An Information Systems Design Framework for Facilitating TQM Implementation

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This paper provides a framework for information systems (IS) design for TQM implementation. The framework consists of three main phases. In the first, TQM implementation tasks are established. These tasks include identifying customer satisfaction variables (CSV), translation of CSV to firm response variables (FRV), benchmarking, and continuous improvement. The second phase includes analyses of communication effectiveness requirements between the organizational entities such as sales/marketing, top management, operations, accounting/finance, and also with the customers. In the third phase, appropriate IS component inventories for different communication interfaces are generated. This was accomplished by first mapping the TQM implementation tasks for the communication interfaces. Then appropriate IS/IT solution was recommended for each interface. The final IS design is achieved by integrating IS components at technological, functional, and strategic levels. Finally, a hypothetical example for a large manufacturing firm is provided.

Total Quality Management (TQM) is a philosophy that emphasizes customer satisfaction as a driving force for all organizational activities. It results in many benefits to organizations (Chalk, 1993; Sabbaghi, 1990; Rooney, 1990; Vansina, 1990). Several approaches to TQM have been proposed (Adam, 1994; Flynn, 1994; Caudron, 1993; Powell, 1995). We adopt the definition of TQM from Flynn (1994) “An integrated approach to achieving and sustaining high quality output, focusing on the maintenance and continuous improvement of processes and defect prevention at all levels and in all functions of the organization in order to meet or exceed customer expectations.”

A number of studies have discussed TQM implementation processes (Ayres, 1993; Sabbaghi, 1990). Some others tried to relate TQM to operating and financial performance (Adam, 1994). Some of the current research have identified an integrated organizational communication system as a critical success factor for TQM Implementation. For example, Schoenberger (1983) and Tillery (1985) concluded that cooperation, coordination and integration of many different functions within the organization is a key aspect of total quality management. Flynn (1994) describes the necessity of linkages between every pair of functions, and forming a web like networking of all functions. Adam (1994) and Powell (1995) through empirical studies have concluded that factors such as objective feedback on performance, and empowerment are more significant than certain other factors such as process improvement and training.

Several of the above-mentioned studies in the TQM area have established the importance of an integrated organizational communication system. However, there is a lack of theoretical or empirical research to suggest how this can be done.

In a traditional organization, growth of information technology (IT) often is not well planned. Most of the growth in IS/IT occurs in pockets and in isolation (Doll and Vonderembse, 1987). Generally, departmental or individual managers vie for sophisticated IT in their own domain. Most often, a decision to implement such technology is born out of the individual desire to be technologically up-to-date rather than from some business necessity. This is contrary to the TQM strategy. Innovative organizations are relying increasingly on IT for maintaining and sustaining the strategic advantage over their competitors (Ali and Miltenburg, 1991; Goldhar
and Jelnik, 1985; Kettinger, et al., 1994; King and Teo, 1994).

In the last few years, we have seen the explosion of technologies such as the Internet, intranet, extranet, data mining, and data warehousing which have the potential of alleviating some of the pitfalls of traditional culture. Also, the recent issue is not about lack of communication, rather it is about how to make communication effective.

In this paper, we propose an approach for designing and using IS for effective integration of organizational communication to support TQM implementation. The paper is organized as follows. In the next section, we discuss the four tasks for TQM implementation. Effective communication requirements for these tasks are identified in the following section. The next section matches IT for meeting communication effectiveness needs. Then, integration through IS at several levels is outlined. An example scenario of integration of IS is provided. The paper concludes with a discussion of future research directions.

**TQM Implementation Process**

Figure 1 provides a general framework for IS design for TQM implementation. Four tasks in the TQM implementation process are identified in the figure. A brief discussion of each follows.

![Figure 1. Framework for IS design for TQM Implementation](image)

**Task 1: Identifying Customer Satisfaction Variables (CSVs)**

The ultimate TQM goal is to attain a high level of customer satisfaction (Marquardt, 1992). Customer satisfaction is multi-dimensional in nature (Mathers, 1991; Rooney, 1990; Ross, 1993) consisting of many CSVs. Some are generic; e.g., customers want a well-performing, reliable, affordably priced and long-lasting product. Although the set of CSVs may be constant, the relative importance of each CSV may change over a period of time.

Customer satisfaction is dynamic in nature and is influenced by various factors in the business environment, especially competition. Consider the case of price as a customer satisfaction variable. In the personal computer industry, a customer’s perception of price for a given performance level is constantly changing due to competition. As a result, CSVs need to be continuously monitored.

Garvin (1987) discusses eight areas of CSVs. They are 1) performance; 2) features; 3) reliability; 4) conformance; 5) durability; 6) serviceability; 7) aesthetics; and 8) perceived quality. Specific variables may be identified from each of these areas. Pursuing perfection in all of these may prove to be neither prudent nor possible (Garvin, 1987). Firms may choose to pursue only certain of these variables; e.g., Wal-Mart may pursue price and product availability, while L.L. Bean seeks reliability and durability.

A-B-C analysis (Meredith, 1992) can be used to narrow down the set of CSVs that a firm wants to focus on. Category “A” variables which are few in number, will have the greatest impact. The variables in the “B” category are moderately important and should also be considered; however, “C” variables are trivial, and have marginal impact. Table 1 gives some examples of CSVs and their categorization in a hypothetical situation. A-B-C classification is contingent on the nature of the product or service; e.g., appearance may be classified as a “C” for machine tools, but as an “A” for garments.

**Task 2: Translating CSV to Firm Response Variables (FRVs)**

Customer satisfaction variables generally define customer expectations and needs, often in broad and subjective terms. Sometimes they cannot be objectively measured. In such cases, it is important to map these CSVs to some measurable variables (Garvin, 1987). These measurable variables hereby are called firm response variables (FRV). Organizations need to manage these variables and track their performance over time. Table 1 presents some examples of this mapping process. The mapping can be either one-to-one which implies that a CSV can be represented by one FRV, or one-to-many implying the necessity of using multiple FRVs for a single CSV. The case of many-to-one relationship is not very prevalent. In Table 1 if price is a CSV then corresponding FRV may be unit cost, and unit overhead cost which affect the pricing strategy.
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