Chick-fil-A, Inc.: Selection of Operating Systems for POS Terminals to Serve Business Functions

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Selection of Operating Systems for POS Terminals to Serve Business Functions at Chick-fil-A

I. Introduction

Mike Erbrick, Director of Restaurant Information Systems at Chick-fil-A, was given the responsibility of converting the restaurant's point of sales (POS) systems from a proprietary EPROM based system to a newer system. This changeover had an investment impact of approximately $3.29 million based on the differences in the costs required to implement the various POS systems being considered, which could be as high as $15,000 per outlet depending on the system chosen and store layout. Within its more than 700 outlets, Chick-fil-A averaged about 8 POS systems per store compared to the two or three systems per store used by other quick-service restaurant chains. The number of POS systems gave rise to additional confusion for the kitchen staff because they could have six to eight orders arriving simultaneously on the Kitchen Display System (KDS) screens. Thus, the new system had to be extremely efficient and scalable to meet the needs of individual stores. Perhaps most importantly to the store owners using the system, who are compensated based on their sales figures and net income, the sales data should be re-layed to Chick-fil-A's corporate headquarters accurately and reported back to each store in a timely manner.

The members of the internal project team, referred to as the Operations Council, were Roger Blythe, Brent Ragsdale, Jon Bridges, Mark Walker, Sandi Moody, Mike Erbrick, and Ken Oliver. The Operations Council researched the problem and then made their recommendations to Tim Tassopoulos, the Senior Vice President of Operations, and Buck McCabe, the Chief Financial Officer for Chick-fil-A. The Operations Council recommended two options for the next generation point of sales system to be used in all Chick-fil-A restaurants. The first option put for-ward was an intelligent POS based on Windows NT/95 that was robust, fault tolerant and database-driven. The second option presented was a "thin" POS based on Windows CE that was fast, incorporated memory-resident programs and data, and was noted for being a strongly resilient system after lock-ups. The price difference between the two was of the order of $5,000 per store, depending on the size and layout of the store.

The team was challenged to evaluate the options with respect to operational usability, technical architecture, programming effort involved, environment, 5 year total cost of ownership, and business issues.
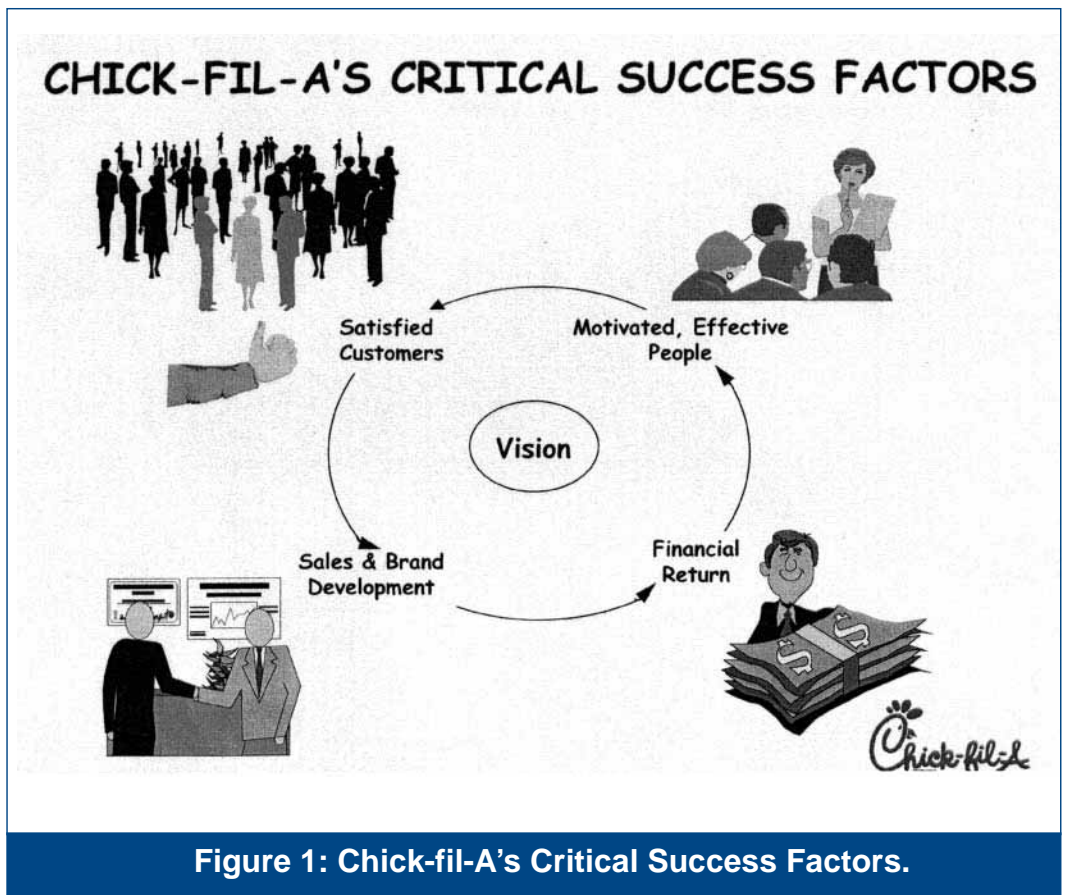

Figure 1: Chick-fil-A's Critical Success Factors.

II. Vision and Critical Success Factors of Chick-fil-A

II.1. People

Chick-fil-A has a unique history and business structure that separates it from other quick-service restaurants. This originated with Truett Cathy, the Founder and CEO, when he opened the Dwarf Grill in Hapeville, Georgia, in 1946 after returning from World War II. In 1967, Cathy pioneered the in-mall quick-service restaurant by opening the first Chick-fil-A in a shopping center location. This move made Chick-fil-A a leader in mall restaurants. During the 1990s, Chick-fil-A moved beyond the traditional mall food court to freestanding units, drive-thru only stores, full-service restaurants, and college campuses, hospitals, airports, business and industry locations. Chick-fil-A had about 850 stores (including licensed outlets) in 1999 and planned to add approximately 100 new locations and an additional international location in 2000.

Chick-fil-A had identified four Critical Success Factors (CSFs) for operations: satisfied customers, sales and brand development, motivated effective people, and financial return for its business (Figure 1). These CSFs were designed to work within the vision and stated mission of Chick-fil-A to enhance its competitive advantage in the market.

The Chick-fil-A corporate headquarters is located south of Atlanta, Georgia on 73 wooded acres. The facility also features a five-story atrium and floor-to-ceiling windows. The headquarters houses the Chick-fil-A museum, as well as Truett Cathy's private collection of automobiles.

There are over 350 employees at the headquarters to service the entire needs of the organization, assisted by a fluctuating number of contract consultants. The Chick-fil-A home office provides support in a variety of areas, such as accounting, marketing, information technology, human resources and training. In addition, a Business Consultant helps operators grow and develop their business by offering additional resources, guidance, and encouragement. The Business Consultant also helps to make sure that all Chick-fil-A standards and quality requirements are met.

Figure 2: A member of the Chick-fil-A Information Technology Team displays the room where training of store owners takes place on the legacy POS System at the Corporate Headquarters in Atlanta.

Also within the headquarters is a training facility for storeowners and operators to learn the point of sales systems that are used by Chick-fil-A. Chick-fil-A trains all operators in a six-week, paid, training period which consists of three phases: two-weeks of pre-training in a Chick-fil-A Unit, three weeks in a classroom in the Atlanta headquarters (Figure 2), and an additional week with a selected operator for hands-on experience.

II.2. Process

The process used by Chick-fil-A for developing its product menu required several steps. First, large chicken companies own/contract with numerous farms throughout the U.S. These large companies have chicken processing plants that process the chicken, preparing it to become "food". The chicken bought by Chick-fil-A was then filleted by high-pressure water machines. The breast filets were packaged and delivered fresh to Chick-fil-A stores via a food distribution company. The chicken was then marinated and coated with special Chick-fil-A seasonings and pressure fried to perfection. Finally these cooked breasts were placed on toasted buttered buns with the two crucial pickles and served with a smile (and hopefully with a soft drink,

fries, and a dessert). The company is constantly working to improve the process, and this has resulted in increasing sales, as shown in Figure 3.

Chick-fil-A had in place a pay structure for store owner/operators which was designed to motivate and reward them. All owner/operators had the same contractual agreement with corporate headquarters. Each month, Chick-fil-A received 15% of gross sales for operational expenses. After all other store expenses were paid, the operating profits from each restaurant were split 50/50 between the Chick-fil-A corporate office and the operator. Each operator was guaranteed a minimum salary of $30,000 annually to secure a certain standard of living. Because of this profit sharing agreement, both operators and the corporate headquarters are strongly interested in improving net profits each month.

Since individual franchise owner/operators were compensated based on their performance and local promotions, they were strongly in favor of national strategies that will promote their business locally. Corporate assistance included support in the areas of marketing, accounting, information technology, human resources and training.
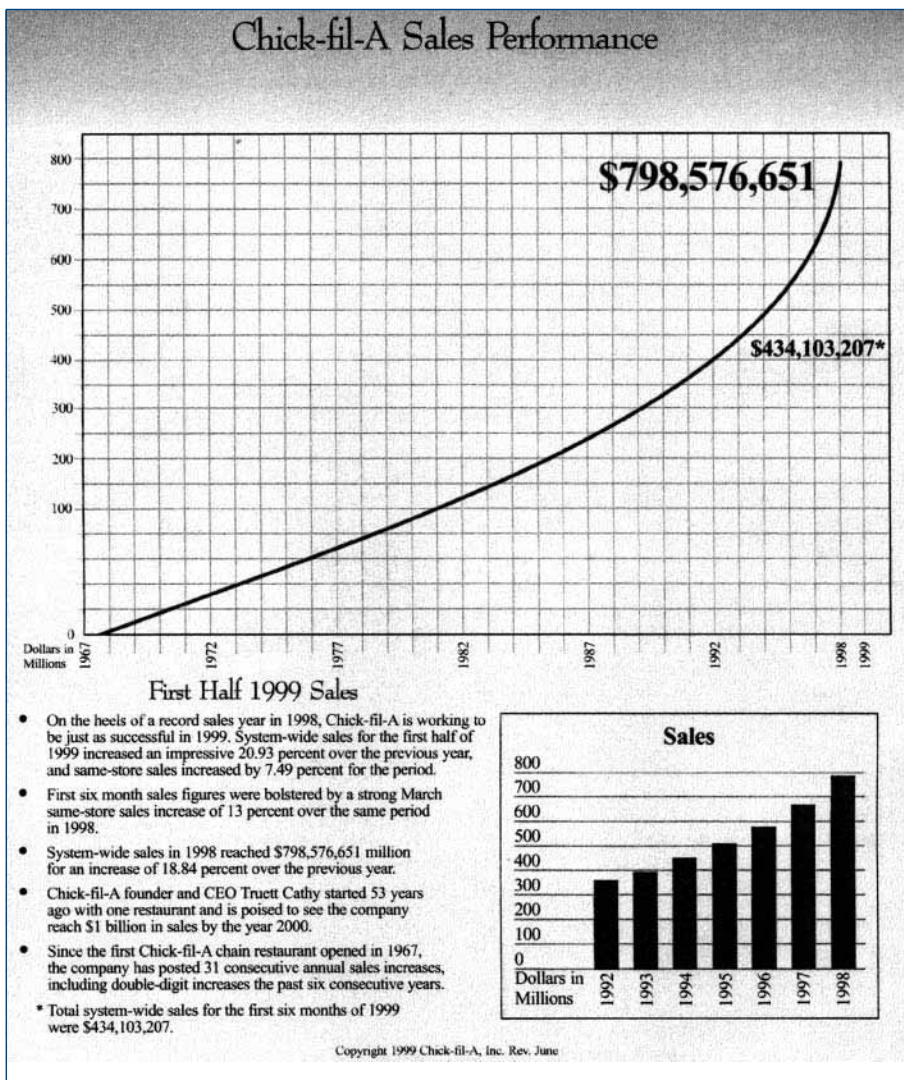
Chick-fil-A Sales Performance

$798,576,651

$434,103,207*

First Half 1999 Sales

- On the heels of a record sales year in 1998, Chick-fil-A is working to be just as successful in 1999. System-wide sales for the first half of 1999 increased an impressive 20.93 percent over the previous year, and same-store sales increased by 7.49 percent for the period.

