The industrial engineering toolkit can build profitable, hospitable foodservice sites

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Doing it YOUR WAY

BY JUAN MARTINEZ

The application of industrial engineering and ergonomics principles in food service can be traced back to Burger King in the late 1970s to early 1980s. I was fortunate to be part of that team. Our organization applied IE principles, including simulation, ergonomics, plant layout and time and motion, to improve the efficiency, productivity, sales and profits of the restaurants to support the strategic growth plans of the brand. One major benefit of using the IE discipline, along with the analytical tools it afforded, was our ability to quantify the dynamics of the operation, providing a great framework for making decisions on the priorities the business should undertake to improve profits and customer hospitality.

The team determined what bottlenecks inhibited the restaurant employees from delivering better customer service, hospitality and the brand promise, as well as finding ways to reduce capital costs that were eroding profitability. Industry journals and magazines sported papers describing the different applications, including one by Bill Swart and Luca Donno published in *Interfaces Magazine* in 1981. I wrote several papers in the mid- to late 1980s about applying simulation and ergonomics to design optimum workstations.

The foodservice business, especially the restaurant industry, was and still is labor intensive. So these efforts aimed to design a model that would simplify the work of the employees, remove production bottlenecks, ensure the right labor deployment and optimize the ergonomics of the operations while maximizing each unit's profits. Supporting the "crew-centric" and ergonomically optimum designs would maximize profits and customer hospitality and service, including food quality, to support growth of the brand, which is the ultimate goal of a thriving foodservice concept.

Over the last three decades, industrial engineering and ergonomics principles have proven to maximize the output (customer service, product quality, sales and profits) while minimizing the inputs (capital and operating costs) for many concepts. While some things have changed since the days of the aforementioned pioneers, much has stayed the same. IE techniques and analytical methodology are critical to ensuring the health and sustainable growth of foodservice concerns. IEs balance the profit goals of shareholders with the service and hospitality needs of patrons to deliver profitable hospitality.

Sensitivity and impact

Close analysis of a restaurant operation would reveal a miniature manufacturing plant. The main differences are certain operating and capital dynamics that could make it more acute and important to apply the principles of industrial engineering and ergonomics. Figure 1 shows some key differences between a pure manufacturing plant operation and a foodservice operation.

Investment. The typical investment in manufacturing involves a few large facilities in a central site to cover a large geographical area. But in restaurants, the investment involves many smaller facilities in each market the concept serves. Such a dynamic development makes "right-sizing" and keeping the investment as low as possible critical to drive return on investment. Most concepts make the facility size as small as

MANUFACTURING VS. RESTAURANTS

Area	Manufacturing	Restaurants
Investment	Few large locations	Multiple smaller locations
Inventory management	Measured in days	Measured in minutes and seconds
Customer service	Measured in days and weeks	Measured in minutes
Labor	Well-trained, stable	Lower training, transient
Product offering	Stable	Always changing

Figure 1. Pure manufacturing plants and foodservice operations differ in several ways.

possible without affecting the sales and throughput capacity. A smaller facility, in addition to driving reductions in building capital, can drive reductions in operating costs, including labor and utilities. Smaller facilities also lower the capital cost for buying and developing the site.

Inventory management. Decades ago, before "just-in-time" principles, typical manufacturing operations had high inventory to ensure fast delivery to customers. The products were produced and inventoried waiting for the customers to order them. Just-in-time changed that, resulting in faster inventory turns and lower inventory costs, often changing the inventory from finished goods to components. The principles of supply management further revolutionized this area. Even under the more rapid inventory fulfillment environments of today, items still are inventoried for at least several days. Food products, especially hot items, lose quality rapidly. Heat is the friend of food as it is cooked, but quickly becomes its enemy because products are held hot after cooking is done, rapidly degrading the quality. So in the restaurant industry, inventory times for consumable products are measured in minutes.

Customer service. In a typical manufacturing environment, customer service times from product order until product delivery are measured in days and weeks, especially for large and costly items. The foodservice and restaurant business measures service times in minutes and seconds. Time is of the essence not only to ensure product quality but also to ensure that you provide good service and hospitality to customers. Every second counts, especially in the drive-through and take-out service mode since the service system is a single line.

Labor. A typical manufacturing operation has a blue-collar, highly trained and stable work force with high tenure among the workers. But restaurant employees are typically transient, which results in a very high turnover rate and lower than desired training. Although restaurant employee turnover has decreased in the last decade, especially during tougher economic times, it is still high compared to other industries. Although companies spend inordinate levels of time and resources to train employees, this high turnover makes well-trained and tenured employees a challenge for foodservice operators.

