

The Implementation and Usage of the North American Association of Food Equipment Manufacturers Data Protocol

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INTRODUCTION

In today's commercial foodservice kitchens, individual appliances: store, prepare, cook, hold, and dispense various food products. Traditionally, each piece of equipment operates independently and relies on an employee to turn on, load, unload, clean, and call for service when it is not functioning properly. The North American Association of Food Equipment Manufacturers (NAFEM) Data Protocol changes this operating paradigm by linking foodservice equipment to a central computer.

The origins of the NAFEM Data Protocol began when leading quick-serve restaurant operators became aware that several proprietary kitchen communications protocol were being developed. When the operators realized the cost implications of supporting equipment with multiple communications protocols, they asked NAFEM to lead and manage the effort to create a single industry wide protocol (Perez, 2002). A standardized data protocol allows flexibility for foodservice operators; they are free to select equipment from various manufacturers, also they are free to use the software of their choosing in conjunction with that equipment to best meet their business needs.

Monitoring a foodservice operation closely can reap a variety of benefits for its operators. Examples of these benefits include, enabling large restaurant chains to better manage equipment, reducing turnaround time for maintenance, and lowering labor costs related to hazard analysis and critical control point (HACCP) requirements (Williams, 2007). With such great benefits, one has to question the resistance to implementation of some foodservice operators. Automation has played a crucial role in other industries, bringing greater efficiency and thus greater profits. The foodservice industry is ripe for such a change, and research to explore reluctance is needed to help the industry move forward. This study aims to find the reasons for the sluggish implementation automation in foodservice

LITERATURE REVIEW

In order to justify research in information technology in restaurants it is important to explore the premise that information technology makes a difference in foodservice operations. In restaurants information technology has played an important role in changing a customer's dining experience – the way an order is sent to the kitchen and how an order is placed, are just a few examples. However, literature shows that the hospitality industry is not technology oriented, meaning that implementation of technology is slow (Buhalis & Main, 1998; Siguaw, Enz, & Namasivayam, 2000; Whitaker, 1987).

In an effort to increase efficiency, restaurants are turning to technological advances such as “smart kitchen” equipment (Oronsky & Chathoth, 2007). A “smart kitchen” consists of food preparation equipment such as: freezers, fryers, ovens, chillers, etc., that are enabled to communicate with each other (Perez, 2002). For example, the POS can send instructions to the oven to lower its temperatures so as to prevent overcooking of the new menu item. The foodservice industry and the food equipment manufacturing industry have decided to make all equipment compatible with each other via the NAFEM Data Protocol. However, to date there has been low implementation of this technology (White, 2006).

Tangible benefits that can be achieved in foodservice operation by implementing technology in their operations are: minimization of costs, better employee management techniques, more effective revenue management, and the ability to monitor and analyze customer benefits. Though the use of the technology reported in this section is uncommon, software packages and “smart” kitchen equipment are available when restaurateurs choose to take advantage of this technology. It is imperative to understand why some operators invest in new technology, while other operators wait for the technology to become more ubiquitous before its adoption.

Simple Networking Management Protocol (SNMP) and Transmission Control Protocol/Internet Protocol (TCP/IP) are used as the backbone of the NAFEM Data Protocol. The purpose of using existing networking technology to build the NAFEM Data Protocol was to: foster open standards, enable connectivity, provide for a uniform communication paradigm and keep costs low. Figure 1 shows the practical usage of the NAFEM Data Protocol in the kitchen.