- First six month sales figures were bolstered by a strong March same-store sales increase of 13 percent over the same period in 1998.

- System-wide sales in 1998 reached $798,576,651 million for an increase of 18.84 percent over the previous year.

- Chick-fil-A founder and CEO Truett Cathy started 53 years ago with one restaurant and is poised to see the company reach $1 billion in sales by the year 2000.

- Since the first Chick-fil-A chain restaurant opened in 1967, the company has posted 31 consecutive annual sales increases, including double-digit increases the past six consecutive years.

* Total system-wide sales for the first six months of 1999 were $434,103,207.

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Figure 3: Chick-fil-A Sales Figures for 1998.

II.3. Product

Chick-fil-A offers a varied menu centered around chicken. The core products are the Chick-fil-A Chicken Sandwich, Chick-fil-A Nuggets, the Chick-fil-A Chargrilled Chicken Sandwich, and the Chick-fil-A Chick-n-Strips (Figure 4). Each year, an independent research firm surveyed customers in each restaurant for the chain's Customer Satisfaction Monitor (CSM). The CSM is considered one of the most comprehensive report cards in the quick-service restaurant industry. Chick-fil-A operators are provided with feedback from nearly 147,000 one-on-one customer interviews conducted throughout the year. The survey asked customers to rate their overall dining experience at Chick-fil-A from the moment they walk in the door until the time they leave the re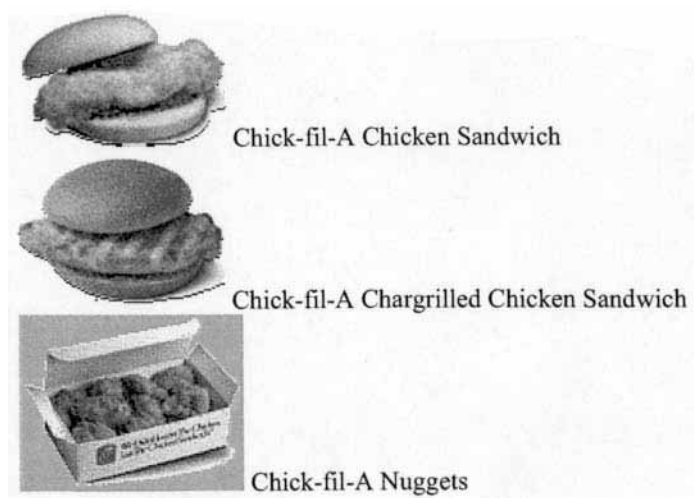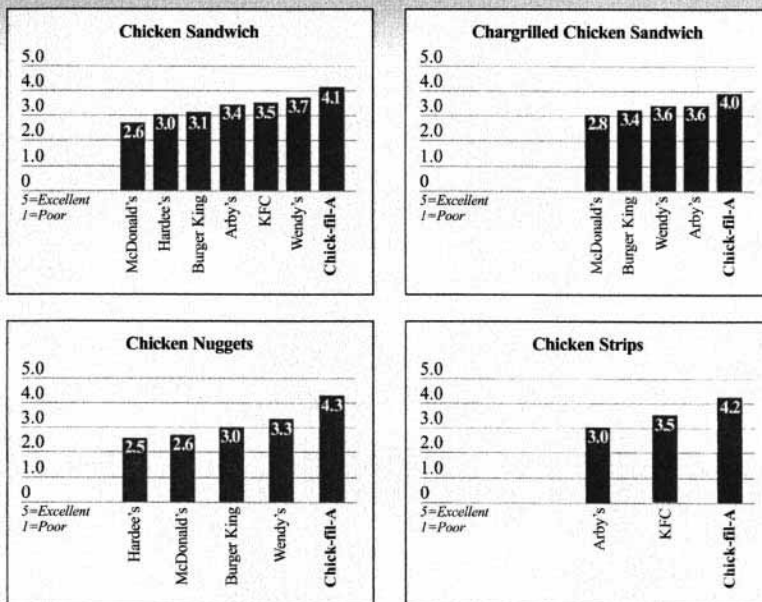staurant. Customers consistently ranked Chick-fil-A's products highest in overall quality compared to their competitors (Figure 5).

III. Information Technology (IT) organization

III.1. Vision

The information technology organization's vision was to work in a team-based environment as part of a small group of talented professionals focused on specific strategic objectives. The entire IT department for Chick-fil-A worked from the corporate headquarters. Their day-to-day activities involved close contact with users and a close linkage to business functions (Figure 6). They did not expect to work in a "vacuum" where they were isolated from real business issues. In all areas of their operations, the IT department attempted to simplify the company's processes by implementing leading technology while providing superior service. Aligning IT vision with their business objectives led Chick-fil-A to adopt a business process objective of "High touch- High tech systems." (Figure 7)

These "High touch- High tech systems" were the foundation of the point of sales support provided for all their stores. This foundation combined the need for a system with a high degree of transaction processing efficiency with a high level of usability to achieve the business goals set

Chick-fil-A Chicken Sandwich

Chick-fil-A Chargrilled Chicken Sandwich

Chick-fil-A Nuggets

Figure 4: Images of some of the products offered at a Chick-fil-A outlet.

Figure 5: National Quality Survey for Overall Quality in 1998.

Figure 6: IT Organization and alignment with business issues.

by Chick-fil-A. The "High tech" element necessitated the automation of manual tasks while the "High touch" element required the POS system to be easy-to-use by the end-user. The combination of "High touch" and "High tech" allowed for decreased training time for employees and increased speed of order placement, while saving money that would otherwise be lost due to incorrect order entries.

Bridges, the Chief Information Officer (CIO) of Chick-fil-A made the following statement about the IT division at Chick-fil-A:

> "Some IT shops do technology for the sake of technology and ignore the true business needs. That is something that can be hard to see for an IT person. We think about the bigger picture-reusability of systems and code. There are some functions that we can see happening at our registers to boost our business and we want our POS to be able to handle those functions. The IT function is critical to our business. It will be a key enabler to the future growth of Chick-fil-A."

III.2. People

At the time of the study, the IT department comprised 47 people, with Jon Bridges as the CIO and a corporate Vice President. It was made up of four distinct groups, with each group having specific objectives: the Corporate Information Systems Team, the Restaurant Information Systems Team, the Information Technology Infrastructure Team, and the Information Technology Client Services Team. The Corporate Information Systems Team was responsible for the automation of manual systems at corporate headquarters (payroll tax filing, accounting data collection, etc.) to minimize the human interaction within transactions. They were also responsible for providing value-added analysis tools for long-term business evaluation and maintaining a knowledge repository for future information and experience. The Restaurant Information Services Team was responsible for developing a way of capturing transactions at the source (at the counter, where customers interact with associates and money is exchanged) and for providing immediate feedback on per-

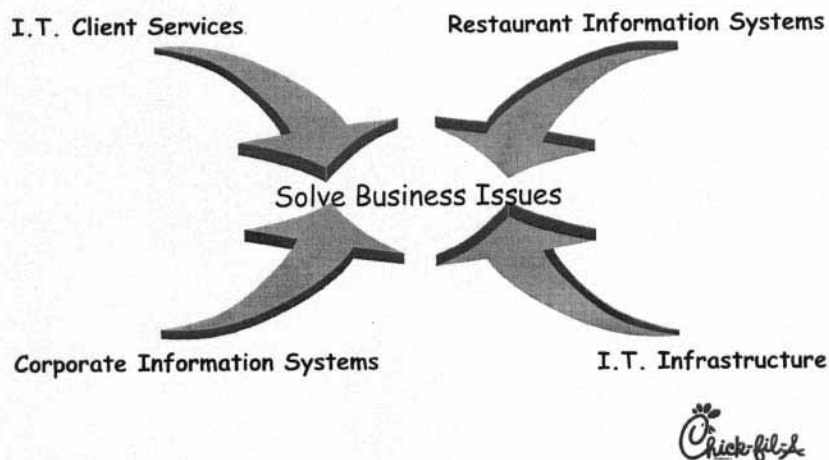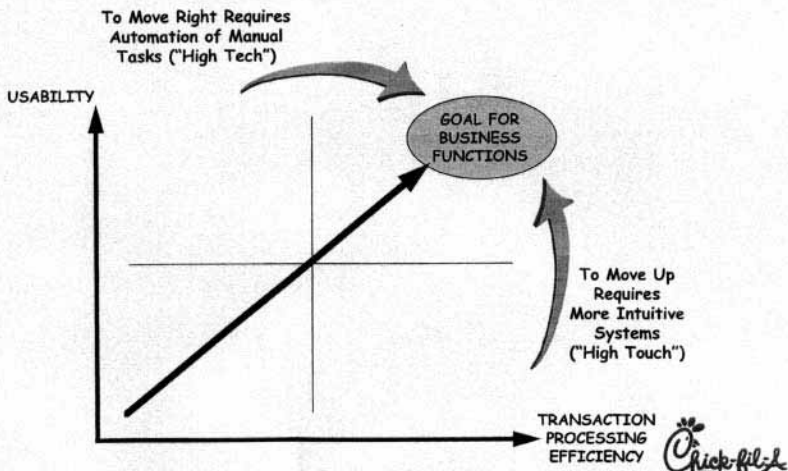**Figure 7: Business Objectives set for a High Touch-High Tech System.**

department was to develop a knowledge management system to improve performance by sharing the "successful practices" used across the organization.

III.3. Process

Chick-fil-A's technology infrastructure provided a solid foundation for their existing business systems and future growth. Chick-fil-A used a variety of computer applications. These applications covered the areas of Help Desk and Training, PC Management, Systems Management, and Systems Development and Maintenance. These applications included various Microsoft operating systems, server support applications, data storage software and hardware, and networking software and hardware, along with the many different programming languages used for systems development.

The technical architecture (Figure 8) was designed to help Chick-fil-A fulfill its business objectives. The POS and computers in each store were connected to each other using an Ethernet network and controlled by a BackOffice PC (based on

formance to store operators. They had an additional function of using information technologies to leverage knowledge and experience across the entire organization. The Information Technology Client Ser-

vices Team was to provide software rollout services, training related to changes in systems, Help Desk support, and application development for the other development teams. One goal of the IT
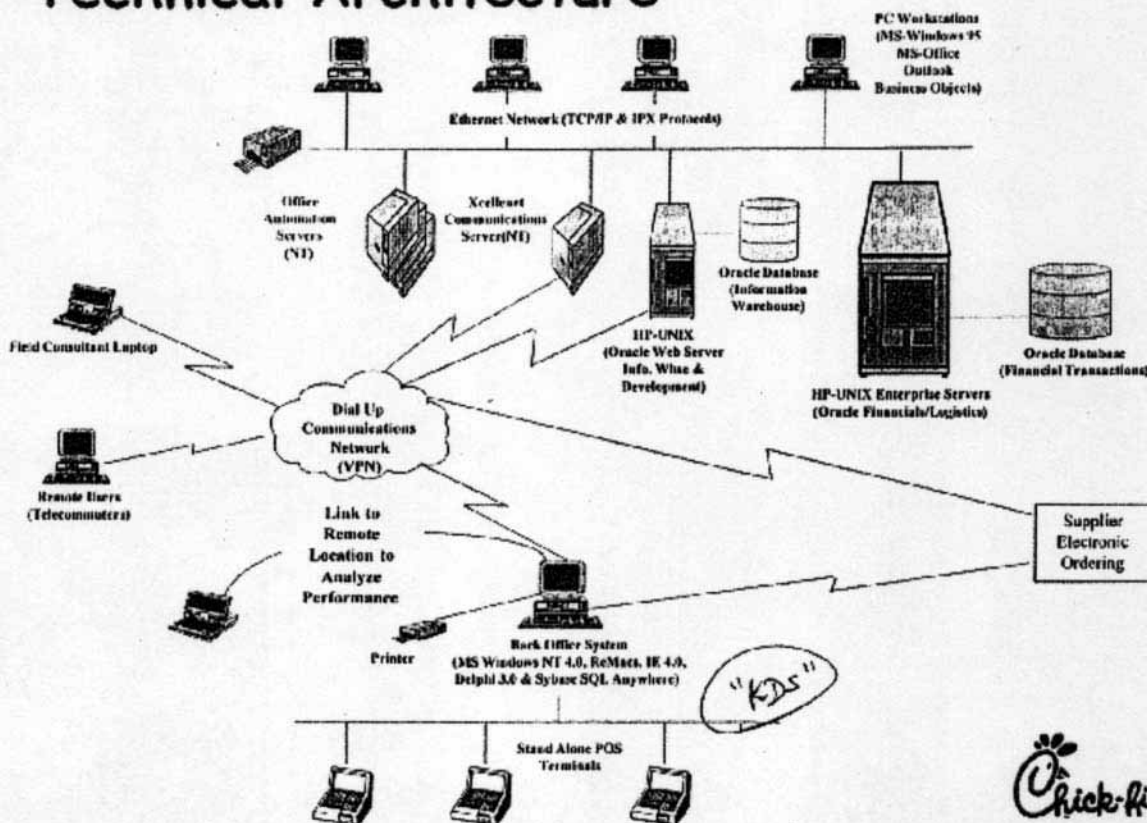

Figure 8: A broad overview of the technical architecture used by Chick-fil-A.

