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EXECUTIVE SUMMARY

Nazar Group of Companies has been a leading producer and distributor of cookies, crackers, cakes, chocolate, and other products in Turkey for more than 40 years. This case is about the group’s management roles in transforming the companies into a more consumer-focused orientation using supply chain management philosophy as a strategic framework. Descriptions of supporting business systems were summarized along with the challenges and problems facing managers in effective utilization of these systems in practice.

Keywords: business process redesign; IS implementation approaches; IT management; supply chain management

ORGANIZATIONAL BACKGROUND

Nazar Cookies Company (NCC) was founded in 1961 by an entrepreneur who had seen a business opportunity in providing new cookie varieties for Turkish consumers. Having graduated from a European university with a management degree, he was expected to manage the family business of flour milling. After a short stay in his father’s business, however, he decided to go on his own way with a clear vision of bringing new tastes to Turkish consumers at the highest possible quality. He also decided to establish his company in his hometown, which is a strategically located central Anatolian city that already had considerable industrial activity.

After a year of intensive work both in product and process development, NCC could begin production in 1962 with a capacity of three tons per day of a few varieties of products that already existed in the market. Since NCC was essentially a production-focused company, and since there had not been any other marketing companies to work with, the products were sold in bulk (4-5 kg boxes) to individual merchants at the factory door, who would then distribute them to retail shops in their own territories.

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During the first few years, workers, foremen, engineers, and the owner were all working together very closely and with high motivation toward getting a share in the market, which was dominated by three major players, all of which were located in Istanbul, the heart of trade in Turkey. In addition to his quick learning ability, the owner/president was very successful in transferring a few critical people from competitors and bringing know-how through his European friends and their networks.

The company established the first semi-automatic production line in Turkey in 1967. NCC grew rapidly by the addition of new production lines and new brands. In 1971, NCC became a family-owned company under the trade name of Nazar Food Company (NFC). In 1975, together with its major competitor today, NFC successfully employed the packaging machines, which were able to produce individually wrapped portions in its process lines. This led these two companies to differentiate their products and earn strong consumer acceptance in the marketplace. Also, in the same year, management decided to lease a computer from IBM to handle personnel files and payroll, which marked itself in history as the first private organization using a computer in Turkey. In 1979, a machinery company (Nazar Machinery Company) was established in the city industrial zone to produce special bakery machines both for Nazar companies and others. Also, during that time, the accounting activities were fully computerized.

As NFC was about to become the market leader in 1980 with sales reaching 39,400 tons, the country experienced its strongest social unrest, which created unfortunate problems with worker unions. The operations had suffered for almost a year, during which the two companies faced grave financial problems. In 1981, the president decided to establish a new production company (Bonjou Food Company) in the industrial zone and a new marketing company (Nazar Marketing Company) in the city, both with the minor partnership of a big industrial conglomerate.

Until 1990, the Nazar Group of Companies experienced stagnation. Computerization reached operational levels in each company. The marketing company organized wholesalers across the country and executed its sales operations through them. There were about 50 large wholesalers who sold Nazar products to more than 2,000 smaller local wholesalers, who also could procure directly from NFC. The transportation between the factories and wholesalers was outsourced. In 1993, the president decided to establish a new and modern production facility for NFC in the industrial zone and to transfer the production in the old factory entirely to the new one in time. This new plant started production in 1995 with one highly automated production line. In 1997, the marketing company was moved to Istanbul, and the sales operations were reorganized under a new distribution system where individual and exclusive distributors were hired as business partners. Most of the old wholesalers became exclusive distributors of Nazar brand products.

Between 1990 and 2000, the business grew on the average of 5% every year, reaching about 74,000 tons annually (see Exhibit 1 in the Appendix). Until that time, export business had been given little attention. In 2000, however, the export directorship was formed within the marketing company, and exclusive distributorships were initiated in about 40 countries. In 2001, a new approach to production planning was implemented, which transformed the production-focused system into a sales-driven system.