Product offering. Product offering in the manufacturing arena has grown dramatically in the last few decades. We likely all remember when the grocery shelves were stocked with a few brands of each item we wanted. This has changed. And although the manufacturing sector offers a significantly higher level of products, that sector would be considered stable compared to the foodservice industry. Restaurants must constantly offer new products to stay relevant to the customer and drive the traffic necessary for financial success. A quick look shows that many foodservice concepts offer similar menus, with the chicken places selling burgers and the burger places pushing chicken. This "melting pot" phenomenon has been discussed in several articles. The high level of product offering creates challenges for the operators to maintain high quality and good customer service and hospitality, both critical and sensitive areas for the foodservice business. The concept designs must allow for this menu flexibility, especially for short duration promotions. Such menu growth requirements, along with the need to implement them in multiple locations, are perhaps some of the roadblocks that inhibit more automation in the foodservice industry.

Although there are other areas for comparing foodservice and manufacturing, the aforementioned clearly represent some of the similarities and differences that make the application of ergonomics and industrial engineering techniques so important and so valuable to the industry.

Design focus

Our focus of design in food service is "employee-centric." Placing the employee first may be contrary to all of the "customers come first" service messages we've encountered. But the reality is that without the employee consistently meeting and delivering the brand promise, the concept will suffer, sub-optimizing any effort and impact in the customer hospitality experience.

This drives us always to look for ways to make the employee's job simpler. All the aspects of applied ergonomics materialize in different ways during the redesign efforts. Whether it is through a process flow, an anthropometric study or a delay analysis, where a full service cycle is documented and analyzed to understand where bottlenecks happen, the execution is always through the employee. Since turnover in the industry is often high, applying the "KISS" principle (keep it simple, stupid) is important to make sure that the steps to get new employees competent in their jobs can be done quickly.

Several parameters must be considered and integrated in complete balance to ensure an optimum design. We refer to these as the concept investment and operating "P's." The principles maintain that simple-to-execute processes and procedures, with the appropriate equipment and technology platforms, located in the right place (facility) and of the right size, being executed by the right people (labor), will result in the restaurant's ability to execute the products (menu) and promotions optimally.

Applying principles and techniques of industrial engineering and ergonomics, both directly and indirectly, will facilitate such execution, resulting in employee-centric and friendly designs. Such applications and design focus are the best way to make

"green designs" for employees, which along with equipment platforms and product components that are "green" will maximize the "green" (profit) for the shareholders.

Design process

The process that we follow is composed of several stages. This process has similarities to many other typical design approaches, perhaps with different names. Each design phase goal is to optimize the concept to make it easier for the employee to execute the brand. The phase often starts with a current base of how the concept is operating today, shaping it through the design phases.

In the discover phase, the goal is to understand the intricacies and details of the operation. This includes how all investment and operations resources are used and how they affect profits and hospitality. Several industrial engineering techniques are applied, including time and motion, along with other analytical techniques.

The define phase researches and quantifies several aspects of current and future requirements. This is critical to ensure that resources are "right-sized" for the current and future needs of the business. In food service, it is critical to provide the operations with flexibility to grow the menu offering to stay relevant to the customers' needs. It is not rare to deal with numerous product promotions each year. Tools applied in this phase could include process mapping and capacity analysis.

In the debug phase, all the aspects of the new design are tested, individually and together. This phase's goal is to iron out all the details of the concept and optimize how they interact to deliver the maximum output and result. Computer and real-life simulation often test the new designs thoroughly and project the potential impact they can have on the concept.

The design phase develops general details. Some activities in this stage include specific and detailed workstation drawings, analyzing and defining the optimum adjacencies between the work areas, detailing the processes and procedures that will maximize the benefit, as well as defining equipment platforms and specifications. This step is all about how the operating and investment "P's" will be redesigned and implemented together to maximize the efficiency of the new concept. The debug and design phases often are done concurrently.

The document phase documents the final design details. Changes to the processes, procedures, deployment, equipment platforms and layout are detailed to facilitate communication of the design intent. The application and use of automated design tools could be applied. It is critical for industrial engineers to interface closely with the implementation team, including architects and equipment suppliers.

The deployment phase provides support to the different teams while implementing the concept. Staying involved in this phase is critical, so minimize the likelihood of changes in design that could impact the overall result and design intent. At times, even the smallest change can get the system out of balance and suboptimize the impact of the concept. Techniques in this phase range from project management to all the previously used techniques to validate the impact of the design. This step is a secondary "discover phase" to understand and document the impact of the design and provide further enhancements.

Integration

One important design principle to consider along the full design application cycle is how the new investment and operating platform will integrate with other critical aspects of design. One of these is the retail or "form" aspects of design. Form and function must live in optimum balance.

