, WPI Group successfully collaborated with Intel and became the leader in linking with RosettaNet standard across the supply chain in the Asia-Pacific region. This move also laid the foundation for future B2B information integration with other suppliers and customers.

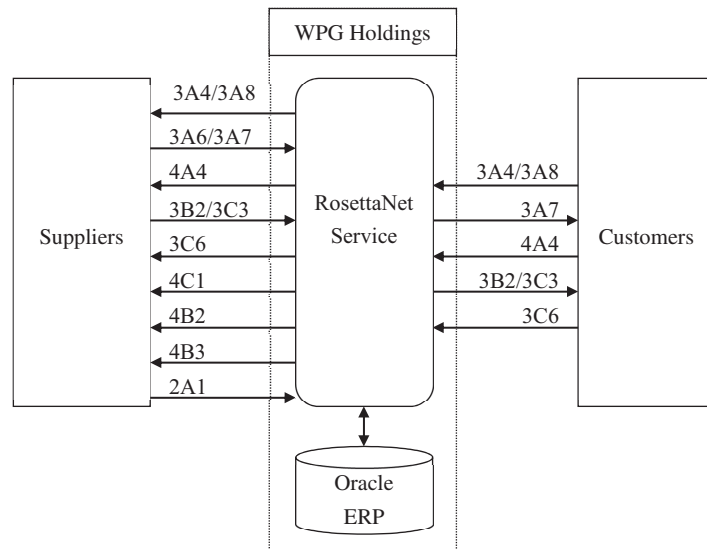
RosettaNet¹⁰ is based on an open structure and the standardized definition of B2B processes. Using the partner interface processes (PIPs), it can handle many business processes such as demand, forecasting, manufacturing, logistics, payments, design, and order. PIPs are the core of RosettaNet, which has combined the standardized process and the standardized data format to enable post-transaction information linking of business partners' back-end ERP systems. This allows automatic data exchange for the purpose of achieving system-to-system integration. Therefore, before B2B integration project started, WPI Group relied exclusively on manually entering order information and confirming order status through Intel's website, and then downloading confirmed order information from Intel's website and entering batches of these information into own ERP system weekly. After B2B integration with Intel, orders have been changed to directly send and receive from Intel's ERP system to WPI Group's ERP system. Moreover, manual checking and coordination of shipping and payment has also been automated on the ERP system. According to Mr. Chen,

"B2B integration using RosettaNet improved traditional transaction and communication between Intel and WPI Group. It also resulted in a 60% increase in the efficiency of order-to-payment business processes."

The major advantage of RosettaNet is that it allows business partners to establish and share a reusable B2B information platform with all of its business partners that use RosettaNet. This feature further enhances the transparency of the entire supply chain system. Therefore, after the 2005 establishment of WPG, they gradually introduced RosettaNet to its other suppliers and customers. The number of PIP applications also increased, which created high trading volume for WPG. WPG's RosettaNet PIP applications are shown in Figure 4.

"Given the success of our collaboration with Intel, we have continuously grown our B2B connections. In particular,

¹⁰http://www.gs1au.org/assets/documents/services/rosettanet/mnet_bbus_intel_0304.pdf



PIPs

2A1: Distribute New Product Information	3C3: Notify of Invoice
3A4: Request Purchase Order	3C6: Notify of Remittance Advice
3A6: Distribute Order Status	4A4: Notify of Planning Release Forecast
3A7: Notify of Purchase Order Update	4B2: Notify of Shipment Receipt
3A8: Request Purchase Order Change	4B3: Notify of Consumption
3B2: Notify of Advance Shipment	4C1: Distribute Inventory Report

Figure 4. WPG's Rosettanet PIP Applications.

when suppliers and customers believe that B2B connections are a prerequisite condition for transactions, our capability to fully utilize B2B connections becomes our competitive advantage,"

said Mr. Chen.

Integrating Subsidiaries' Heterogeneous Systems

WPG's strategy of M&A is to integrate all of its warehouses and sales offices under its subsidiaries' existing leaderships and operation systems. Moreover, there is integration between the subsidiaries' information departments. In 2006,

Mr. Chen understood that WPG's establishment was not the finish line because the firm would be joined by more and more subsidiaries. However, information systems and information exchange standards (e.g., RosettaNet, EDI, XML) used by subsidiaries and their suppliers and customers vary. In addition, the services that the subsidiaries provided to suppliers and customers overlap. These issues substantially increased the complexity of the transaction and communication modes of the WPG supply chain network and wasted overlapping resources.