The Nazar group management decided to enter into the chocolate business, and a new chocolate factory was built in 2003 in the industrial zone under NFC. By the end of that year, the marketing company sold about 111,000 tons of about 80 different Nazar brands, including cookies, crackers, digestives, light products, baby biscuits, specialties, cakes, pies, wafers, and breakfast cereals, out of which 21,000 tons were exports. The revenue exceeded $250 million US, while the group had almost no debt (see Exhibit 1). Nazar brand became one of the top five brands recognized in Turkey.
According to Nielsen data, between 2000 and 2003, the Turkish packaged bakery products market was stagnant. Since per capita consumption of packaged bakery products is about 3.8 kg in Turkey, which is well below developed countries (e.g., 7.2 kg in Germany, 11.4 kg in England, 14.2 kg in Holland), the reason for market stagnation was explained by the economic crisis that the country had been going through in recent years that adversely affected disposable incomes of the people (Euromonitor, 2003). Therefore, as economy improved in Turkey, the market was expected to grow considerably. This expectation had been luring most of the multinational companies and local industrial conglomerates to move into FMCG market through acquisitions, joint ventures, or direct investments.

In this market, from 2000 to 2003, Nazar’s share rose from 29% to 33% (see Exhibit 1), while its major competitor’s share declined from 59% to 50%. The rest of the market was filled by almost 50 small, mostly local producers, the largest of which had 5% share. The duopolistic market structure created by Nazar and its major competitor had been a big entry barrier for the newcomers. Both had established very strong brands and distribution patterns during the past 40 years. While Nazar’s major competitor had been successfully moving into different food categories, from beverages to cooking oil, during the past few years, Nazar had chosen to remain focused at its core business until recently when it had moved into the chocolate business.

Nazar production companies currently operate under ISO 9002 quality standard leading towards TQM. This is in compliance with the group’s objective of producing and selling the best quality products at affordable prices to Turkish consumers. In the late 1990s, NFC had turned down a joint venture deal with a giant multinational food corporation, closing the opportunity for higher competition in this market.

Among the distribution channels, the chain stores sales in Turkey had been rising from 19% in 2000 to about 40% in 2003, still far below developed countries, while the individual grocery stores’ share dropped to 52% from 71% in terms of Nielsen’s Retailer Measurement Index. The rest of the channel comprises confectionery stores, kiosks, gas stations, and so forth remain about the same. Nazar’s distribution pattern altered similarly in that the share of national chain stores rose up to about 15% in 2003 in volume.

Nazar Marketing Company (NMKC) is the only customer of the two production companies and functions as a service (transportation, sales, marketing, etc.) provider for them. By design, these four companies cannot function independently in that together they form a big supply chain that is administered by the Group Management Team (see Exhibit 2 for the list of group managers.) Some of the members of this team have been elected for the Management Council, which the president established in 1999 (see the list of council members in Exhibit 3.) The council sets strategic directions and gives organizational and financial decisions regarding the group of companies.

All of the Group Management Team members are placed under the payroll of NFC. Also, NFC holds the industrial property rights of Nazar branded products. On the other hand, each company has a general manager who is responsible for its board, which is comprised of family members, professionals, and a few external consultants (see top levels of the organizational charts of NMKC and NFC in Exhibit 4.) Vice President of Procurement oversees the Procurement Director who manages a group of officers responsible for executing the MRP system through which the material requirements of the production companies are satisfied collectively. They communicate with the Supply Chain Group Manager and the factories’ planning managers.

Vice President of Planning and IT oversees the Supply Chain Group Manager, the Information Systems Group Manager, and a number of technical analysts, and administers the Production Inventory Management System (PIMS), which is the key interface between sales and production functions. The Supply Chain Group Manager communicates with the procurement offic-
ers, Sales Forecast Manager, and country managers in the NMKC and planning managers in the production companies. The Information Systems Group Manager administers central data processing, the help desk for the Nazar intranet, and computer program development projects. The Vice President is also responsible for corporate governance and strategic planning, for which he or she establishes and coaches project groups to satisfy certain organizational needs.

The Technical Coordinator oversees the Quality Assurance Group Manager and a number of technical analysts and administers the use of technology and feasibility of investments in the production companies. The manager also coordinates group resources for process design, facility layout, Total Productive Maintenance projects, and quality assurance activities.