Microsoft's Windows NT 4.0). The BackOffice system was in turn connected to the headquarters computers using a virtual private network (VPN). This network ensured that the stores were connected to the headquarters only as needed, while at the same time providing secure access. An HP Unix Oracle web server received the information from the stores and supported the applications at the headquarters. This was a top-of-the line server where the main production Oracle database was maintained. An EMC Symmetric disk storage array with the capability of storing 2.8 Terabytes of data was housed in the headquarters. An Enterprise Data Manager provided a backup solution with the ability to store 175 individual tapes. IT systems allowed Purchasing personnel based at the headquarters to maintain a close watch on individual store inventories and to alert store owners when supplies needed to be ordered if they had not already done so. Finally, this data was archived at the headquarters to analyze marketing trends over time and to support corporate decisions.

The IT department was required to support over 1,000 end-users of information technology. This support was given through Help Desk support, classroom training, store meetings, and personnel meetings. In addition to these support functions, the Chick-fil-A IT department was responsible for development and maintenance of the systems that ran in the restaurants and in the corporate offices.

III.4. Products

The existing system allowed the IT division to produce daily reports that captured sales off the POS systems throughout the organization. Another system made payments to vendors, while a third was used to pay the employees, based on web-based payroll implementation. A fourth system was used to order food via EDI and this system was in turn tied to the other three systems. The sales, labor, and inventory information were all fed into an accounting system automatically so that they could produce an income statement for each store on a monthly basis. Various performance metrics were calculated by the financial system and sent back to the stores.

Each individual store had the ability to generate reports and obtain summary data on an as-needed basis. The store owners/operators could print out a daily sales report and analyze it to identify trends. Additionally, they could also produce time reports and other reports of relevant store data every day. The daily time report was used to help the operator track employees and the hours worked. Another report compared the total dollar sales with the number of employees and hours worked within a store. They could also obtain information on what happened on a particular day during the previous year and use it to plan for sales each day. The BackOffice PC server in each outlet was also used to help the owners keep a handle on their business. Owner-operators used the system to monitor labor, product movement, food cost, and hourly sales, thereby enhancing their ability to manage the outlet. They used the system to keep the food costs down and reduce the level of employee theft. The owners' expectation was that they would like to hire an employee in the morning, train them, and have them ready to work by the lunch hour.

IV. Business and Technology Issues for POS Systems

The company was forced to choose a new direction for point of sales terminal systems since they were unable to continue purchasing their traditional systems (Figure 9). Gemini had been a major supplier for several years (Version 1000 systems since 1986 and Version 2000 systems through 1998). However, the Gemini Version 2000 systems had gone out of production and Chick-fil-A had to make the next generation POS decision during 1998. They needed Gemini to continue to support their existing systems, since they had more than 500 restaurants still using them. The company had to consider business and technology issues in making its decision. The responsibility for making this decision was assigned to the Restaurant Information Systems Team.

IV.1. People

Tim Tassopoulos, the Senior Vice-President of Operations, and Buck McCabe, the Chief Financial Officer, assigned the Operations Council to come up with solutions to this problem (Figure 10). This seven-person Operations Council team was composed of Roger Blythe, Brent Ragsdale, Jon Bridges, Mark Walker, Sandi Moody, Mike Erbrick, and Ken Oliver. Mike Erbrick and Jon Bridges acted as the team leaders. The Operations Council was responsible for researching
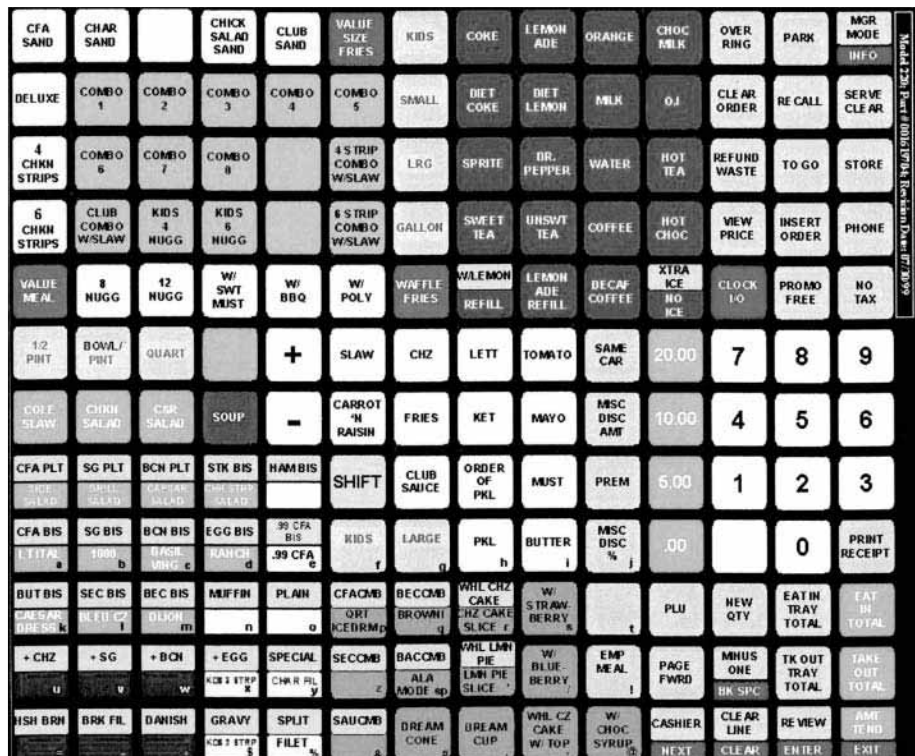

Figure 9: The input touch board used by the EPROM system.

Figure 10: Jon Bridges, the CIO (left) speaks to Michael Garrison (right) at the Corporate Headquarters in Atlanta, Georgia about the next generation POS system that was chosen.

Figure 11: Business Issues considered by the Operations Council.

alternatives based on both present and future business needs.

IV.2. Process

Business Issues

The business issues that prompted the need for the next generation POS were the company's inability to purchase traditional systems, labor issues, and the anticipated increase in self-service customers (Figure 11). These issues are discussed next.

Mike Erbrick (Director of Restaurant Information Systems) and Jon Bridges (VP, Information Technology and CIO) got together to discuss the issues involved in the selection of POS. Mike Erbrick discussed the inability to purchase traditional systems.

He reported:

"The Version 2000 EPROM systems that we have been using since 1990 are no longer going to be produced by Gemini. Subcomponents that are used in the 2000 can no longer be purchased. In addition, it seems that Gemini has a new touch screen system that they want to produce. They are going to convert their whole assembly line to that new product. So we are faced with choosing our new point of sales system sooner than we thought."

Jon Bridges replied:

"We still need the support of Gemini to support our stores that are using their systems. We now have an installed base of over 5,000 systems of this Version 2000 in more than 500 stores."

Mike Erbrick explained:

"We need to go ahead and purchase 150 Gemini Version 2000 systems to make it through the year while we decide on a new POS system. That decision should help us position our company for all of our up-coming grand openings. Any POS systems that we bought will probably last about eight years to ten years. So anything that has been deployed in the last eight or ten years won't be replaced. We will have to fully utilize and depreciate the current Gemini systems."

Jon Bridges agreed and added that labor issues also needed to be considered in the POS decision:

"An issue from a business perspective that we face is labor turnover. We have a shrinking labor pool. The average employee is between 15 and 22 years old. Recent demographic trends show this labor pool is shrinking. There are fewer people for us to choose from. There is also a proliferation of new restaurants. The employees have more places that they can work- it is getting harder and harder to get people-good people. We also experience high turnover. The restaurant industry on average experiences over 200%;

about 250% turnover per year. We, as a company, experience about a 100% turnover, which is significantly lower than the industry, but that means every year we basically have all new faces; all new people trying to ring up and learn the keystrokes for the register systems. There is a learning curve any time you walk into a new project, a new company, a new process. Any new POS we design needs to be easy-to-learn, possibly within a short time."

Mike Erbrick agreed that labor turnover was an issue. He then introduced the topic of changes in customer buying habits and their impact on the POS selection:

"I agree with you on that. I am also thinking that any new architecture that we use would have to be able to support a rising trend that I am seeing in customer attitudes. Many customers want to handle orders themselves - I want to give them that ability by developing a very simple touch-screen system interface. Our old Gemini systems did not support these new trends, where a PC-based system would. Of course, these self-service POS systems would have to be more "wizard-driven" than the ones that our employees use, but I want the new architecture to be flexible enough to support this. Also, credit card use is rising,

even in the quick service restaurant industry. Furthermore, customer loyalty programs are growing in popularity. We need to make certain that our POS selection considers these trends."

Both Jon Bridges and Mike Erbrick agreed that the three business issues of their inability to purchase traditional systems, future labor shortages, and customers who prefer self-service had to be taken into consideration in the POS decision. They also felt that the technology issues needed to be another driver of this decision.

Technology Issues

The technology issues that prompted the need for the next generation POS were PC-based point of sale architecture, data synchronization, and limited accessibility to the system (Figure 12). These issues are discussed next.

Jon Bridges felt that the demands placed on the new POS meant that it needed to be based on a PC architecture. He said:

"Clearly, we will have to go to a PC-based architecture that will support touch screen technology. Again, any new POS must be able to support more than just ringing up orders- there is a lot of other functions that we want this system to do. One of the challenges that we will face is how to move all of our input to the Kitchen Display System and to the BackOffice server."

Mike Erbrick explained that data synchronization is another major issue:

"We are going to have to run a network here from the BackOffice server to all the POS systems in a store. The issue is: where do we want the data to reside?"

Jon Bridges replied:

"If the server retrieves it as soon as each order is placed then you don't have to worry about synchronizing the POS and the BackOffice Server."

Mike Erbrick pointed out a potential problem:

"But then you have a single point of failure if the BackOffice server fails. What if each POS had its own database in case the server was offline?"

POINT-OF-SALE SYSTEMS
-Technology Issues
- PC-based Point-of-Sale Architecture
  - Immediate obsolescence
  - Difficult to support
  - Expensive
- Data Synchronization
  - Increasing volumes
  - Increasing frequency of change (promotions, new products, etc.)
- Limited Accessibility to "The System"
  - Back office is not where the action is
  - Decision making is where the customers are
  - User interfaces are not intuitive

Figure 12: Technical Issues considered by the Operations Council.