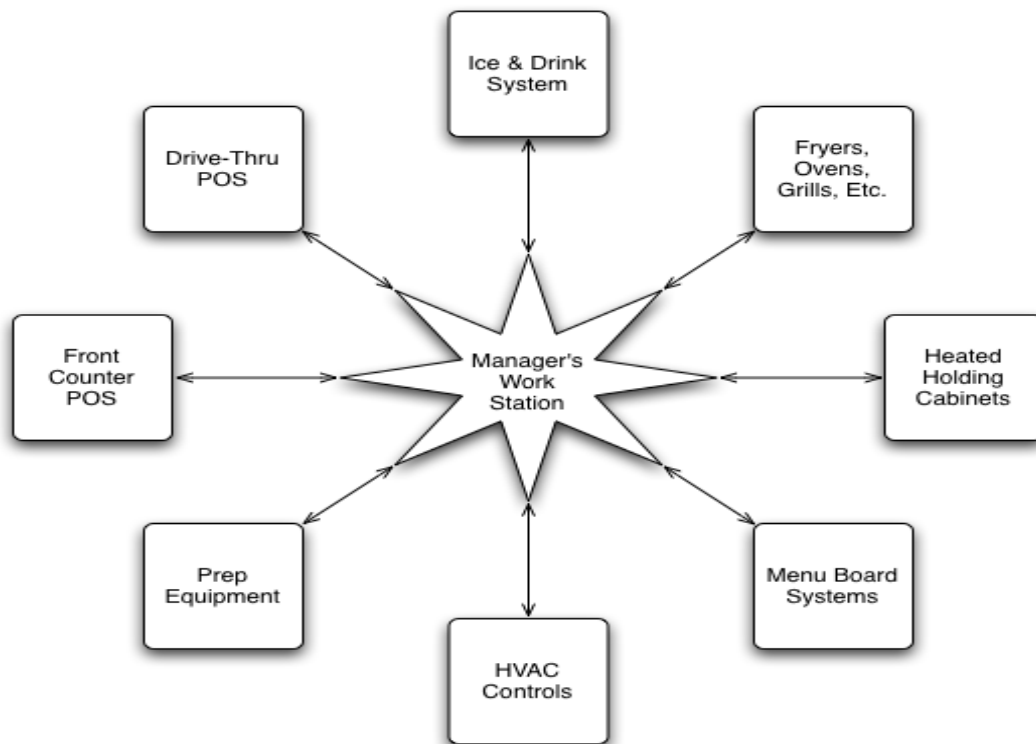


Figure 1. Practical usage of the NAFEM Data Protocol (North American Association of Food Equipment Manufacturers, 2001)

The main criteria in the implementation of automation are economic and technical feasibility. When an automated system could perform a function more efficiently, reliably, or accurately than a human operator or simply replace the human at a lower cost automation has been applied at the highest level possible (Collier, 1983). In the ultimate application of this practice, automation would completely replace human operators in systems. This has not often occurred in practice, however, as even “unmanned” systems involve human operators in a supervisory or monitoring capacity.

Potential barriers to change can be categorized as internal or external, alternatively they can be grouped in terms of perceptual, economical emotional, cultural or technical dimensions (Carnall, 2007; Thomas, 1985). A list of main barriers and resistance to change can be found in Table 1, it should be noted that this list is not exhaustive.

Table 1. A list of main barriers and resistance to change in organizations (Okumus & Hemmington, 1998)

External Factors	Internal Factors
High cost of change	Fear of insecurity
Financial difficulties	Unpleasant previous experience
Time limitation	Commitment to the current practices
Powerful trade unions	Strong organizational culture
Technical difficulties	Internal politics
Government regulations	Priority of other businesses
Lack of skills and resources	

Typically, these barriers are described in terms of the types of resources that are either missing or inadequately provided for in the operating environment. The underlying assumption with external barriers is that once adequate resources are obtained, integration will follow. Alongside of this assumption is that change cannot even begin to happen until necessary resources were in place (Kerr, 1996). The high cost of change, financial difficulties, time limitations, powerful trade unions, technical difficulties, government regulation and lack of skills can frustrate many restaurant firms, especially when having to deal with more than one external barrier at a time. Reduction or resolution of external barriers allows internal barriers to surface allowing for a comprehensive resolution of barriers (Sandholtz, Ringstaff, & Dwyer, 1990).