Mr. Chen believed that standardizing the subsidiaries' external communication windows and B2B connection modes not only reduced the load of IT settings and B2B connections for global sales offices, warehouses, suppliers, and customers but also effectively achieved both the horizontal integration of subsidiaries and vertical integration with their trading partners. To implement such standardization, Mr. Chen took two initial steps: first, he integrated the IT teams and business functions of each subsidiary and second, he integrated the front-end interface and the back-end ERP systems.

Integration between IT teams and business functions

The integration of information departments has maintained WPG's unique information service. By combining all of the subsidiaries' IT staff, WPG's IT unit was divided into three functional services: front-end, back-end, and workflow (see Figure 5). The front-end system includes B2B, the Web, the enterprise information portal (EIP), the ERP system's purchase orders (PO) module, and the ERP system's order management (OM) module. The back-end system includes the warehouse management system (WMS), the flexible vendor management inventory (VMI) system, and the ERP system's financial accounting (FA) module. Workflow includes the human resource information system (HRIS), the office automation workflow system (webflow), the customer service system (call center), and the ERP system's training module.

At the beginning of the integration, differences in the subsidiaries' cultures and working habits appeared. Mr. Chen

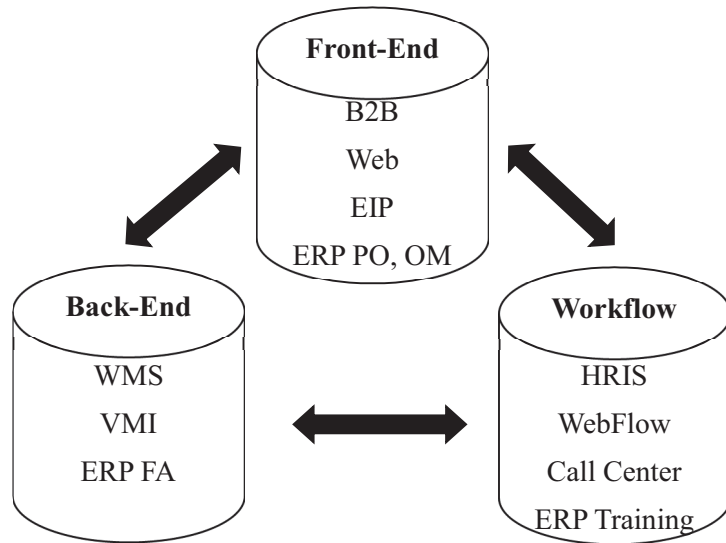


Figure 5. Overview of the WPG Information System.

decided to solve that problem in two stages. In the first stage, WPG's IT team was a composite of subsidiaries' IT teams with existing subsidiaries' IT staff. The different IT teams handled different functional tasks of WPG and were encouraged to share their experiences with each other. For example, prior to integration, SAC Group and RichPower Group both had their own ERP systems and ERP teams, which were then merged into the WPG ERP team, with one team taking responsibility for purchase order tasks and the other taking responsibility for sales order tasks. Therefore, both teams became familiar with one another's information system. Moreover, different EPR teams operated their functional tasks differently for different subsidiaries. WPG adopted advantages from different EPR teams to compensate for any deficiencies and created the best practice for the team. In the second stage, after the subsidiaries' IT staff have become familiar with WPG's business, the WPG's IT team was broken up and IT staff were reallocated to new positions and suitable functional tasks based on their expertise. To ensure that each IT staff has learning opportunities, IT staff were rotated through different business functions.

Integration between the front-end interface and the back-end EPR system

To integrate different information systems and the standards of B2B information exchange, WPG first designed the configurable interface at the front-end. This interface relies on a large software-development platform that contains a variety of templates to process different standards of B2B information exchange. At present, the standards of B2B information exchange that WPG can handle include RosettaNet, XML, EDI, EDIINT-AS2 (Internet EDI), and Web Service. RosettaNet is WPG's most commonly used standard of B2B information exchange.

For the integration of WPG's EPR system, Mr. Chen considered that WPG's numbers of B2B connections were comparatively higher and WPG had more experience than the subsidiaries in integrating the information system. Therefore, all the subsidiaries required to adopt WPG's B2B system. In addition, the subsidiaries were persuaded to use WPG's Oracle ERP system and its data format to communicate with suppliers and customers.