Jon Bridges considered this suggestion:

"That could be very expensive to maintain and upgrade. Then you would have eight POS databases that you have to replicate, consolidate, summarize, and then synchronize with the BackOffice system (Figure 13). At the other end, if the BackOffice Server keeps tabs on each order, it might get overloaded when the volume of business increases. Another issue is the POS databases have to be in sync when the headquarters offers special promotions and new products. It is important that the POS be easy to change as our business changes- when we roll out new products, change prices, and change menus. These changes need to be reflected in each POS accurately. We don't want errors happening as the employees ring up the orders."

Erbrick replied:

"In addition, if we have 10 POS systems per store in 800 stores and we have to make changes to the hard drive, then we have 8,000 hard drives to upgrade. That is a tremendous effort and cost. As per our capital maintenance plans, the storeowners do not have any incentive to upgrade or maintain the systems at their locations. BackOffice is not where the action is; the decision-making is

where the customer interacts with our employees at the POS systems. In our current system, whenever a menu changes, the only way to indicate that is to put a new sticker on top of a key. This isn't easy to change."

Jon Bridges saw the problems. He said:

"It is tough making any operating system stable and reliable. There are going to be inevitable crashes of the system. During my research, I will see if I can find answers to this problem. Maybe some of the POS systems will store the order data in memory for a sufficient period of time so that the server can poll and pull that data in periodically. We need the system to help our employees take an order in less than 20 seconds, perform the cash transactions in less than 20 seconds, and deliver the food in less than 20 seconds. We need a POS that can accommodate the need for a customer to leave the store within a minute of entering it with the food items requested."

Jon Bridges brought up the point that the BackOffice Server and the POS systems may not be easily accessible so that employees can not put in floppy disks, play CDs, change cables, etc., on a routine basis. He said:

"Some of our malls have just a little closet and the BackOffice Server

might be sitting on top of the refrigerator. In a drive-thru location, there is just sufficient space for two people to cook and sell chicken and that's it. There are no special rooms for computers in these locations. The server may be balanced on a shelf, sitting in a hallway, or wherever they can put a computer."

Mike Erbrick added:

"If we go PC-based, I want it to be a "no Quake" zone. We don't want employees playing games, doing their homework, or changing out cabling."

Jon Bridges replied:

"That is what I am saying- we need to have a system designed so that only those with the authority can make changes. It will include putting the server away from the employee's workstations and putting locks where it is appropriate. This includes the BackOffice to the actual terminal head."

POS Terminal Functions

Jon Bridges showed Erbrick a chart that he had made listing some of the terminal functions that he wanted to include in the POS system (Figure 14). He said:

Any POS that we select has to obviously do <u>order entry</u>. You know, that is pretty simple, that is what most registers do. But, then I thought about other things. An important feature I would like us to add is multimedia training. You know, if we came to the executive committee and said, 'Hey we want to go do multimedia training for the stores as a separate task,' that would be a hard sell. But as we are looking for a new system, we might be able to incorporate the multimedia training as part of the POS system; it is a good way to really justify our POS architecture.

Mike Erbrick asked:

So you are suggesting that a POS be able to help with training?

Jon Bridges replied:

"Yes, exactly. It would be truly multimedia training. We could have some of our training videos like the "How to Bread Chicken" training video converted to digital format. I would suggest that our new POS have a mode that you can go into for training that
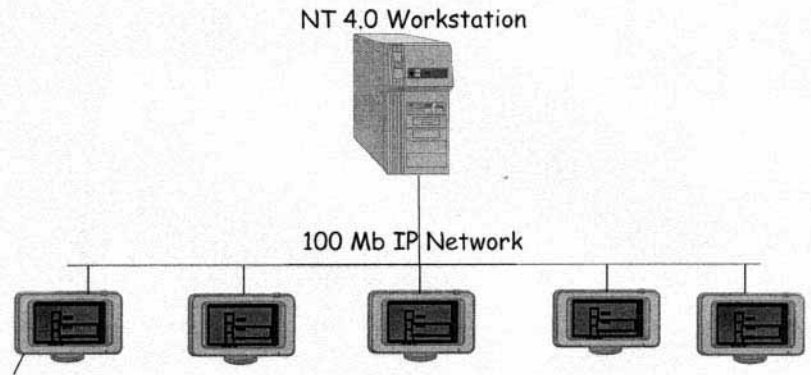

Figure 13: POS Connectivity with the BackOffice Server.

will run videos off the BackOffice server. We could have 6 of these videos running 6 different screens at the same time across our network. Our employees can play these training videos during slow hours and thereby learn our system faster. And this could go beyond our employees at the sales counter - it could also include videos to train the cooks."

Mike Erbrick liked this idea:

"That would be particularly helpful during the busy holiday season. If we can cut the training curve for a new employee from weeks to hours, then we could really have an impact on

sales figures through this new technology. And what else are you proposing for the POS system?"

Jon Bridges then made a suggestion in favor of <u>suggestive selling</u>. He explained:

"The POS can prompt the employee with suggestive selling questions - popping up a little questions like, 'Would you like to up-size that drink?' Or, 'Do you want a desert with that today?' We can have the system prompt the employee or customer with these questions. Marketing has found that customers accept suggestive questions and that usually leads to an additional profit margin. And
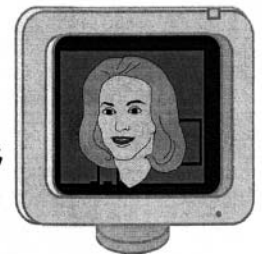

Figure 14: POS Terminal Functions demanded by the Operations Council.

there is a certain population that is interested in ringing up their own orders. I think that we will always have a cashier taking a customer's order, asking questions and ringing it up. However, I also believe that we will probably begin to have at least one POS system in a store that will allow for a customer to ring-up their own sales in the near future."

Mike Erbrick agreed and wanted to examine some other functions that the POS may be able to handle. He commented:

"These are excellent suggestions. I was thinking that it might be nice if we could support our stores with time clocks on each machine so as to keep track of employees signing in, taking a break, signing out, etc. This would really help out and of course the computer can't lie about the time, especially if we limit access to the system."

Jon Bridges replied:

"That was my next point. Employee time clocks need to be a feature of this new architecture as well, for employees to login and put in their employee ID to clock in and also to clock out. Also employee satisfaction surveys; today those are done depending on the owner and are typically paper-based. Again, we could capture that information electronically and analyze it at several different levels."

Mike Erbrick identified two other demands that he had for any new POS, saying:

"I would say that I want two other features out of any new system. One, it has to be tough. I mean it needs to stand up to spills from soft drinks that are being handed across a counter. And two, it needs to be a really flexible POS system. By this I mean that I want to be able to use it in all our restaurants- from our in-mall quick-service outlets to our full-service restaurants. The screen has to be able to change icons depending on the outlet. Something else, I think that the new POS should be able to handle any special promotions that we are having. We need to keep these suggestions in mind when we are presenting our findings. Is there anything else that we have not considered?"

Jon Bridges closed the conversation with the following:

I think that whatever we choose, it should be based on a 32-bit architecture. 16- bit architecture is almost all gone now- 32-bit is the standard. UNIX has now moved up to 64-bit, so probably in two years the PC world will be totally involved with 64-bit architectures. I think that we should just go ahead and get away from the 16-bit legacy POS.

IV.3. Product

The Operations Council drew up a slide show of their high-level criteria for the next-generation POS (Figures 11, 12, 13, and 14).

V. Identifying Vendor/System Choices for POS terminals

V.1.People

The Operations council approached Tim Tassopolous and Buck McCabe and showed the slides from their previous discussion. After reviewing the document, Tim Tassopolous said:

"The new system must be resilient. I want a system that never goes down; that can do hundreds of orders an hour and be banged on in a very, very difficult environment and hold up in that. After all that, and at the end of each shift and the end of the day, it has to tell the management what happened. I don't want the owners to try to track down trends in the data on a paper tape that may or may not have gotten printed that day. Our marketing function is more than brand development- we need to be identify our top selling items through the POS. I like the points that you have made- but let's try not to be on the leading edge of technology just for the sake of it."

Mike Erbrick agreed with Tassopolous:

"The Gemini Version 2000 POS systems were bulletproof. I understand that you want the next generation POS to be just as reliable, but incorporate the functions that we have outlined for you. It looks like we are going to have to go PC-based from the criteria that we have set. Is that correct?"

Buck McCabe replied:

"Yes Mike, that is correct. Also con-

sider that because we will have to buy all our hardware and software for a PC-based POS, we will also have to buy or build a major IT infrastructure. This means everything- from data storage here at corporate headquarters to a field service organization that can show up and fix it when a piece of the system breaks. I also want the new POS system to be 'open'. It needs to be able to work beyond any proprietary systems- from the operating system to the network. Finally, we will want a POS that has intranet and Internet capabilities. I would like you both to see what vendors and products are out there and get back to me. This looks great so far. Keep up the good work".

V.2. Process (JAD) (Figure 15)

The company followed a Joint Application Development (JAD) process by iterating the design multiple times and working with the vendor of the POS system.

Iteration One

The Operations Council reported back to Tassopolous and McCabe about the vendors that they had been investigating.

Mike Erbrick said:

"Buck, it is possible that we could take another EPROM product and make it work, but we think that touch-screen is where we need to be. And this is only possible by using a PC-based architecture. The total cost of ownership is probably going to be twice as much as if we stayed with an EPROM product, but we think that the benefits will pay off more in terms of shorter training cycles, higher productivity, additional information capture, and future flexibility."

Jon Bridges agreed with Erbrick, saying:

"We have really investigated this and believe that a PC-based system is the correct choice. What happens when credit cards become a mandate for our industry like they did for convenience stores a couple of years ago? Pay-at-the-pump was not a big deal back then, but now it seems like a requirement. So, if we are faced with the challenge of accepting credit cards with EPROM, it would be a lot of
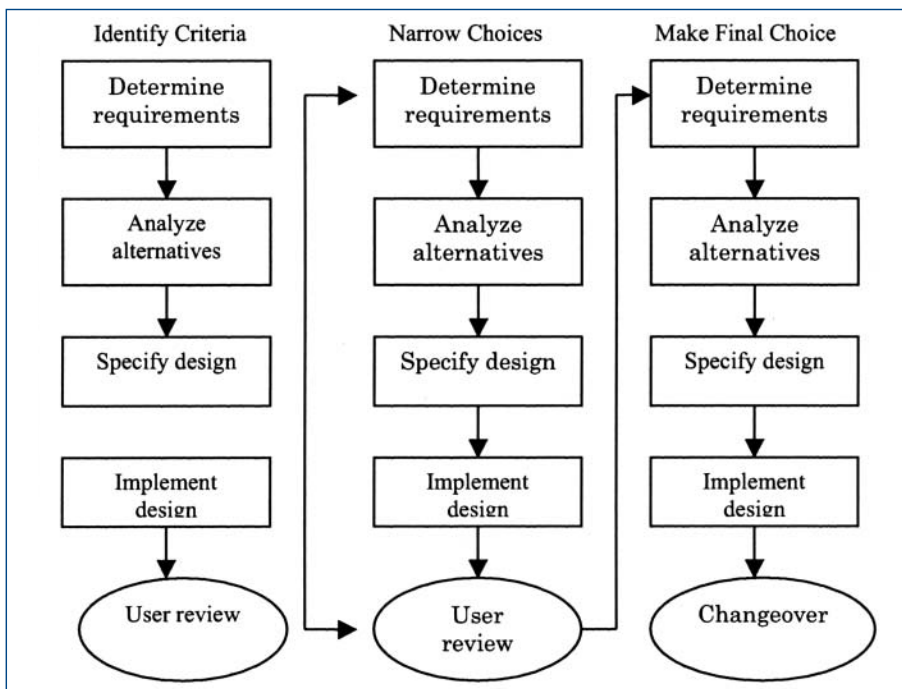
Figure 15: Joint Application Development (JAD) approach to system development.

work. With the flexibility of touch-screen, it is not that difficult. Besides, it is easy to use and there are a number of 'open' devices that will work with touch screen architecture."