Internal barriers are typically rooted in underlying beliefs about business operations and may not be apparent to others or even operators themselves (Kerr, 1996). This may be because they are less tangible than external barriers, also, the internal barriers are more personal and more deeply ingrained (Ertmer, 1999). With internal barriers, managers have to confront the difficulty of creating an operating environment that is fundamentally different from the one with which they themselves are comfortable. While it is possible that some operators will not face external barriers of change, in the implementation of technology, external problems may emerge during the implementation process (Okumus & Hemmington, 1998). This suggests external and internal barriers may never be completely eliminated. The barriers to change are dynamic and will evolve throughout the implementation process.

METHODOLOGY

The population of this study consisted of two distinct groups. The first group consisted of corporate leadership of chain restaurants; the second group consisted of restaurant general managers and their equivalents. Each of the two groups was sent a

survey; both groups were surveyed on their awareness of and barriers to the NAFEM Data Protocol.

The first group of participants, which consisted of corporate leadership responsible for making decisions regarding equipment purchasing, was contacted via e-mail, which contained a hyperlink to the website that hosted the survey. Qualtrics.com survey hosted tools were used in the development of the survey webpage. The survey was first deployed May 15, 2009. Because of the low response rate the survey was redeployed, and a new round of e-mail invitations to participants was sent on October 15, 2009. The survey was closed on October 29, 2009.

The second group of participants, restaurant general managers and their equivalents were contacted through a survey sent via United States Postal Service (USPS). The survey was developed in Microsoft Word and was paper-based. The survey was deployed on April 6, 2010 and data collection ended April 25, 2010. All data was collected anonymously and the emails of respondents requesting the summary of results were not associated with their responses.

RESULTS

The results of the study were based on the responses to the surveys sent to restaurant corporate executives and restaurant managers. The restaurant corporate executives were located throughout the United States and the restaurant managers were located in Tippecanoe County, Indiana. A total of 179 emails were sent to the corporate executives. A total of 29 responses were received, however due to surveys being incomplete only 21 were included in the analysis. This yielded a response rate of 11.2%. Of the restaurant managers 586 surveys were mailed, of those 510 were delivered. A total 45 responses were received, however, two were rejected because they were incomplete, bringing the total usable surveys to 43, an 8.4% response rate.

The main results of this study are that awareness of the NAFEM Data protocol is low. This is evident by the fact that over 50% of the respondents were unfamiliar with the NAFEM Data Protocol. The fact that the response rate was so low may also indicate a lack of awareness. Some individual may have been reluctant to participate because they were unaware of the protocol or did not think the impact it can have on an operation was significant enough to warrant their participation. Lastly, the answers assessing the awareness did not always match the capabilities stated in the NAFEM Data Protocol specification literature, again indicating a low awareness level.

Another result that can be drawn from this study is that restaurant managers and corporate executives generally have different perceptions of the barriers to the implementation of 'smart' kitchen equipment. The only perceived barriers that were not different were employee resistance and negative effects on the customer; the reason that the two barriers may not be different could be both groups perceive that neither customers nor employees would be affected by the implementation of the NAFEM Data Protocol. The reason that all other barriers to implementation are significantly different could be due to the fact that the perspective of corporate executives and restaurant managers are different. While corporate executives have an overall picture of operations

and have to operate many different restaurants, the restaurant managers have a unit level view of the operations. This means that the restaurant managers are more concerned with the day-to-day handling of tasks in a restaurant.