The NMKC has Marketing, Sales, Exports, and Planning directorships located at the head office in Istanbul, who report to the General Manager. NMKC has eight regional sales offices, each with sizable warehouses geographically dispersed across Turkey. Each office has a regional manager directly reporting to the Sales Director. There are about 150 distributors who execute exclusive sales routes. These distributors are individual merchants who serve about 180,000 sales points, including small kiosks, confectioneries, gas stations, groceries, and local chain stores. Each distributor is served by a Distribution Manager, who reports to the Regional Manager, who looks after daily local business affairs in addition to administration of financial and operational obligations of the distributors towards NMKC. Distributors own their service trucks, which are driven by their sales representatives who are trained and equipped according to the standards established by the Sales Director. Each sales representative carries a hand-held terminal through which they view the individual account of a sales point, issue an invoice, take backorders, or view promotion programs. The Sales Director designs and administers incentive packages for distributors, which include various operational and financial targets. If a distributor meets these criteria, he or she earns additional sales premiums.

The Marketing Director oversees a number of brand managers who are assigned to certain product groups. Brand managers administer standing of brands in the market, monitor competitors’ activities, design promotion programs, develop brand advertisements, conduct consumer surveys, and contribute new product development projects. In addition, there is a Sales Forecast Manager under the Marketing Director who operates the Demand Forecasting and Production Order System (DFPOS) in collaboration with the Supply Chain Group Manager.

The Export Director and a number of country managers operate the Export Order Management System (EOMS) in collaboration with the Supply Chain Group Manager. The Planning Director of NMKC administers improvement projects as a project leader, which involves cost cutting, technology implementation, TQM, and other organizational issues. The Director also manages a local IT group, which acts as a help desk for the Distributor Management Information System (DMIS).

The General Managers in two production companies oversee Production, Technical, Planning, Quality Assurance, Finance, and Personnel Managers. The production companies are organized along the production processes, where each process has an owner who reports directly to all of the managers. Planning Managers operate PIMS in collaboration with the Supply Chain Group Manager.

**SETTING THE STAGE**

Prior to 1990, computer utilization had been limited to data processing for payroll and accounting purposes, which was administered under the Finance Coordinator. This involved a backroom operation lacking a clear vision or strategy. In 1990, Deniz Batu was hired as the Vice President responsible for planning and IT. His main task was to identify critical business processes and to develop IT applications to enhance and, if necessary, to redesign them according

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to a priority given for him at that time. Batu’s concerns were on redesigning business processes using an IT-enabled approach to organizational change (Al-Mashare & Zairi, 2000; Davenport & Short, 1990; Davenport & Stoddard, 1994; Grover et al., 1993).

Until 1990, there had been an officer working under the General Manager of NFC who would communicate with NMKC through telephone, receive sales information, negotiate with them, and establish a production scheduling program for the following month. The manager would take into account capacity limitations, material, and workforce requirements based on some scheduling patterns coming from personal experience. Batu thought that this approach had been successful in the past when the system was compact enough, but then it eventually became too ad hoc and myopic, which did not allow structural business growth. He envisioned a new approach.

Batu decided to start from the business transactions of the wholesalers; that is, he formed a project group that developed an IS for order processing, credit status reporting, and payment collection. Shortly after the implementation of this system, the project group developed an additional IS module, which included warehouse inventory management and shipment operations.

Having collected sizable data through the use of this IS platform, Batu decided in 1992 to develop a performance measurement system that summarized financial and operational data as graphs and tables in order to support business decision making as well as to measure the performance of the marketing and production companies. This approach, however, changed the atmosphere of the group management meetings adversely, because until then the decision makers were used to relying on their instincts and limited information. The production people were more reluctant to accept the measurement results, while marketing people were disturbed mostly by someone else watching their operations.

One of the positive outcomes of the performance measurement system, however, was that the group management realized that the overall profitability of the group had been affected adversely by demand fluctuations. Thus, a lesser degree of demand variation would lead to less shortages, lower inventories, and higher capacity utilization. The group management started to search for remedies.