Mike Erbick added:

"Touch screens really can do more. We have seen that with touch screen, we can create separate tabs on the display terminals. So each tab could be something different- you could have a drink tab, a desert tab, a training video tab- anything. With all of this, we could represent over 1,500 possible items (Figure 16)."

Tassopolous replied:

"Well, I hope that we never have that many…"

Mike Erbrick responded:

"But, that's the support- flexibility and scalability as our product and menu line grows."

Tassopolous replied:

"Okay, from the information that I have gotten and your work, touch screen could be the future for us. The next task that I have for you two is to find a vendor that will produce this system with us."

Jon Bridges and Mike Erbrick sought out several vendors to see who could produce the next generation POS that had just received approval from Tassopolous and McCabe They contacted two vendors.

Iteration Two

The first vendor the Operations Council contacted was Mercury. The Mercury system used Windows CE as the operating system (OS) and was a "thin POS" alternative. It was one of the top two alternatives for hardware and software that had been identified by Erbrick and Bridges.

The display screen on the "dumb" or thin POS used fewer colors than the competition. It was able to handle touch-screen technology and was often used in business applications. The CE OS was also popular in the handheld devices known as personal digital assistants (PDAs).

The Mercury POS could be connected to BackOffice servers using an open network based on TCP/IP over copper cabling. The input data on the screen would be constantly polled by the BackOffice server and synchronized there. If the server failed, the POS terminal would automatically go into stand-alone mode. There is enough memory in the terminals to hold 6 hour's worth of orders while awaiting service. With advances in technology, this expected it to go up to 18 hours in the near future. The server must retrieve the sales data within 6 hours. If the server fails, this has no effect on the Kitchen Display Systems or the POS. The employees could be trained directly on this POS by retrieving videos and other information from the BackOffice server.

Figure 16: A demonstration of tab menus such as those suggested by the Operations Council.

Finally, this POS has enough memory that all the programs necessary to run the POS terminal applications could reside within it. This memory is not volatile- it would not have to be reloaded if the POS suddenly lost power. The reboot time of an individual terminal is less than 45 seconds.

The Mercury POS would be capable of browsing the Internet, although any heavy processing that was done would have to be accomplished by the BackOffice server. The Windows CE operating system also allows for intranet browsing capabilities for use within the store. Should the icons or prices on the POS need to be changed, corporate headquarters could send the needed code to all stores. Once the stores received the updated code, each individual owner/operator would then install this code on the server. Each terminal would reflect the updated display screen as soon as the server was updated.

Implementing a dumb POS system in a store would cost approximately $30,000 to $35,000. This includes all the POS systems (about 8 per store), a drive-thru POS, kitchen display systems, BackOffice NT server, and network connections.

Iteration Three

The second vendor they contacted was Gemini, who had produced the previous EPROM POS terminals for them, but had begun producing a PC-based touchscreen POS as the older EPROM systems were phased out of production. Gemini uses Windows NT for the operating system of their POS. This system's operating system makes it the "intelligent POS". It could also support touch screen technology. Each individual POS terminal incorporates its own Pentium processor for transaction and application execution.

This platform makes use of individual 2 gigabyte hard drives within each POS for storage of transactions. The hard drives are replicated and synchronized with the BackOffice server via a TCP/IP network over copper cabling. These hard drives could also hold the training videos and other applications that were needed by storeowners. The hard drives could be easily swapped out should one of them fail; however this also means that a Gemini POS has more moving parts than the alternative. The reboot time for each individual terminal after a power loss is less than four minutes and always more than two minutes, since the OS requires the ScanDisk operation to be run after failures. This POS option has the ability to hold weeks' worth of data in its internal database should the server become unavailable, thus eliminating the dependency upon the network to process transactions. Should the server become unavailable, the Kitchen Display System would not be affected. Internal store training programs could be loaded into the machine databases individually, so that training could continue despite a server failure.

The Gemini POS interface on the display screen has more colors than the Mercury option POS. Windows NT is a popular operating system used in desktop workstations in many businesses. Because it is so widely used in desktop functions, there are a larger variety of programs that could be integrated with the system than were available for the alternate option.

The Windows NT operating system could support both Internet applications and an internal intranet. New icons or price changes that were needed for the display screen could be "pushed" down from the corporate headquarters and installed on each intelligent POS via the BackOffice server.

Implementing an intelligent POS in a store would cost approximately $40,000 per store. This cost includes all the necessary components to implement the technology in the store, including the terminal heads, network server, network media, and the kitchen display systems. The cost to support each restaurant per year for either the dumb POS or intelligent POS was estimated to be between $1,500 and $2,000.

V.3. Product

At the end of this iterative process, the Operations Council decided to present the two options, the dumb POS and the intelligent POS to the company's senior management, Tassopolous and McCabe.

VI. Decision by CFO (Buck McCabe) and COO (Tim Tassopolous)

VI.1. Decision among the Operations Council

The operations council reconvened with Buck McCabe and Tim Tassopolous present to discuss the vendors and products that were available for Chick-fil-A. They provided a memo to Jon Bridges (Figure 17) summarizing the events leading to the decision. Mike Erbrick kicked off the discussion:

> Tim, it is really a decision between the dumb and intelligent POS. Both are great products, but we have to decide which one of the two is most in line with our business.

Buck McCabe responded:

> Before we finalize our decision, I want us to discuss how we would go about changing over to a new system and how this would impact the current POS systems that we have out there.

Mike Erbrick replied:

> We are clearly not thinking that we need to sign a national contract with anyone right away. We need to have a testing phase to make sure that we are going to get the best support that we can get. You know, we need to keep ourselves in a position to negotiate with the vendor that we choose.

Jon Bridges agreed:

> I think that you are right. When we choose a vendor, let's have some practice grand openings at some of our new locations before they actually open.

Mike Erbrick suggested a way of doing this:

> We should commit to opening a limited number of stores with whatever system that we choose, that way we could assess how good the support is. I was also thinking that we should have this new system tested in stores in the Atlanta area and some stores outside of the Southeast. That way, we could test their ability to service us in areas that aren't right under our noses.

Jon Bridges wanted to return to the issue of providing an internal organization to

support the new system and the time it would take to fully implement any new POS system. He said:

> We also do not want to roll out a system in all of our stores right away because we do not have the ability to support 8,000 plus PC-based systems. I think that we are going to find that it is best to fully depreciate our current systems. Any new stores should get a new POS system, but this change is going to take years for us to see fully implemented.
>
> Before we make a decision, we need to consider our store environment. Not just the atmosphere in the customer sense, but the environment. We have a lot of heat and grease in a store environment. The system must be able to hold up in that kind of environment. Not only should we roll out the new system at different periods of time; we need to make sure that the new systems work with the older POS devices. My chief concerns have been that we need a system that is resilient to the environment, durable, able to handle any future technologies that we want to implement, and a system that could reduce our training times while giving us a high degree of order accuracy.

Chick-fil-A, INC.
POINT-OF-SALE DECISION

Chick-fil-A is at a Cross-Roads:
1. Gemini has been a key supplier for several years (Version 1000 systems since 1986 and Version 2000 systems through 1998)
2. Gemini Version 2000 systems are out of production (although they can make more if we make special arrangements)
3. Chick-fil-A must make a next-generation point-of-sales (POS) decision.
4. We still need Gemini to support our existing systems.

Future System Features and Characteristics:
1. Touch Screen POS will be the future architecture:
   -Easy to use.
   -Based on PC architecture with Microsoft operating system (open standards)
   -Able to support more than just ringing up orders (customer activated, reporting, training, Internet access, etc.)
2. Support for the future (PC-based) systems will be less expensive (between $1,500 and $2,000 per year per restaurant)

Alternatives:
1. The top two options are Gemini and Mercury.
2. Both are major suppliers
   -Mercury ships more POS devices than Gemini each month.
3. Criteria have been identified by Chick-fil-A.
4. Both vendors are ready for rollout of products.

Next Steps:
1. Choose a vendor.
2. Complete a 22-store pilot test of selection.
3. List of stores participating will include locations outside of Atlanta for two reasons:
   -To test ability of vendor to provide service in remote locations away from corporate headquarters.
   -Allow for the IT Priority Team to work closely with the system.

Objectives:
POS Software:
1. Value- Both initial and on-going.
2. Easy to use.
3. Bug-free
4. Easy to adapt.
5. Small footprint.
6. Support.
7. Year 2000 compliance.
8. True 32-bit architecture.

POS Hardware:
1. Cost of ownership.
2. Reliable (mean time to failure 10+ years).
3. Long useful life (7+ years as a technology).
4. Easy to install/run wiring.
5. Hot swap-able components (disk drives, etc.)
6. Serviceable (simple; cost; service level).
7. Expandable.
8. Good design/ergonomics.
9. Environmentally resilient.
10.   Open (Microsoft products).

POS Networking
1. Response time.
2. Accurate.
3. Data movement technique.
4. Can handle software updates from Headquarters.
5. Can support menus/icons/promotions sent from Headquarters.

Figure 17: The final memo from the Operations Council to Jon Bridges.

Glossary of Terms

1. Back-Office Server – Server situated in the back office of a Chick-fil-A store. Normally all the POS are attached to this server by cable.
2. Bread chicken- The process used by Chick-fil-A to prepare the chicken once it is received by an outlet.
3. CEO- Chief Executive Officer. Generally, this individual holds the position of the highest office in an enterprise. The CIO often reports directly to the CEO on information technology related issues.
4. CFO- Chief Financial Officer. Generally, this individual is a vice president of an enterprise and reports directly to the CEO on financial matters.
5. CIO- Chief Information Officer. Generally, this individual is a vice president of an enterprise and is responsible for the information technologies and computer systems that support enterprise goals.
6. COO- Chief Operations Officer. Generally, this individual is a vice president of an enterprise and reports directly to the CEO on operational concerns.
7. CSF- See Critical Success Factors
8. Critical Success Factors- The aspects of an organization that must be performed correctly for a business to succeed. The number of CSFs should be as low as possible, to identify those areas that are crucial to the company's survival.
9. Database- A collection of data that is organized so that its contents can be easily accessed, managed, and updated.
10. EDI- Electronic Data Interchange. A standard format for exchanging data between units and corporate headquarters.
11. E-PROM: Erasable Programmable Read-Only Memory
12. Ethernet- A local area network (LAN) topology that is commonly used. An Ethernet LAN typically uses copper cabling for communications within a store at speeds of 10 or 100 Mbps.
13. Full-Service Restaurant- An outlet that allows for customers to enter a unit, be seated, and served by the staff. Unlike a quick-service restaurant, the customer interacts with the staff away from the point of the transaction.
14. JAD- See Joint Application Development
15. Joint Application Development- An interactive process that uses a team approach of vendors, corporate staff, end-users, and corporate high-level executives to reach decisions concerning systems design.
16. Memory-resident- Describes the ability of a machine to hold application programs, related data, and operating sys tems, often within the RAM (Random Access Memory).
17. Operating System- A program in a computer or machine that manages all the other programs and applications within that machine or computer.
18. O & M- See Operations and Maintenance
19. Operations and Maintenance- Describes the steps that Owner-Operators take to maintain an outlet.
20. PDA- See Personal Digital Assistant
21. Personal Digital Assistant- A term for any small, handheld device that provides computing and information storage and retrieval capabilities. Also known as a handheld device.
22. POS- See Point of Sale(s)
23. Point of Sale(s)- The device/location where the transaction takes place between a customer and sales associate.
24. Terabyte- A measure of computer storage capacity corresponding to 2 to the 40th power. It is comparable to a thousand gigabytes. A byte is 8 bits long; a gigabyte is roughly a billion bytes.
25. RAM- Random Access Memory. This is the place in a computer or machine where the operating system, application programs, and data in current use are kept so that they can be quickly accessed by the machine or computer's processor.
26. Terminal Head- The physical device in which the applications and programs for processing a customer's order take place.
27. Quake- A popular game often played on personal computers.
28. Quick-service Restaurant- An outlet in which the customer enters a unit, places the order, makes the transaction and receives the items personally.
29. Unix- An operating system that was written in the "C" language and is noted for being "open"; no one particular organization controls the rights to use Unix.
30. TCP/IP- A communication protocol, Transmission Control Protocol/ Internet Protocol.
31. Windows- A generic description for a system that makes use of the graphical abilities of a computer. Using windows allows a user to share the graphical output of a computer among several applications at the same time. Using a separate window for each application allows the user to multitask between the applications without having to reinitiate those applications.