Different ERP systems and information exchange standards result in different order formats, which dramatically increase the difficulties of system-to-system integration. Therefore, Jeffrey Wang,¹¹ an information management manager of WPG, suggested that coordinating common items and order columns in the ERP system during integration is necessary:

"As early as the beginning of implementing the ERP system of WPI Group, we analyzed the order formats of all of our suppliers and customers and attempted to standardize them. After WPG was founded, we applied the 80/20 principle to maintain 80% consistency on the order format and allowed 20% of the order column to remain flexible. By defining various order columns of possibilities, purchasing personnel have the flexibility to set the order columns when they contact new suppliers and customers. Once the order columns have been identified, the

¹¹The name used in this case study is a pseudonym.

format conversion/mapping (e.g., RosettaNet, EDI, XML) is automatically generated. This allows a system-to-system integration during a transaction with different suppliers or customers that are using different B2B information exchange standards, based on the standardized process and the standardized data format."

Through the integration of the interface and ERP systems (see Figure 6), WPG's global sales personnel can handle different transaction issues (e.g., new order input, confirming quotations, delivery, inventory, and logistic tracking) through the same web browser-based interface. The system will judge the identities of different users and their permission of accessing the system to display different login windows. When WPG exchanges information with different

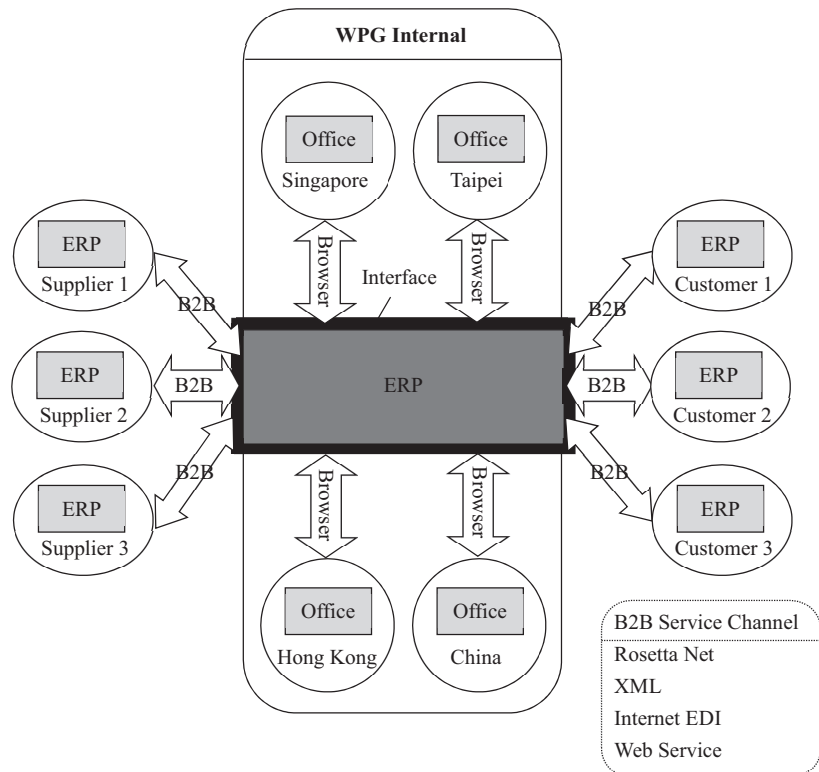


Figure 6. B2B Integrations between WPG and Internal Subsidiaries along with External Suppliers and Customers.

trading partners, the system will transfer the data format that meets the trading partner’s B2B information exchange standard and directly transmit information to the trading partner’s ERP system. Mr. Chen said happily that

“The integration of the interface and the ERP systems helped WPG to achieve both vertical and horizontal integration of its supply chain network and to reduce waste of resources. Therefore, electronic integration shortened the time of processing demand forecasts, orders, and invoices of suppliers and customers from 3–5 days to 0.5–1 day.”

See Figure 7.