The friction between Batu and the rest of the group, however, did not stop him from proceeding. As a next step forward, he initiated another project group to work on sales forecasting. This group developed an IS module that generated monthly sales forecasts for each SKU based on the past 36 months’ sales data. Users would input pricing and promotion information and choose among alternative analytical and subjective forecasting tools. As a result, the program would output forecast intervals (minimum and maximum values) for the following three months. Unfortunately, even though the users in NMKC liked the idea of forecasting, they were not willing to adapt for change. Thus, the use of this system failed in the implementation stage.

Batu’s next target was to improve the procurement operation performance, measured as production loss due to material shortages. To this end, he decided to develop an MRP system for the Procurement Director and his team. He formed a project group that included production people and procurement officers. This group developed an MRP platform, which was essentially a decision support system to optimize total cost of procurement while improving the relationship between production planning and material availability. The system has been upgraded several times since its launch in 1995.

In about 1994, based on performance measurement results, the group management started to exercise the idea of implementing an exclusive distributorship instead of working with wholesalers. Even though the operational cost of a distributor system would be higher, it was believed that, among other benefits, this system would yield more accurate sales forecasts, which, in turn, would improve the overall performance of the Nazar group.

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In 1996, the group management made its decision in favor of distributorship. Thus, Batu decided to develop an operation management system that would replace the existing system for the management of wholesalers. To this end, the Distributor Management Information System (DIMIS) was developed and implemented in 1997. DMIS included order processing, inventory and account management, and promotion and pricing modules, which were presented as a decision support platform for the distributors. On the other end, the financial and operational performance of each distributor was monitored daily, since the system was synchronized by dial-up connections every night.

Together with DMIS, a newer version of the sales forecasting IS, called Demand Forecasting and Production Order System (DFPOS) was also launched. Being a monthly-operated, three-month planning horizon system, DFPOS was designed to administer production orders for Nazar production companies based on sales forecasts. In the first phase of the run, each Distribution Manager (64 individuals at that time) entered their subjective views as a function of 10 critical factors, including competitors’ activities, new product launches, and distributors’ stocks for each SKU. This information then was provided for each Regional Manager as a regional sum, and their acceptance or revision was asked.

Following this stage, the regional forecasts were integrated together with the analytical forecasts obtained by running three forecasting methods using the past 36 months’ sales data, corrected for seasonality, price, promotion, and advertisement effects. The resulting forecast intervals for each SKU were passed into the second phase of DFPOS run, where the weekly production orders for the next 12 weeks were obtained. In this process, annual budget figures and market research parameters also were taken into account.

Implementation of DMIS continued smoothly, since there was an urgent need for such an operating system to run the new distributor system. DFPOS was launched in 1997; however, it could not be implemented successfully, because between 1997 and 1998, the top management of NMKC had been almost completely renewed, and there were more urgent organizational problems to deal with.

Between 1997 and 1999, Nazar Group’s operations grew considerably, which required more synergy between the production and marketing companies. However, it seemed to Batu that the production companies were making their production plans on their own, while NMKC was trying to respond to market dynamics in the short term. As a result, the group management meetings were dominated by inconclusive discussions between the marketing and production people.

In the Management Council, Batu argued that the group management team had not been able to manage the Nazar supply chain efficiently. Thus, the subsystems developed that far had to be integrated further in order to establish more group synergy. Batu commented:

*From my side, supply chain management concept is a management model which extensively utilizes the systematic approach to run the business. ... Our efforts/practices could not be seen as the picture of a developed supply chain and its administration, but only a part of it. These efforts only show our consciousness on the way to have a supply chain management system and its practice. The transition is still going on. (See Chandra and Kumar, 2000; Ho, et al., 2002; Kopczak and Johnson, 2003; Larson and Halldorsson, 2002; Mentzet et al., 2001; for reviews of supply chain management).*

After long discussions, the Management Council accepted Batu’s proposal and, in addition, decided to move the group management from production-focused (push-type) orientation to a more customer-focused (pull-type) one.
In 1999, the General Manager of NFC and the Technical Coordinator left the group, which was the initial sign of change. Batu had to revise his implementation strategy; thus, he had to determine where to start the integration project and how to proceed. In 2000, a new Technical Coordinator was hired as a council member, who also had background in supply chain management. He became Batu's major partner in system design.