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Chick-fil-A, Inc.: Selection of Operating Systems for POS Terminals to Serve Business Functions
INSTRUCTOR'S MANUAL

Synopsis

Mike Erbrick, Director of Restaurant Information Systems at Chick-fil-A, was given the responsibility of converting the restaurant's point of sales (POS) systems from a proprietary EPROM based system to a newer system. This changeover had an investment impact of approximately $3.29 million, based on the differences in the costs required to implement the various POS systems being considered. This difference could be as high as $15,000 per outlet, depending on the system chosen and store layout. Within its more than 700 outlets, Chick-fil-A averaged about 8 POS systems per store compared to the two or three systems per store used by other quick-service restaurant chains. The number of POS systems gave rise to additional confusion for the kitchen staff because they could get six to eight orders arriving simultaneously on the Kitchen Display System (KDS) screens. Thus, the new system had to be extremely efficient and scalable to meet the needs of individual stores. Perhaps most importantly to the store owners using the system, who are compensated based on their sales figures and net income, the sales data should be relayed to Chick-fil-A's corporate headquarters accurately and reported back to each store in a timely manner.

The members of the internal project team, referred to as the Operations Council, were Roger Blythe, Brent Ragsdale, Jon Bridges, Mark Walker, Sandi Moody, Mike Erbrick, and Ken Oliver. The Operations Council researched the problem and then made their recommendations to Tim Tassopoulos, the Senior Vice President of Operations, and Buck McCabe, the Chief Financial Officer for Chick-fil-A. The Operations Council offered two options for the next generation point of sales system to be used in all Chick-fil-A restaurants. The first option put forward was an intelligent POS based on Windows NT/95 that was robust, fault tolerant and database-driven. The second option presented was a "thin" POS based on Windows CE that was fast, incorporated memory-resident programs and data, and was noted for being a strongly resilient system after lock-ups. The price difference between the two was of the order of $5,000 per store, depending on the size and layout of the store.

The team was challenged to evaluate the options with respect to operational usability, technical architecture, programming effort involved, environment, 5 year total cost of ownership, and business issues.

Educational Objectives

The instructional objectives for this case study are to:

(1) Make students aware of the necessity for the technology selection process to align with business needs. Show how this was achieved by Chick-fil-A in making its selection of a new Point of Sales System (POS).

(2) Learn the iterative nature of systems design used in Joint Application Development (JAD) by studying the example of Chick-fil-A's use of JAD in making its POS decision.

Intended Courses and Levels

This case study is designed for use in undergraduate and graduate MIS and engineering classes. Sophomore and junior students or first year graduate students would be the recommended level for case presentation. The 'issues' identified in the case for Engineering students are also appropriate for Information Technology students, since Network engineers and Technicians evaluate, deploy, configure, install, troubleshoot, and maintain network systems.

Connection to Theories in Information Technologies and Engineering

(a) Information Technology issues:

(1) Business-Technology Alignment Model: Parker, Marilyn M. Strategic Transformation and Information Technology: Paradigms for Performing While Transforming. Prentice Hall, Upper Saddle River, NJ. 1996. (Graphic: Page 198) (Explanation: Page 198-200). A convergence model shows that end-user needs and available solutions have to be balanced in order to create the best solution for the end-user.

(2) Joint Application Development Process: Reynolds, George W. and Ralph M. Stair. Principals of Information Systems: A Management Approach. Third Addition. ITP (International Thomson Publishing). Cambridge, MA. 1998. (Graphic: Page 523).

(b) Engineering issues:

(1) Operating Systems (OS): Comparison of alternate OS (Windows NT vs. Windows CE) and their impact on business. In 2000, factory floors are beginning to be equipped with thin client systems that report the progress of movement of work-in-progress to an intelligent server located at the factory office. An understanding of the issues that affect the selection between NT vs. CE would help students in engineering and manufacturing realize the advantages and disadvan-

tages of these systems for use on the factory floor.

Basis of Research

Site visits and interviews with the executives of Chick-fil-A were used to develop this case study. The research team also visited a retail location of Chick-fil-A to collect information from the viewpoint of the owner/operator. All the exhibits used in the case study have been supplied by the company and from Worldwide Web sites. The Worldwide Web sites that were used are the following:

http://www.chickfila.com/

http://www.oracle.com/corporate/
    oracle_at_work/html/chckfila.html

http://www2.computerworld.com/home/
    print.nsf/idgnet/9804134256

http://www.cio.com/archive/
    120196_consult_print.html

http://www.microsoft.com/WindowsCE/
    embedded/start/cs-radiant.asp

http://www.microsoft.com/PressPass/
    press/1998/Feb98/Winrtlpr.htm

http://www.thestandard.net/companies/
    company_display/
    0,1591,51077,00.html

http://www.whatis.com/windowsc.htm

http://www.whatis.com/windnt.htm

Possible Format for Class Discussion

This case study works best when assigned to groups of students. These groups could perform the following tasks:

(a) Group A: Defend the recommendation to implement the intelligent POS system by identifying the criteria for selecting the software, hardware, and network.

(b) Group B: Defend the recommendation to implement the thin POS system by identifying the criteria for selecting the software, hardware, and network.

(c) Group C: Discuss the process used by Chick-fil-A to align the technology choice with business needs. Critique and suggest means by which Chick-fil-A could have improved this process.

(d) Group D: Discuss the process

used by Chick-fil-A to analyze, design, and choose the POS system. Critique and suggest ways of improving this process.

(e) Group E: Play the role of Jon Bridges (CIO) and select the system to be implemented within Chick-fil-A.

The suggested team format for classroom management of the case parallels the method used by corporate management to review current operations, forecast short and long-term goals, and select a new operating system. The team approach also uses a divide-and-conquer approach, in that each team has a specific focus that will become part of the overall recommendation.

When the students research the case for explanatory answers to the questions, they will read through much of the background material included. This case study was designed to provide a very engaging and critical analysis of the case.

A possible approach is for the students to be given the case objectives and the questions to answer individually. This would give the instructor a basis for individual student evaluation. Once teams are formed and given specific assignments, team members could compare answers to questions relating to the team's assignment. If answers varied, team members would agree upon a consensus and could begin to talk together and come up with a proposed solution.

It can also be helpful to require a formal presentation of the solution from each team. This shifts the responsibility to the team to determine the most appropriate format to use in presenting their solution.

How the Instructional Objectives Were Achieved

(a) Make students aware of the need for technology selection processes to align with business needs. Show how this was achieved by Chick-fil-A in making its selection of a new Point of Sales (POS) System.

Chick-fil-A had a legacy Point of Sales (POS) system that was adequate for taking orders, displaying an order to the kitchen via the Kitchen Display System (KDS), and tracking income for individual stores. These POS systems made use of the DOS operating system and lacked intuitive interfaces

and flexibility. Over time, many competing chains in the quick-service restaurant industry had tried to make PC-based systems work within their stores with limited success. Chick-fil-A had closely studied the successes and failures of theses PC-based systems but had decided to stay with the EPROM (DOS-based) systems that had been in place since the mid 1980's.

However, the manufacturer of their EPROM systems had decided to stop producing these systems in favor of the newer PC-based systems. The manufacturer was willing to continue producing and supporting the EPROM systems that were used by Chick-fil-A, but only at a cost that made it prohibitively expensive to maintain as a chain. It was at this time that the need to make a decision concerning the adoption of a next-generation POS system was forced upon Chick-fil-A.

It was clear to the Information Technology (IT) group at Chick-fil-A headquarters that technology could be used to accomplish more than just ringing up orders. The EPROM technology was not meeting these needs of the enterprise.

To meet this challenge, Chick-fil-A's IT group (under the leadership of Chief Information Officer Jon Bridges) demanded that the POS systems be used for more than simply supporting the accounting division. By implementing new technology properly, Chick-fil-A expected that it could analyze sales data at different levels of the organization and study marketing trends. Additionally, the new systems were expected to meet the demands of storeowners in several areas, such as faster and more effective training, more accurate order entry, employee tracking, and easier implementation of new menus, prices, and promotions.

Many critical success factors (CSF's) were taken into consideration at the earliest stages of the selection planning. Chick-fil-A identified critical success factors as those items that must be done correctly in order for the business to succeed in achieving its stated goals. By making food and labor costs the true metrics of the orga-

nization for success and focusing on these demands, Chick-fil-A was able to use technology to focus on these throughout their POS selection process.

(b) Learn the iterative nature of systems design used in Joint Application Development (JAD) by studying the example of Chick-fil-A's use of JAD in making its POS decision.

Chick-fil-A used a team approach to Joint Application Development (JAD). First, a small streamlined group was formed (the Operations Council) to identify the problem that the new technology was to solve for Chick-fil-A and the criteria to be used to judge its success. This composed the entire first iteration, which identified the PC-based touch screen technology as the best solution at a macro level. After review, the team then set out to research the available solutions and vendors and to check the feasibility of meeting the targets that had been set. This second step narrowed the choices to two PC-based software operating systems (OS): Windows NT or Windows CE. Again, the work of the Operations Council was reviewed. The Operations Council then further investigated the two possible choices and reported their findings to Tim Tassopoulos (VP Operations) and Buck McCabe (CFO) for final selection. In the final iteration, the two alternatives were closely examined and a selection made.

JAD groups consist of both problem holders and solution providers. A group normally requires one or more top-level executives to initiate the JAD process. Many companies have found that groups can develop more complete pictures of their requirements than individuals working independently, and have found JAD to be a very successful technique.

Other possible selection models that are available include:

◆ *The traditional Systems Development Life Cycle (SDLC).*
This involves five common phases:
1. Investigation- Understand the problem.
2. Analysis- Understand the solution.
3. Design- Select and plan the best possible solution.
4. Implementation- Place the solution into effect.
5. Maintenance and review- Evaluate the results of applying the solution and modify to meet business challenges if necessary.

◆ *Prototyping.*
This is an iterative approach to the systems development process. For each iteration, requirements for alternative solutions to the problem are identified and analyzed, new solutions are designed, and some portion of the system is implemented. Users are encouraged to try the prototype and provide feedback.

◆ Rapid Application Development (RAD).
This technique employs tools, techniques, and methodologies designed to speed application development. RAD reduces the amount of paper-based documentation, automates program source code generation, and facilitates user participation in design and development activities.

◆ End-user Systems Development.
This includes any systems development project in which the primary effort is undertaken by some combination of business managers and users. Information systems professionals encourage the participation of end-users of the system in the development process.

Taken from: Reynolds, George W. and Ralph M. Stair. *Principals of Information Systems: A Management Approach*. Third Addition. ITP (International Thomson Publishing). Cambridge, MA. 1998. (Text: Pages 520-524).

Short Answers to Questions

(1) Identify criteria used to determine the best POS software:

(a)   Value
Chick-fil-A had to consider both the initial hardware costs as well as on-going costs. This is known as the total cost of ownership.

(b)   Ease of use
Any POS system must be intuitive to meet the demands that labor force training cycles be reduced.

(c)   Bug-free
The system must be resilient against failures. This includes experiencing a low number of daily errors as well as having a long, useful life span before being replaced by another POS system sometime in the future.