In addition to keeping an employee-centric and ergonomics approach in each phase, it is critical to keep a customer focus in those areas that affect the customers' experience. This includes the customer service and flow areas and eating spaces. One can say that the retail aspects of the design (the form) drive the initial visit and concept usage intent, while the functional aspects of the design (the function) support the execution of the customer experience, fueling repeat visits. The prior is often more visible to a customer, while the latter may not be. When the functional aspects of the design are not delivered, the customer experience will suffer, affecting the potential for repeat visits. This is why both areas must be designed and integrated using a systemic and holistic design process.

Although an employee-centric and an ergonomic approach should drive the design effort, it is critical to ensure that the other parts of the customer experience, specifically the retail environment, are optimally integrated. Form and function must exist in harmony to maximize the customer experience. After all, although we are proponents of "the employee comes first," we also believe that the customer must be a close second.

Techniques

We use numerous industrial engineering techniques to optimize foodservice concepts. These range from direct ergonomics application to time and motion studies to process mapping and labor management, among many others. In reality, all the techniques consider the human capabilities of the work force and how employees use the resources provided to make it easier for the employees to execute the brand promise consistently. In doing so, employees will deliver a better customer experience that will support brand growth.

A couple of ergonomics applications are important in foodservice design. One area deals with the physical aspect of ergonomics. It considers the anthropometric capabilities of the employees, as well as the time and motion of all activities that employees are asked to do. A simple ergonomic analysis can show the reaches and lines-of-sight employees would have as they interface with a workstation. This type of analysis is done for different populations. For a tall male, the issue may be the line-of-sight to the workstations, which are usually at 36 inches in height from the floor. For a shorter female, it may be reaching items on the shelves above. Considering the anthropometric characteristics of the different populations that will work the stations is critical to optimize the design.

The other area of ergonomics application deals with the cognitive capacities of the employees, considering the mental and information processing capabilities of the employees. Keeping the information flow simple and well-organized is especially important for several reasons. The labor force is transient; turnover means workers often have low training; and foodservice concepts must continually refresh the menu offering to stay competitive. In this area, automated order routing systems, especially "smart" ones that capture dynamic labor demands as well as cooking and processing times, have sprung up significantly in the last decade. The more inefficient order management systems funnel the information through a single point, creating a processing bottleneck in the system, both physical and cognitive. The more flexible order processing systems divide up the order and share the work between the employees. The latter could be achieved through an automated system or by designing a nonautomated, "smart" and optimum manual order management setup. Manual systems offer low capital costs and give operators the flexibility to handle dynamic changes when production, cooking or order handling demands get out of balance in one station or the other.

Time and motion studies are a critical technique in food service. When done right, they provide a great baseline of information to understand system bottlenecks. When applying this technique, make sure the system is broken down into sufficient detail to model the true process and uncover the bottlenecks inhibiting better use of labor. Figure 2 is a simple depiction of the customer experience side-by-side with the production one. Such a graphical representation often analytically finds the bottlenecks that inhibit better efficiency.

Applying an optimum labor management system often significantly boosts the bottom line of the foodservice concept. In the foodservice environment, a large number of concepts manage labor through an empirical, financially driven number. It is almost a "what can I afford to spend on labor" method. This is somewhat understandable since financial goals must be achieved. But in reality, this method often leads to a position where the location cannot drive sales.

The typical initial discussion with clients about labor management usually starts with the question, "How much labor can you save me with a labor management system?" But in reality, labor management systems do much more than enhance profits and increase the bottom line. We like to sell labor for the capability that it has on the top-line sales building and processing capacity, as well as the objective and actionable information it provides to understand thoroughly the labor needs of the concept. Everyone realizes that the best way to increase profits is to increase top-line sales. A work content and activity-based labor system that accounts for changes in items sold and demand changes in small time increments is important to the best labor management system. This is the most optimum way to deploy "the right labor" in "the right place" at "the right time" to drive the most efficient use of the labor resource. In the foodservice industry, labor can account for 25 percent to 35 percent of sales, thus the importance to manage this critical resource.

The methodology for such a system starts with one of the previously mentioned techniques, time and motion, which documents and accounts for all the tasks. A time standard