CASE DESCRIPTION

In mid 2000, Batu decided to start the integration project right at the interface between Production and Sales, where the majority of management problems originated. He formed a steering committee, which assigned certain projects to cross-functional project groups. The steering committee reported to the Management Council. The objective of the initiative was to develop and implement an IS, called Production-Inventory Management System (PIMS), which would integrate sales forecasts coming from NMKC and production planning, while optimizing the overall operational efficiency of the Nazar supply chain.

Prior to the PIMS project, Batu pointed out that production companies were undertaking pseudo-production planning activities without an obligation to meet production orders taken from DFPOS. Although a production order for each product was given each month, orders were rarely met. For this reason, production cost control in that kind of environment had been very difficult. Finch and Luebbe (1995) state that planning for operations is essential because operation function controls a large percentage of a firm's resources, including inventories, capacities, and workforce.

Basic supply chain components of Nazar Group are shown in Exhibit 5, where the system boundaries of PIMS and its relational diagram also are indicated. Having looked at this picture, Batu realized that in the first stage of the project, conceptualization of PIMS had to be agreed upon collectively. To this end, many project meetings were organized where production, marketing, and procurement people were presented with a number of alternative approaches to system design. After many discussions, a list of protocols was established between marketing and production, and another one between production and procurement functions under which the selected system (shown in Exhibit 6) was defined.

The protocols were designed to underline the responsibilities of both parties and to resolve or avoid conflicts. For instance, under the protocol between marketing and production, the planning period was established as 12 weeks rolling horizon and the time step was taken as one week. Therefore, NMKC had to enter the sales forecasts for 12 weeks for each SKU. That is, every week, sales forecasts for the following 11 weeks could be revised, and the 12th week had to be entered for the first time. Sales forecasts, however, only could be revised under certain revision limits that were previously agreed upon. The correlation between weekly sales forecasts (revised) and actual shipments was a part of performance measurement for NMKC. On the other hand, the production company was responsible for the realization of production orders and preparation of stocks, including safety stocks, for shipment in the beginning of the assigned week. The correlation between production orders and actual production was a part of the performance measure of the production company.

Under the protocol between production and procurement, the production company was responsible for validating daily raw material usage, while it was procurement's responsibility to update supplier information, net cost of procurement, batch sizes, and so forth. Also, it was the procurement department's responsibility and its performance measure to provide the correct materials at the required time. To this end, the materials were divided into two groups: namely, major and minor materials, where the major materials were the ones with high usage, short shelf-
life, or short leadtimes (less than two days), and minor materials were the ones with low usage or long leadtimes. It was agreed under the protocol that the procurement department would have to provide minor materials needed at the beginning of the week and provide major materials not longer than two days before their use. The timing of usage of the materials was given by the Production Planning Program (PPP) output (see Exhibit 7).

Having established the systems concept, Batu decided to move forward to the next stage, where a number of project groups would examine the MRP, production, production planning, human resources, and warehousing functions in order to identify their weaknesses under the new system requirements. After several upgrading studies, these functions were improved, especially, in terms of IT and decision-making abilities. User terminals were transformed into Web-based, and the underlying database operations were streamlined to achieve a higher speed of data exchange. Also, the connections to remote locations, especially within factory floors or warehouses, were improved.

In the mean time, a group of analysts started the development of PPP with an objective of generating a 12-week production plan that utilized production means and sources in the most economical way. To this end, PPP was designed as a hierarchical optimization model (Schneeweiss, 1999), as shown in Exhibit 7. At the Master Production Schedule (MPS) level, the optimal weekly production plan for the 12-week planning horizon was determined. This plan optimized the use of production line capacities in order to fulfill the sales forecasts and safety stock requirements so that shortages and inventory carrying costs were minimized. MPS was modeled as a periodic review, partial backlogging, and capacitated production-inventory model (Hax & Candea, 1984).