(d)   Easy to change
The selected POS system had to have the ability to rapidly adapt to promotions (or coupons) as well as menu and price changes. For example, in September of 1999, Chick-fil-A added four salads to the menu. A new POS system has to be flexible to allow for these types of changes in menu structure. This flexibility also encompasses the ability to handle paradigm shifts in the way that units do business. For example, Chick-fil-A may find that credit card payment becomes the standard way that transactions are handled in the near future, much as pay-at-the-pump has proliferated in the gas station/fuel-service industry. A new POS system must be flexible enough to meet this demand.

(e)   Small footprint
Chick-fil-A units vary in size from drive-thru only to full service restaurants with waiters. This required that a POS system be able to adapt to these different environments.

(f)   Support
Support includes aid from vendors that supply the system and an internal labor force available to maintain the system. A PC-based, open architecture such as Microsoft Windows OS allows for a greater labor pool than would be available with a closed, proprietary system, resulting in lower costs.

(g)   Y2K compliance
Any new POS system would have to be able to handle this threat.

(h)   True 32-bit architecture
A new POS system needs to distance itself from the legacy of 16-bit architecture. Chick-fil-A's IT department believed that in the near future PC-based applications would require at least a 32-bit architecture. This was a proactive step to protect the flexibility of any new system.

(2) Identify criteria used to determine the best POS hardware:

(a) Cost of ownership

A new POS system must keep the cost of ownership to a minimum. To meet this criterion, Chick-fil-A demanded a rugged system, as the system must be resilient against the environment found in their stores. This included having components that could stand up to the poor air quality and constant use in order to reduce repair or replacement costs to a minimum.

(b) Reliable (mean time to failure of 10+ years)

A new POS system must be able to last for several years without breaking from normal use. For example, sales associates with dirty or greasy hands from handling orders must be able to input orders on the touch screen without the system failing. Also, hard drives and other hardware (video cards, etc.) inside of a POS system need to continue to function for a reasonable amount of time.

(c) Long useful life (7+ years)

The technology used in any new POS system must be advanced enough that no technologies that are better suited for chain-wide implementation would be likely to appear within seven years of implementing a new system.

(d) Easy to install/run wiring

Network cabling should not require specialized experts to make any new POS system function properly. This would keep installation labor costs low, as well as any unexpected maintenance costs. The cabling should also be tough enough to withstand the store's environment.

(e) Hot swapable components (disk drives, etc.)

In the event that there was a failure with any new POS system, the components must have the ability to be changed out on-site, reducing repair and maintenance costs for storeowners/operators. In 1999, Chick-fil-A's business model encouraged storeowners to spend as little as possible on repair and maintenance.

(f) Serviceable (simplicity; cost; service level)

Any new POS system had to have hardware that was easily repaired in the event that the system needed hardware maintenance. The POS also needed to be designed so that it could be easily repaired at a minimal cost.

(g) Expandable (customer activated terminals, credit cards, etc.)

As the quick-service restaurant industry changes, Chick-fil-A felt that a POS system needed to have the ability to change with it. A new POS terminal would have to be flexible enough to accept likely future trends seen in Chick-fil-A's vision of the future. These internal forecasts included credit card "swipes" on the terminals as well as customer-activated kiosks within the units.

(h) Good ergonomics

The hardware design of any new POS system had to be comfortable for a sales associate that would be working on the system for several hours at a time. The design should keep fatigue to a minimum.

(i) Environmental impacts (grease, flour)

When considering the poor environmental air quality of the typical Chick-fil-A unit, any new system needed to be able to withstand the flour and grease that are present in the air. For this reason, Chick-fil-A wanted to eliminate the moving parts inside of a POS system, such as cooling fans and hard drives.

(3) Identify criteria used to determine the best networking/support strategy for POS/headquarters operations:

(a) Response time

A new POS system must be able to rapidly transmit and receive information from the BackOffice server for training videos, data synchronization, and menu and price changes. The system must also quickly display orders to the Kitchen Display Systems (KDS) in the food preparation areas.

(b) Accuracy of information

The network used by any new POS system must ensure that the data that is transmitted is accurately reported to the BackOffice server. From the BackOffice server, the Virtual Private Network (VPN) used must also maintain the accuracy of the data for transmission to corporate headquarters or vice versa.

(c) Data storage techniques

Data must be stored in a central location on the BackOffice server, but there must also be a technique used to eliminate complete dependence on the network. To circumvent this problem, a new POS system must be able to hold some orders in a stand-alone mode, with an ability to continue to operate independently while sales transactions are taking place. The data should be easily synchronized from the POS terminals to the BackOffice server in a seamless fashion.

(d) Depot for hardware

POS terminal heads are likely to need repairs that require them to be sent away from the unit location. For this reason, Chick-fil-A felt that its partnership with the servicing vendor needed to include a provision covering this requirement. By establishing a depot of spare units, Chick-fil-A felt that it could provide quick replacements for broken POS systems as they were needed.

(e) Software updates from corporate headquarters via PC

Software for a new PC-based point of sales system should take advantage of the enterprise network used by Chick-fil-A. Using the network would ensure that all units were using the most recent releases of software, while also cutting down on the distribution costs associated with updating software throughout the entire business.

(f) Menus/items/price changes from corporate headquarters

Menus, promotions, and prices were inevitably going to change as a new POS system was implemented and put into operation. Believing that this trend was likely to continue, Chick-fil-A specified that all of this data would have the ability to be "pushed" down from the corporate headquarters to all BackOffice servers that make use of the new POS systems. From here, each storeowner could make use of their unit's network and update each POS terminal head with the new data that was received.

(4) Defend the reasons for choosing the thin POS option (Windows CE-based Operating System)

• The "thin" POS option involved the selection of Windows CE for the software running on the terminal head. This was the selection that Chick-fil-A made after

some discussion with the vendor. Windows CE is considered by Microsoft to be the "light" version of the Windows 9X series. It is commonly found in handheld devices such as palm-sized computers, known as Personal Digital Assistants (PDA's), and other space-constrained devices. This technology is making more appearances in an embedded form for such devices as microwaves, gas station pumps, and information kiosks. In this case, the Operating System (OS) was embedded into the memory. This allowed for total POS reboot times (from start to finish) lasting less than one minute (average tests indicated reboots of less than 50 seconds). Other than installing Windows CE on a terminal head, the only other requirements were the necessary device drivers (printers, video cards, etc.) Processing power requirements were kept to a minimum by placing all of the applications needed onto the server.

In very much to the same way a networked computer functions, these devices make use of a server for data storage; typically a POS terminal head can only hold a day or so's worth of orders independently of the server. In this sense, the devices are truly thin clients- applications appear to be running on the client but are actually running on the server. This configuration allows for the system to be free of hard drives or floppy drives for boot up, data storage, and running applications. During the investigation of possible alternatives, this factor was especially important because it eliminated the need for the devices that require moving parts in the POS terminal head, chiefly the cooling fans for the processor tower and the hard drives. Having moving parts would necessarily raise the total cost of ownership, as these devices tend to fail often in the poor air environment that is typical of a quick-service restaurant. These systems are slightly cheaper than a full-blown PC-based (the Windows NT) solution, although the lower cost of ownership is more important to Chick-fil-A than the initial investment.

This CE system also fully meets all of the criteria set by the Operations Council. The video quality is equal to that delivered by Windows NT. Additionally, the touch screen can represent menu items in picture quality allowing for a possible future option allowing customers to place orders themselves.

Another attractive feature of the Windows CE solution was that it made use of the Windows 32-bit architecture. This meant that important software functions that may be needed (such as acceptance of credit cards at the POS) could be written for the device much more easily and much more cost effectively than would have been possible with a proprietary architecture.

Windows CE also allowed for communications with a wide range of applications. Since CE already featured a fully functioning TCP/IP capability, much of the time and costs associated with developing a communications protocol were eliminated. This capability could essentially make each POS terminal head a node on a network for Chick-fil-A. A corporate-wide intranet within the organization could be implemented and software and application problems within POS terminals could be addressed by accessing this intranet for help. Company control could soon become much more centralized and data mining techniques would be able to analyze trends much sooner and in greater detail than had been possible with the existing EPROM systems. The built in communications abilities would also allow for easily communicating with the Internet in the future.

Windows CE also allows for devices to be added to the terminal head easily by making use of its ThinPATH family of add-on software. These devices may range from microphones (for voice activated order entry in the future), parallel devices (such as printers), serial line devices, and speakers.

The interface is familiar to all of those trained in Microsoft's Windows family. Windows CE developers were actually few in number in 2000, but anyone trained in Windows-based development could be trained in a reasonable amount of time. Developers for this solution would not be forced to learn a closed proprietary system, which often tends to scare away developer talent in the industry.

However, there are concerns that the technology had not proven itself as a solid technology. As of early 2000, this technology had few business applications and an unproven track record for industry usage. Martin Mortensen, an analyst at the Garter Group, Inc., a consulting agency, said, "We have to remember that Windows CE is a year and a half out of the gate [in 1999]. We are still talking about the sale, and you want to make sure that this thing doesn't suddenly go down."

Several of Chick-fil-A's competitors are also investigating introduction of these devices in their restaurants.

(5) Defend the reasons for choosing the smart POS option (Windows NT-based Operating System)

Windows NT comes in two forms: Windows NT Server and Windows NT Workstation. Chick-fil-A was only considering Windows NT Workstation for its POS terminals OS. Windows NT (from here on only Windows NT Workstation will be discussed) was designed to be an OS for those needing more advanced capabilities than were available from other Windows OS products. It was considered to be a faster performing and more fail-safe environment than Windows 9X or Windows CE (For example, Microsoft claims that its speed was up to 20% faster for 32-bit applications). This robustness of the operating system was one of the major criteria that made it a possible alternative for Chick-fil-A.

Windows NT also featured many more security and management functions that were not available with other Windows operating systems such as Windows CE. Windows NT would obligate each POS terminal head to have its own database with its own applications resident on each device. The network would really only be required for the synchronizing of data for transmission back to corporate headquarters. The elimination of network dependence adds a layer of independence to protect against data loss in the event that the network became unavailable. Since the data would be resident on each machine, backing up data without accessing the network would be an option available to the storeowner.

Windows NT was considered to be highly scalable because its use is so commonly used to meet business needs. This adds a degree of flexibility, allowing it to readily adapt to future needs that cannot be accurately predicted in specific industries such as the quick-service restaurant industry.

Windows NT has all of the abilities of the CE solution in terms of communi-

cations. It also has the extended ability to run several other network protocols in addition to TCP/IP, for ease of integration with other networks. These protocols include IP, IPX, DLC, and NetBEUI.

Windows NT also has similar graphical abilities to those featured in Windows CE.

Window NT has some additional advantages over the CE version. At the time, it was better supported with business applications and was already widely used in several industries. Support was routine, easily affordable, and there was a large labor force readily available. Developers for the Windows NT were also readily available and could be recruited affordably.

However, Windows NT was considered to have a larger footprint than Windows CE when in the two systems were directly compared. Windows NT would also require that the terminal heads contain moving parts.

(6) Discuss the process used to show the link between business and technology: Business-technology core competency linkages theory could be used in the choice of POS software for Chick-fil-A.

(a) Good user buy-in from operators and team members

Business and technology considerations coincided in the selection for the storeowners/ operators, due to their conviction that any PC-based POS system would help them manage their stores more effectively. Storeowners would be able to find important data without having to search through reels of receipt tape that may or may not have been printed at the end of each day's operations. A PC-based system would also help storeowners/operators with order accuracy, employee tracking, satisfaction surveys (both for customers and employees), provide suggestive selling prompts, in addition to rapidly decreasing training times. By reducing the training curve for new employees from days to hours, the system would help reduce the labor concerns of upper management.