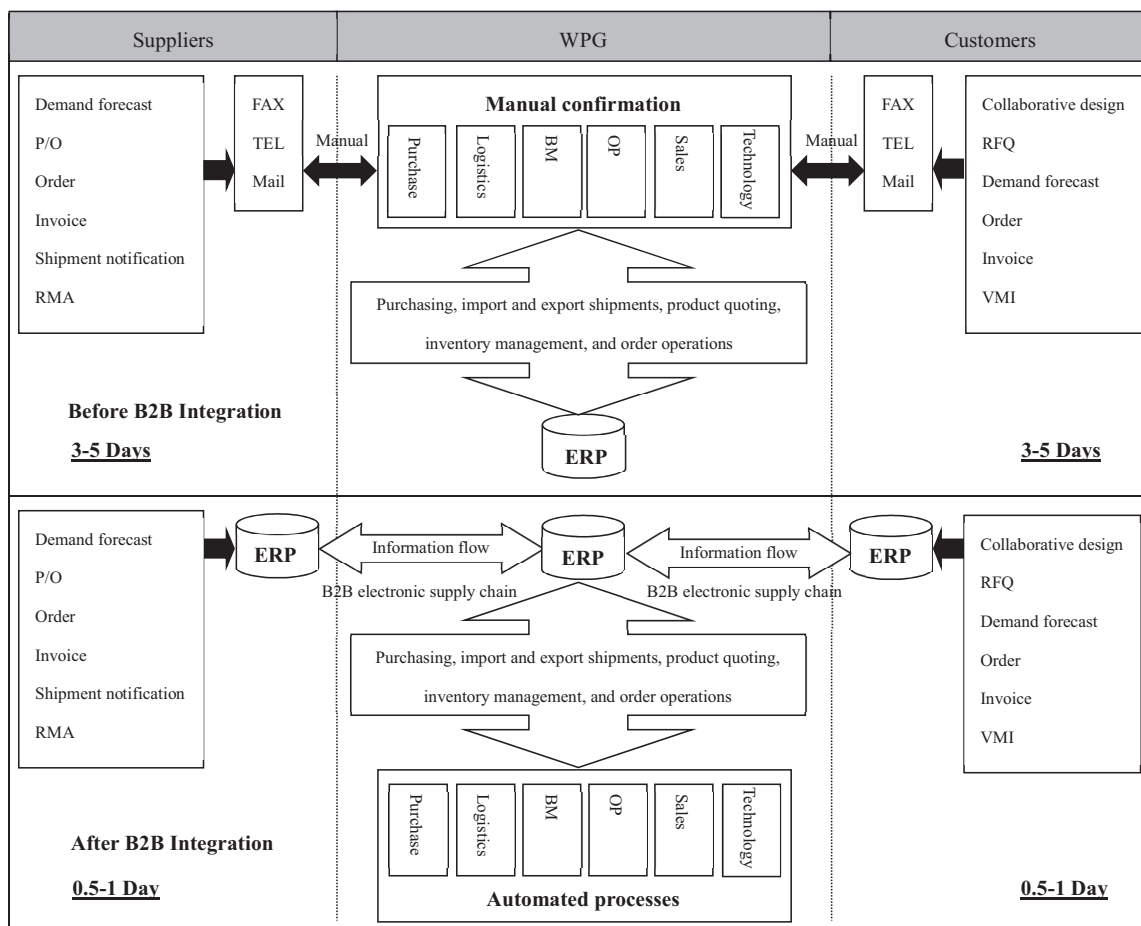


Figure 7. Changes to and Benefits of WPG Transaction and Communication Modes.

Managing Employees' Resistance

However, the process of integration was not always smooth.

“Due to the transparency of the information system, the gray zone of purchase orders could be monitored. Purchasing personnel could not hide problems related to temporary product shortages from their customers; the system instantly informed customers if there was a problem with the order. In addition, previous undisclosed prices were no longer hidden before shipment but, rather, were instantly displayed to suppliers for each product and corresponding customer. Purchasing personnel who were accustomed to the conventional manner therefore might resist to the establishment of B2B connections between subsidiaries, suppliers, and customers,”

said Jeffrey Wang.

To overcome the resistance of subsidiaries' purchasing teams, Mr. Chen first persuaded each subsidiary that B2B integration had greater benefits than the previous, manual operation. The number of B2B connections was included in WPG's KPI, which was then promoted to each subsidiary. Second, front-end purchasing personnel were well trained in electronic manner. According to Mr. Wang,

“These two strategies effectively overcame the subsidiaries' internal resistance to B2B connections and convinced them to give up the conventional 'gray zone' and to shift to a more transparent information system.”

In addition to the resistance of purchasing personnel, Mr. Chen also faced problems of IT staff's high turnover rate. Due to WPG's continuous integration with its subsidiaries, its IT staff must at all times flexibly and efficiently address B2B integration for new subsidiaries, suppliers, and customers. IT staff must often meet with B2B business partners to understand and resolve connection problems and fill integration-related gaps to provide an efficient B2B integration. In addition, the IT capabilities of the subsidiaries and some trading partners were not as mature as those of WPG. In some areas (e.g., China), employees often had no computer-related knowledge. Thus, the WPG's IT staff have

the responsibility to train the trading partners and front-end users. However, increased integration-related workloads with no corresponding increase in salary caused IT staff to consider quitting their jobs.