The output of MPS (weekly production quantities) was entered into the Scheduling Model. This model used a heuristic solution procedure to obtain the detailed production schedules for 63 shifts (three weeks) that minimized the completion times and setup losses. The output of the Scheduling Model was entered into the Assignment Model, which determined the optimal workforce assignments for the 63 shifts given by the Scheduling Model so that the use of workforce skills was maximized. Under this hierarchical structure, an iterative method was used so that the lower-level optimization programs checked feasibility of the higher-level program solutions. If the feasibility test did not pass, then the higher-level program searched for the next solution. The iterations ended when a feasible and satisfactory solution was obtained.

The MPS model, developed for one of NFC’s plants where 120 SKUs were produced in 12 production lines, was structured as a Mixed Integer Programming (MIP) model with about 10,000 constraints and 5,000 decision variables. The Scheduling and Assignment models also were designed as MIP models with 52,000 constraints and 41,000 decision variables, and with 4,500,000 constraints and 5,350,000 variables, respectively. The optimization models were developed using GAMS modeling tool. The iterative hierarchical solution procedure was developed in-house using a C++ code, which called in Cplex solver for MIP. The entire system is located in a server with 2 GB RAM and 2.4 GHz Pentium IV microprocessor. It took 90 minutes for the program to obtain a satisfactory solution.

One of the critical success factors of the project was the effective use of IT so that the resulting system would allow fast and accurate decision making and be open for future system extensions. This required a careful database management on the mainframe, because there were many distributed network users from different disciplines, and their interactions involved data entry, report/graph viewing, and local decision making.

In the next phase of system integration, Batu decided to launch user training programs. MRP users were trained for the use of materials management according to new rules. Human resource departments at the production companies were trained for updating operator skill levels, developing operator training programs, and getting performance measurement information. Also,
the production planning people at the production companies were trained for updating product and process parameters, setup times, operator skill definitions, and so forth.

In the last quarter of 2001, Batu decided to launch the PIMS system starting at one of NFC’s production plants. There were minor IT- or IS-related problems, which were solved immediately. However, there was major resistance from both production and marketing users, but not from the procurement people. In fact, in the beginning of 2001, a new general manager was hired for NFC and appointed to the Management Council as well, who was hesitant to show leadership for implementation, since most of the major decisions were made before him.

The production people also were arguing strongly about the success of the new production paradigm (customer-focused, planned production), and they were defending the performance of the old paradigm (production-focused, myopic production planning), where they enjoyed full control of production resources. For instance, they claimed that the finished goods inventories were higher compared to one year before. However, after a short analysis, it was shown that the difference originated partly from the safety stocks, which did not exist before, and the rest of the stocks on weighted average were moving at a rate faster than before. Batu thought that the production people were used to giving short-term tactical decisions, which mostly optimized local factors, and they were not willing to see easily that PIMS was concerned about group-wide optimization that involved longer-term strategic decisions; for this reason, the model outputs seemed flawed to most users.

Marketing people also were resisting change. The sales forecasts coming through DFPOS were still short-sighted. They were complaining about PIMS not being able to adapt to changes in the market quick enough, which, they argued, had been leading the company to a high loss of sales.

Amidst all these low user adoptions, the system was operating technically quite smoothly. Batu was able to reply to almost all of the complaints with performance measures. These complaints continued until mid-2002, when Batu decided to move ahead and promote his project leader as Supply Chain Group Manager, thereby collecting most planning decisions under one manager. From that point on, PIMS was administered by this group manager, who was knowledgeable about the entire system.

In 2002, the sales grew 12%, and the market share rose 2% while the Management Council decided to remain neutral about PIMS. In 2003, Batu decided to include the other NFC plant and Bonjju Foods under PIMS. The implementation took about nine months with almost no implementation problems on the production side. DMIS also was upgraded from a dial-up connection to a Web-based application in 2003, adding features to streamline the process and adding value for the distributors. Since the distributors are Nazar’s customers in its supply chain, this application is hoped to form a basis for more collaboration. (See Fawcett and Magnan, 2002, for a study of supply chain integration practice; and Lancioni, et al., 2003, for Internet application trends in SCM.)