(b) Buy-in from IT

The information technology (IT) department favored a PC-based system because it allowed for greater control from corporate headquarters. Menu and price changes, along with special promotions, can be "pushed" down to individual units simultaneously, giving them the ability to promote on a national scale more uniformly. The information technology department also believed that a PC-based system would allow for better data warehousing, resulting in better data mining. Thus, trends in sales could be analyzed by several different departments at the corporate headquarters. This would also help refute the idea that the IT department at Chick-fil-A was used mostly as a sub function of the accounting department.

(c) Buy-in from finance

Chick-fil-A's finance department had found that a PC-based system would result in greater order accuracy. For example, with the EPROM based systems, some combo meals came with a drink included in the price and other combo meals did not have a drink included in the price. Often, sales associates would deliver drinks with combo meals that did not include them, resulting in lost sales for one of the biggest profit making portions of the business. The PC-based system and its use of suggestive selling were expected to end this problem.

(7) Discuss the process used to analyze, design, and implement the option

(a) JAD process

The Joint Application Process (JAD) was used to introduce high-level management to the needs of the end-users. This process is noted for collaborative work resulting in greater input than is possible for individuals working separately. The JAD process is also powerful because it "flattens" the decision making process by giving knowledge, input, and judgment power throughout an organization.

(b) Need for iterations

Chick-fil-A used iterations to eliminate options until it could focus on the final choices available. The iterative approach also helped to identify the high-level and low-level criteria that were required for POS system selection.

(c) Working with vendors

Chick-fil-a worked with vendors to help investigate the uses of available operating systems. Since Windows CE is a relatively new technology for industrial use, Chick-fil-A relied on the vendor's own research into available technologies rather than launch their own expensive research and development project.

Prologue

- What did Chick-fil-A choose?

Chick-fil-A chose the Windows CE option for their next generation Point of Sales Operating System. However, Chick-fil-A had not yet signed a national contract with the vendor for the new CE terminals. This change management strategy was an attempt by Chick-fil-A to negotiate a better deal while deciding on a national business model for support of a new POS system with storeowners. Once Chick-fil-A finalized their five to ten year business plan, they were expected to sign a contract for full implementation. However, Chick-fil-A planned to fully depreciate the existing EPROM systems that were currently in use by store units. Only new Chick-fil-A units and units that needed new POS systems would get the CE terminals installed.

- Why did they choose that option?

Chick-fil-A chose the CE option over the NT option for several reasons. An article that appeared in the CIO magazine is attached as Appendix A. The reasons are listed as follows (in no particular order):

(1) The close proximity of the food preparation area (kitchen) and the transaction site (POS system) were of great concern for the terminal electronics. The air environment in this area contains higher than normal amounts of grease and flour from the food preparation in the kitchen, and these contaminants ruin electrical devices over time. The Windows NT option, with its necessary hard drive and cooling fan, would be likely to suffer damage from the contaminated air, resulting in increased hardware costs and a shorter life span for the equipment. Past experiences of Chick-fil-A storeowners have shown that this type of air environment has damaged microphones located near food preparation areas, forcing replacement before the normal expected failure.

(2) The reboot time for the Windows CE system is much shorter than for the Windows NT-based system. Any PC-based system is likely to experience lockups

from time to time. The Windows NT OS would be likely to attempt to run its ScanDisk operation after a failure, taking up precious time. This ScanDisk operation and a complete loading of the OS could take up to four minutes, while the CE system averages a complete reboot time of less than one minute. During a busy lunch hour some storeowners process over 100 transactions during the typical lunch period, and lost time waiting on an NT system to reboot could cost several missed orders especially in a mall unit where alternative food outlets are located very close together. The CE version is therefore better for this situation.

(3) The "thin client" architecture concerns for the CE based terminals were overcome through the use of internal memory that can hold orders while awaiting maintenance. The CE devices cannot hold as much memory as the NT versions with hard drives (again the air quality concerns are introduced), however the CE terminal has the ability to hold several hours to more than a day's worth of orders without having to synchronize with the server. This stand-alone operation was considered long enough to eliminate dependence upon the network.

(4) The CE terminal heads have only limited access to the entire POS system. There are no CD-ROM or floppy drives that could easily be accessed by sales associates. Therefore, concerns that employees may attempt to use the POS for homework or game playing was eliminated. Also, since CE is primarily targeted to space constrained applications (gas pumps, home appliances, etc.) there are few applications and games available.

(5) The CE version is considered to be the "light weight" version of the Windows family of operating systems. Chick-fil-A's information technology department predicts that in the future, POS systems will become smaller and will eventually be wearable by sales associates. By going with the CE version, Chick-fil-A has begun to move towards this vision.

(6) Windows CE is also the OS often used in information kiosks. Chick-fil-A upper management believes that in the future, there will be an increase in the self-service minded customer. If this trend does manifest, then customers will be placing orders themselves and the CE display would already be familiar to those that have used information kiosks. This type of sales would be similar to the familiar "wizard–driven" approach to task accomplishment. Additionally, the internal memory will be able to offer suggestive selling questions to the sales associates in traditional order placement. It has been noted by internal researchers from Chick-fil-A's marketing department that the use of suggestive selling would be likely to result in increased sales.
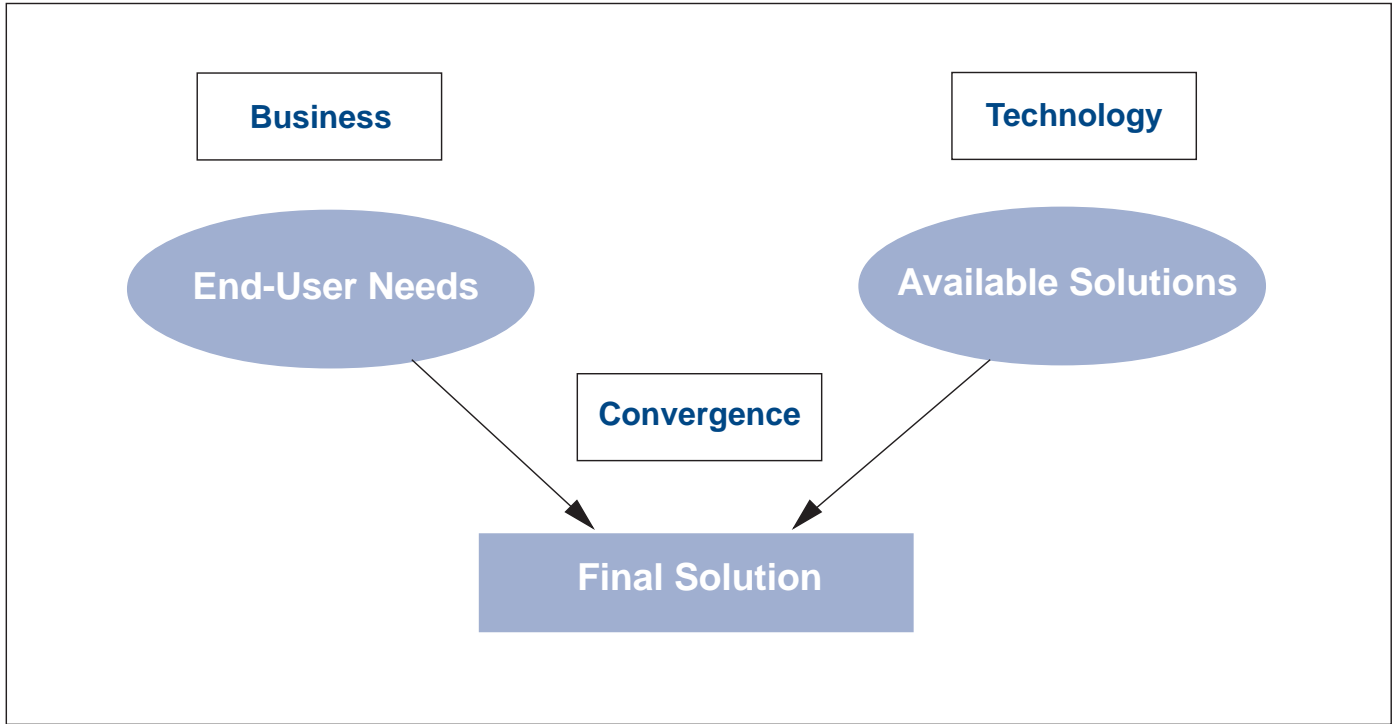
(7) The CE system makes powerful use of the available (currently copper-based) network. It has the ability to store training videos in one location (the BackOffice server) and to run different videos to different terminal heads simultaneously. This would reduce redundancies that would likely to be found on the NT version and thus reduce the chance that there will be anomalies in the databases.

(8) The CE terminal heads are considered to be more rugged than NT based POS systems. Storeowners have reported that drinks are often spilled on the POS systems during transactions (remember that Chick-fil-A often uses more terminal POS heads than other quick-service restaurants, resulting in many orders being passed in near proximity to the terminal). An NT based system with hard drives and cooling fans would likely fare worse in the event of a drink spill.

(9) The CE version meets all the criteria that Chick-fil-A identified as necessary for their next-generation POS system.

The Missing Piece: Field, T. "The CIO Role," CIO, http://www.cio.com/archive/120196/consult.html, Dec. 1, 1996.

Business		Technology

End-User Needs **Available Solutions**

Convergence

Final Solution

Chick-fil-A's senior director of information technology, Jon Bridges, relies upon his contacts at SIM, Omicron and the MIS group of the National Restaurant Association to keep up with competitors McDonald's and Wendy's. The first thing he does when an important decision comes down is call a member who's already been through a similar experience. "There's nowhere else I can go to ask stupid questions," he says. "The whole key is how fast can you get stuff put out. If you spend all your time researching, you get bogged down pretty quickly." Jon Bridges, a former consultant with Andersen Consulting, is the senior director of information technology at the $500-million, Atlanta-based Chick-fil-A Inc. restaurant chain, where he finds his consulting skills valuable in his position as the company's CIO-level IS executive. "My job hasn't really changed," says Bridges, who left consulting because he was tired of travel. "I just do it for the same company all the time." At Chick-fil-A, Bridges says, he encountered two challenges: one, to prove the value of IS, which previously was a subfunction of accounting; and two, to overcome the apprehension of some staff who feared he would enforce a high-intensity, 90-hour standard work week in

the department. To address both issues, Bridges set an example through his diligent-but-reasonable work habits and by seizing rather than waiting for the opportunity to make IS a major player in the company's competitive strategy. Chick-fil-A identified food and labor costs as key metrics in restaurant management, so Bridges became part of a team to develop of a new, chainwide shared information system to track administrative functions throughout the company-a first step toward tracking those food and labor costs. After securing executive support for the system, Bridges enlisted field consultants, financial analysts and store managers as part of the IS development team to identify and incorporate everyone's needs in the system design. "It was critical," Bridges says of the cross-functional teamwork. "We had to get the agreement that the result [of lower costs] was worth it, and we had to have the buy-in from the stores." By giving the departments some ownership of the project, Bridges was able to meet their needs and facilitate a successful system rollout. And he also helped the IS staff become more comfortable working both with him and with business-side peers. That success gave the IS department a solid hit in its first at-bat, and it gave Bridges credibility within

the organization. Subsequently, he has been pulled into such projects as menu development, new products and corporate communications, and he has helped create a new financial system, logistics system and a data warehouse.

Despite the relatively low turnover at Atlanta-based Chick-fil-A Inc., Vice President of IT and CIO Jon Bridges says the labor shortage is his company's biggest business challenge. In his quest to replace Chick-fil-A's old push-button registers, on which cashiers can require as much as two weeks of experience before they feel totally comfortable, Bridges is testing new touch-screen POS systems from the Hospitality Systems division of Radiant Systems Inc. in Alpharetta, Ga., and Par Microsystems Corp. in Norcross, Ga. "My daughter is 5, and she can ring up a sale on a touch screen with no training," says Bridges. In addition to being easy to use, touch screens can function as training tools themselves. Radiant's POS terminals can be programmed to offer multimedia training as needed; if a cashier's average sale is below $4, for example, a two-minute video on so-called upselling would automatically play at the end of the shift.