Mr. Chen understood that most IT staff have great knowledge and experience and are valuable assets to the company. Therefore, he must appease them before they leave. Accordingly, Steve Chen attempted to deliver the management methodology upon fair leadership and Maslow's hierarchy of needs to team leaders. Mr. Chen believed that allocating workloads fairly may prevent employees from experiencing a sense of relative deprivation. These values can also encourage cooperation among employees. If administrators provide varying types of assistance based on employees' different levels of need, employees' satisfaction will be enhanced. Moreover, Mr. Chen also promoted mentoring and focused on both educating and training employees. He believed that by mentoring and sharing experiences, along with educating and training managers and workers, employees' frustration at work will decrease and the coherence of the entire team and department will increase.

"Amazingly, it turned out that no employees have left," he said.

Continuously Increasing B2B Connections

After resolving the resistance of employees, to achieve synergy in supply chain integration, Mr. Chen's further goal was to continuously increase the amount of B2B connections with suppliers and customers. One day Mr. Chen noticed that based on reports, the progress in making connections was unexpectedly slow. He then met with Mr. Wang and attempted to understand the problem.

Mr. Wang believed that because different business partners had different needs, requirements, and considerations related to the B2B connections, WPG had to provide customized services. However, the customization increased the cost and resulted in a small progress in establishing B2B connections. For example, WPG tried to use RosettaNet as

a major information exchange standard. However, in a few cases, WPG had to adopt other B2B information exchange standards. For example, after SAC Group joined WPG, SAC Group's suppliers and customers used the extensible markup language (XML) standard. Moreover, due to the growth of the Chinese market, WPG's customers from China paid more attention to electronic integration. However, those customers primarily used Web service or employed a variety of standards that are different from international standards (e.g., the XML standard), as well as the most order formats in free format. In this situation, WPG had to customize its services in a manner that are different from the formats used by RosettaNet.

To resolve this problem, Mr. Chen decided to develop the standard process for handling various B2B integration requests from applicants (mainly are business partners). The standardization includes the unification of work categories and work flows, which is shown in Figure 8.

Step 1: System assessment

System assessment is divided into two categories. The first category is a self-assessment by the applicants themselves. The second category is an internal assessment by WPG's information department. After the assessment, the system is ranked according to the points attributed to different questions and thus obtains its final score. The applicants' self-assessment includes several categories of demand (e.g., catering to demands of service, project, business partners, government regulation, and firm's policy); levels affected by demand (e.g., individual, department, company, subsidiary, and entire holding group); reason for the business process reengineering (e.g., to improve the efficiency of routine duties and to develop new business models); usage frequency (e.g., daily, monthly, and annual usage); the number of users; and the expected benefits (e.g., a 50% reduction in operating time). After the WPG information department receives the demand form, they evaluate the necessity of the demand, and the urgency of the demand, the compatibility of the applicant, and development duration (e.g., more or less than 15 days).