CURRENT CHALLENGES/PROBLEMS
FACING THE ORGANIZATION

By the end of 2003, all existing production lines were administered under PIMS except for those in the new chocolate plant, which would be joined later. It seemed to Batu that a procurement and production mechanism was built, which operated at a reasonable efficiency; however, the sales forecast errors were still too high to get the most out of this system. The marketing people were still operating the system with shortsighted forecasts, which led to imposing too many forecast changes and thus, higher stock levels than expected. In return, this often caused
wrong management concerns about the effectiveness of PIMS. It seemed to Batu that adapting marketing people to change would take longer than expected, and he had to initiate another process to motivate them.

Batu also believed that the group management organization was not adequate anymore for the current size of the overall supply-chain operations. Under the current group management structure, the cross-functional decisions were not made as fast nor as effectively as they should have been. As a result, the implementation of PIMS was affected adversely by the lack of a collaborative group management platform. In fact, all collaborative group operations, such as product development, were affected adversely by the current management structure. Thus, the problem would have to be solved through a holistic strategic management approach.

On the other hand, users were complaining about the long response time of the system, as they were trying to test the performance of several implementation scenarios. Batu believed that there were still a number of improvements to be realized about the optimization algorithms within the PIMS and MRP systems in order to speed up the overall solution time. The current runtime of about 90 minutes seemed to be a practical limit to undertake what-if type manual decision interventions regarding the use of production resources, such as overtime or hiring/firing decisions.

In addition, there had been a strong demand from users in that they needed more variations about the output report formats. Batu considered these continuous improvement projects as a step toward higher user adoption, where he placed utmost emphasis.

Note: Dedicated to the memory of Mustafa Ozturk.

REFERENCES


## APPENDIX

### Exhibit 1. Financial data — Nazar Group of companies

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<td>Market Share (%)*</td>
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<td>32</td>
<td>30</td>
<td>29</td>
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*Nielsen data

### Exhibit 2. List of group management team members, all placed under the payroll of NFC

- President (family member)
- Vice President of Procurement (family member)
- Vice President of Planning and IT
- R&D Coordinator (family member)
- Technical Coordinator
- Finance Coordinator
- Human Resource Coordinator
- Group Auditor

### Exhibit 3. List of management council members

- President (family member)
- Vice President of Procurement (family member)
- Vice President of Planning and IT
- R&D Coordinator (family member)
- Technical Coordinator
- General Manager of Nazar Marketing Company
- General Manager of Nazar Foods Company
- External Consultant for Finance
- External Consultant for Public Relations
- Two Family Members

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Exhibit 4. Top-level organization charts of Nazar Foods and Nazar Marketing Companies

Nazar Foods Company Board
- General Manager
  - Production Manager
  - Production Planning Manager
  - Technical Manager
  - Quality Assurance Manager
  - Finance Manager
  - Personnel Manager
  - Plant Manager (Rusk Factory)
  - Plant Manager (Chocolate Factory)

Nazar Marketing Company Board
- General Manager
  - Marketing Director
    - Sales Forecast Manager
  - Sales Director
    - Eight Regional Managers
    - Chain Stores Manager
    - Transportation Manager
  - Export Director
    - Country Managers
  - Planning Director
  - Finance Manager

Exhibit 5. IS components under Nazar Group supply chain

MRP
- Procurement
- Production
- Warehousing
- Distribution
- Sales

DMIS and DFPOS

PIMS
Exhibit 6. Conceptual overview of production-inventory management system (PIMS)

Exhibit 7. Production planning program (PPP) system design
Vichuda Nai Polatoglu is an assistant professor at Anadolu University, Eskisehir, Turkey. She received her bachelor’s from the University of Michigan, Ann-Arbor, and her master’s from the University of Illinois at Urbana-Champaign, both in economics. She worked as a staff economist in the U.S. before obtaining her PhD in MIS at the University of Wisconsin-Milwaukee. She has published papers in journals such as the International Journal of Bank Marketing, International Journal of Human-Computer Studies, Information Resources Management Journal, and in conference proceedings.