ORDER DELAY ANALYSIS

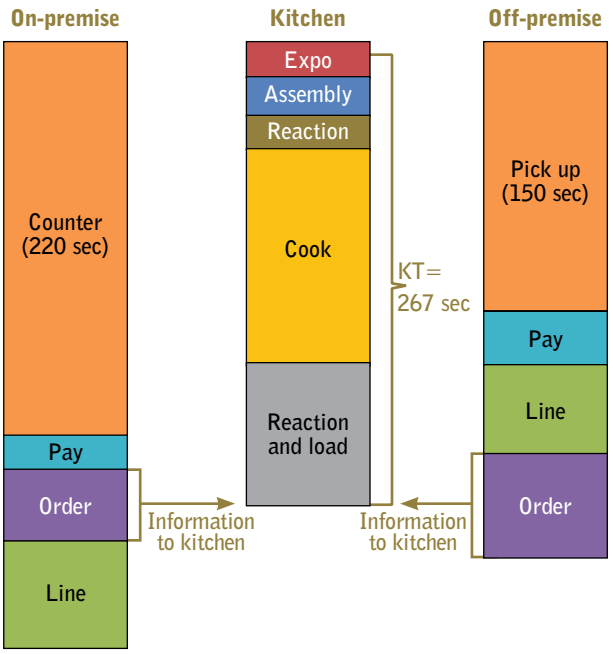

Figure 2. A graphical analysis objectively can discover where bottlenecks are in the foodservice industry.

A MAP FOR THE PROCESS

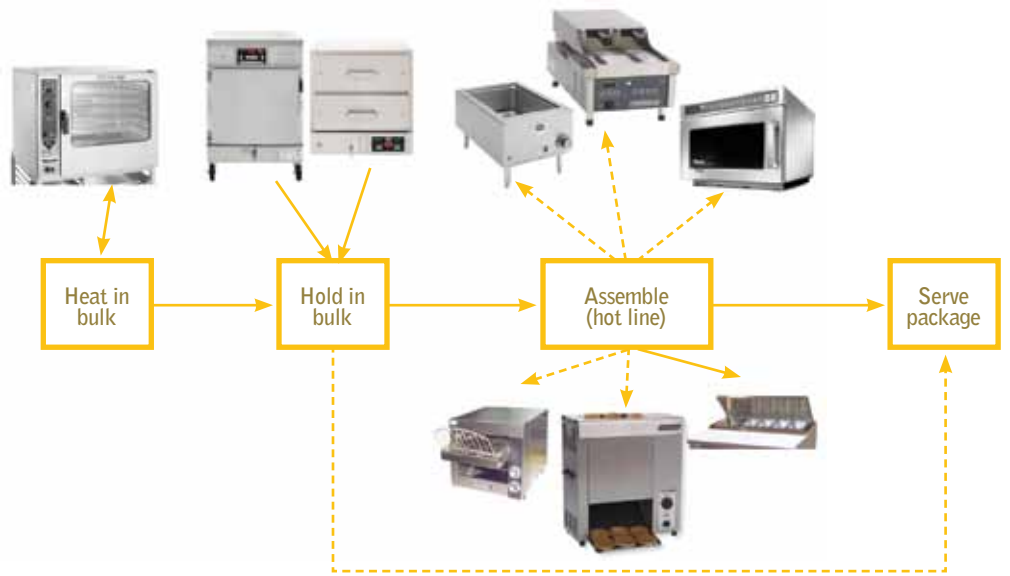

Figure 3. Process mapping can show foodservice industry executives what pieces of equipment are feasible in their restaurant settings.

is applied using one of many techniques, including predetermined, engineering standard systems. Once the tasks are well-defined, then iterations of the actual sales of the foodservice establishment are iterated to define the labor requirements needed and develop the optimum deployment requirements. Often these requirements are then translated into inputs that the back-of-house computerized labor management system can use to create the labor guidelines. Creating the appropriate standards as well as translating them into inputs that the labor management system can understand are activities that industrial engineers are trained to do.

Process mapping is another technique used. Figure 3 shows an example process map for the feasible set of equipment solutions for a new process. The old adage that suggests a picture is worth a thousand words certainly is applicable with this scenario. The process map shown provides the audience with a clear depiction of the feasible pieces of equipment.

Other techniques that can be applied in the foodservice industry include regression analysis for forecasting, simulation to represent scenarios dynamically, capacity analysis to define the right equipment and processing requirements and statistical analysis. Most tools taught in industrial engineering curriculums have some sort of application in this industry.

Conclusions

The application of ergonomics and industrial engineering principles and efforts can add significant value in almost all areas of the foodservice business. Executive project sponsorship for these efforts can come from all the functional areas in the organization. This value is driven by the ultimate goal that all organizations have to increase output, sales and profits while reducing the input, capital and operating costs. Achieving this yields a true and quantifiable gain in productivity and efficiency, driving the profit needs of the shareholders and the hospitality needs of the customers.

The significant value of industrial engineering and ergonomics application in the foodservice industry has been proved by many concepts. This is especially true for multi-unit concepts since the impact of the benefits can be applied and implemented across the full system. Often the changes that would be needed to improve the business can be relatively simple and quick, making it feasible for even smaller concepts to benefit from such applications. The disciplined and rigorous application of industrial engineering and ergonomics principles can help concepts increase profits while improving overall customer hospitality and service.

This will deliver the type of profitable hospitality that can drive brand growth.

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