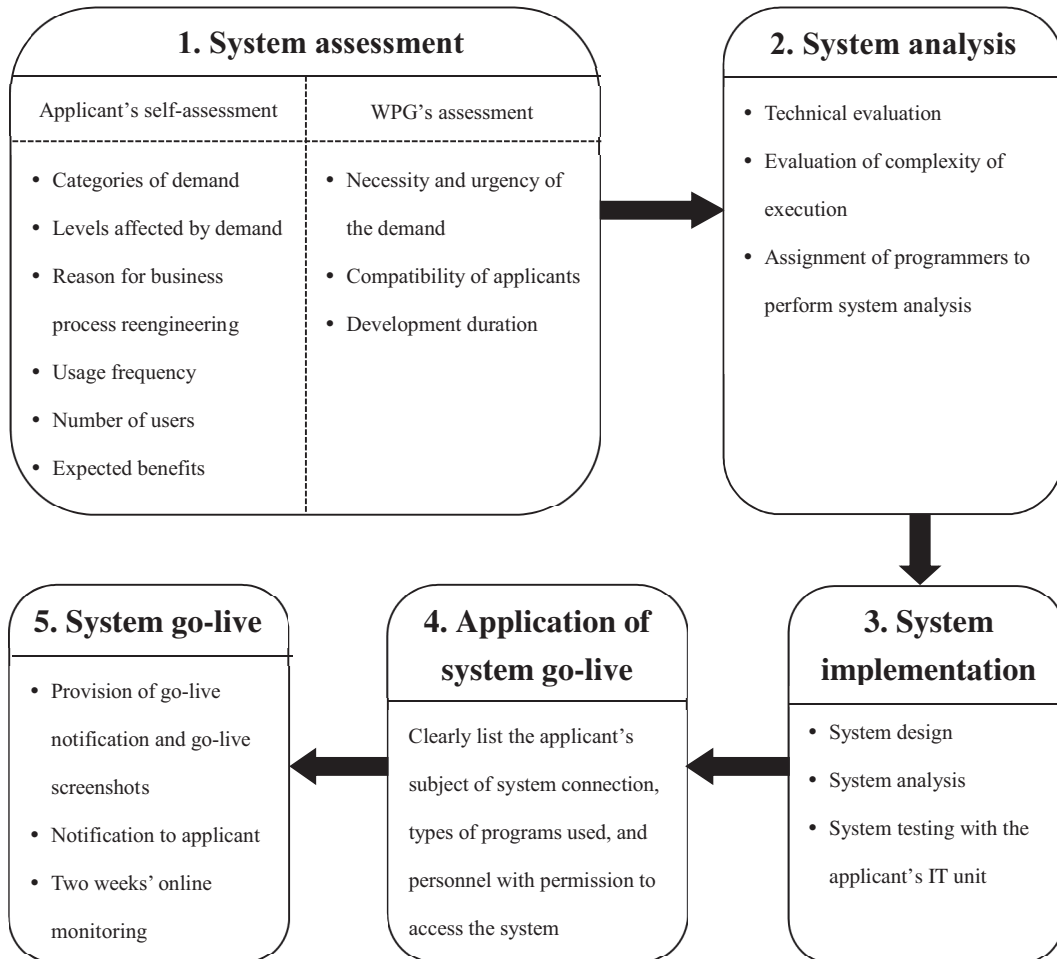


Figure 8. Standard Process for WPG B2B Integration.

Step 2: System analysis

This stage is mainly to evaluate a system's technical level and the complexity of execution. On the technical level, WPG primarily assesses the applicant's technical standards to determine whether it is consistent with WPG's internal technical standards (e.g., RosettaNet). The more similar the technical standards, the higher the acceptance. To assess the complexity of execution, WPG divides technical status of the applicant into the different categories: 1. the applicant with existing, self-supported programs and processes; 2. the applicant that

requires new function development by WPG's ERP team; and 3. the applicant with large projects that require cross-regional and cross-group collaborations among IT, operation, and marketing units of WPG and the applicant. Subsequently, WPG assigns programmers to perform a system analysis.

Step 3: System implementation

This stage primarily involves system testing between the IT units of WPG and the applicant. After resolving the technological problems, as explained above, WPG sets up an order on a test machine and requires the applicant to confirm whether the system has successfully delivered the message.

Step 4: Application of system go-live

Once the applicant has successfully received the order, the applicant can apply for system go-live. The applicant must provide various information regarding with whom would be connected, the type of programs that it uses, and the personnel who have permission to access the system.

Step 5: System go-live

When system is go-live, WPG provides notification and screenshots of go-live to confirm the correct usage of the program. WPG also provides additional notifications and two weeks of online monitoring.

WPG'S FUTURE CHALLENGES

WPG was selected for the 2013 Forbes Global 2000 List. According to the EBN's report, WPG continued to hold one of the top three electronic components distributors worldwide. These accolades greatly encouraged WPG employees and assured their continued hard work. However, in recent years, WPG's gross margins have begun to decline. The industrial tendency of cut-throat competition and the market rules of "the bigger the stronger" alerted Mr. Chen and his

team to prepare for future challenges, especially in the area of IT. For example, although Mr. Chen hopes that more business partners establish B2B connections with WPG, the business partners, in contrast, believe that B2B connections are unimportant. Thus, it is a challenge for WPG to persuade its business partners to believe that B2B connections are important and to be willing to spend enough of their resources and time on B2B connections and tests. In addition, cloud computing has gained more and more attention among enterprises and is the future of WPG's IT development. The advantage of cloud computing is that it allows users to connect anywhere through different devices to access applications, which provide a dynamic and shared computing resource to achieve a significant economic scale. The efficient implementation of cloud computing will be another challenge for Mr. Chen and WPG's IT team.

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