Table 1. Comparison between corporate executives and store managers

Barriers	p-value	
Operational priorities	0.000*	
Lack of understanding of the NAFEM Data Protocol	0.004*	
Cost of implementation	0.001*	
Current economic conditions	0.009*	
Lack of technological assistance	0.004*	
Legacy equipment	0.001*	
Internal politics	0.014*	
<i>Employee resistance</i>	<i>0.361</i>	Th
<i>Perceived negative effects on customer</i>	<i>0.731</i>	is study
		also found
		that even

*significant at $\alpha=.05$

though both groups perceived different hindrance levels in the implementation, both groups rated external barriers as being more significant problems to overcome than internal barriers based the mean score of the Likert scales. This is consistent with information found in the literature review: external barriers often mask underlying internal barriers. The internal barriers may become apparent only after external barriers are removed; for this reason external barriers are rated higher than internal barriers. It may be advisable to target marketing towards external barriers and use different marketing techniques between the two different groups of corporate executives and restaurant managers.

One of the most surprising results was restaurants with greater gross sales, restaurants with more customers and restaurants companies with more units being more likely to have implemented the NAFEM Data Protocol or 'smart' kitchen equipment. This means that size of a restaurant is unrelated to implementation of 'smart' kitchen equipment. This was surprising since the protocol was developed base on requests from leading quick-serve restaurant operators. One may conclude that the sample size may have be one of the reasons this hypothesis is unsupported. Another reason was that the analysis was done on per unit sales and not total corporate sales.

CONCLUSION

In summary, it can be stated that marketing of the NAFEM Data Protocol compliant equipment needs to be specifically targeted for both corporate executives and restaurant managers; both groups have different concerns regarding the implementation of 'smart' kitchen equipment. Marketing the NAFEM data protocol properly is essential because the data showed that that the more an organization understands and knows about the NAFEM Data Protocol the more likely they are to own equipment that support remote equipment communications. Lastly, the revenue and number of customers served in a restaurant cannot predict their likelihood of implementing 'smart' kitchen equipment.

The implications of this research should be considered as a whole rather than its parts. The main premise of this research was the idea that 'smart' kitchen equipment is useful in restaurant operations and there are major barriers in its implementation. The study measured both restaurant corporate executives and restaurant managers' perceptions.

When developing an advertising program to increase the awareness, NAFEM needs to differentiate between independent restaurants/general managers and corporate executives. As determined by the data these groups have differing perceptions of the barriers. For this reason two completely different approaches should be taken in terms of marketing the NAFEM Data Protocol. The low awareness of the NAFEM Data Protocol should also be considered when evaluating the effectiveness of the current marketing strategies.

NAFEM should focus the majority of their marketing efforts on educating corporate executives. These individuals are responsible for purchase decisions for multiple units, and have greater available resources than individual restaurant managers. This study found that restaurant corporate executives that have the most familiarity with the NAFEM Data Protocol are the most likely to use equipment that support remote communication. NAFEM should target reducing the impact of external barriers; in particular, operation priorities and cost of implementation.

Although formal statistical analysis could not be conducted due to the sample size, the means seem to indicate that external barriers of implementation seem to be of more concern than internal barriers of implementation. This is important because external barriers are easier to resolve than internal barriers to change (Ertmer, 1999; Okumus & Hemmington, 1998). A factor to this can be that internal barriers are more likely to become a concern to managers once external barriers have been resolved. The implication to restaurateurs is that once external barriers such as financial ability and cost of equipment are resolved there will be a greater acceptance of 'smart' kitchen equipment and the NAFEM Data Protocol.

LIMITATIONS AND FUTURE RESEARCH

A limitation of this study was the sample sizes. Neither sample was large enough to perform desired statistical analyses. Another limitation for restaurant managers was that the survey was only conducted in one county in Indiana, thus making it impossible to generalize the results nationally. When comparing the two groups, restaurant managers and corporate executives, the small sample size of the corporate executives may have influenced the results of the statistical analysis.

Because of the nature of the issues surrounding awareness and implementation of NAFEM Data Protocol compliant equipment, a face to face interview would yield better results and increased participation in the study. This should be done for both restaurant managers and corporate executives. This would allow researcher to conduct deeper research into the industries' attitudes of 'smart' kitchen equipment and whether it will provide them with safer foods at a lower price.

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