

AN EMPIRICAL EXAMINATION OF THE LINKAGE BETWEEN ORGANIZATIONAL CULTURE, PROCESS MANAGEMENT, AND PLANT PERFORMANCE

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ABSTRACT

Often process management practices are implemented without ensuring a supportive culture. This study proposes that there are different enabling cultures for process design, improvement, and control. The results indicate that there are different enabling cultural values for each dimension of process management and that process design is the key component to achieving high performance.

Keywords: Organizational culture, process management, quality

INTRODUCTION

Industry has observed the benefits of process management through the eyes of companies like GE, Motorola, Toyota, and Honeywell. But despite the tremendous success that these companies have experienced, there are many other companies that have not seen such gains in operational performance. One cause for the lack of success of these programs is the inability to change the organizational culture to be more supportive of these new initiatives [1] [2]. Culture is an “important concept in thinking about organizations since people and processes must combine to produce output” [3]. The objectives of this study are to examine the different cultural values that support process management and evaluate the impact of process management on operational performance.

BACKGROUND

Process management is the design, control, and improvement of processes that transfer inputs into outputs [4]. The design, control, and improvement of processes requires that organizations maintain stable processes (control) while also having the flexibility to change and create new processes (design and improve). Simultaneously, organizations must balance the internal and external perspectives of the business. Organizations have to be focused on attaining efficiencies

and maintaining consistent quality internally, as well as, ensure that processes are meeting customer needs and responding to changes in the environment. Design, improve, and control require different supporting values that make effective implementation of process management more challenging. For example, values associated with creativity, flexibility, and teamwork may be better suited for process design, while values associated with uniformity, consistency, and stability support process control. Establishing a supportive internal organizational environment can be challenging when different dimensions of process management compete for different organizational values.

Culture is defined as a shared set of beliefs, values, and norms [5]. There are a number of cultural frameworks in the management literature [6] [7]. However, these frameworks do not capture and theoretically explain the complexity of trying to balance different sets of values. The Competing Values Framework is an organizational culture model that is based on the competing tensions present in organizations [8]. The CVF consist of a horizontal axis representing internal versus external focus and a vertical axis representing stability versus flexibility. A unique cultural type is conceptualized in each of the four quadrants and organizations can embody multiple cultural types.

The hierarchy culture encompasses stability and the internal organization. This cultural dimension represents values associated with bureaucracy, standardization, rules, procedures, and centralized decision making so that organizational control and order is maintained. The group culture also focuses on the internal organization but embodies the values associated with flexibility as opposed to stability. This type of organization values teamwork, togetherness, empowerment, shared values, common goals and consensus on decisions. The developmental culture emphasizes flexibility with an external focus. This type of organization culture flourishes in a flexible, dynamic environment; so creativity and adaptability, as well as risk taking are valued. The last culture type is rational culture. This cultural dimension is characterized by values associated with goal setting, goal attainment, profitability, and efficiency.

HYPOTHESES

Our theoretical framework proposes that organizational culture is directly related to the dimensions of process management which is then linked to plant performance. Hence, the elements of process management mediate the relationship between culture and performance.

Process design enabling culture

Process design is the development of new processes and is a means for adjusting to a changing environment [4]. Plants must be creative and flexible in order to develop and implement new processes [9]. Group and developmental cultures are oriented towards the flexibility dimension that relates to process design. Group cultures emphasize teamwork and employee learning and participation, which is vital to designing a new process. Developmental culture is also compatible with process design activities since this culture values change and innovativeness.

H1: Developmental culture is positively related to process design.

H2: Group culture is positively related to process design.

Process improvement enabling culture

Process Improvement is defined as changing existing processes to enhance performance [4]. A culture supportive of process improvement must embrace employee participation, sharing of ideas, and teamwork [4] [10]. These types of values are affiliated with the group culture orientation. The rational culture, which emphasizes goal-setting, productivity, and goal attainment, is also hypothesized to enable process improvement. Improvements are geared towards increasing business performance of efficiency and productivity. Projects typically are goal oriented and have the clear purpose of fixing a process problem and achieving performance goals.

H3: Group culture is positively related to process improvement.

H4: Rational culture is positively related to process improvement.

Process control enabling culture

Process control maintains the consistency and stability of existing processes [9]. The use of process control helps to ensure that goods are not only produced consistently, but they are also produced to meet customer requirements [4]. A rational culture is customer focused which promotes values aligned with ensuring that products consistently meet or exceed customer demands. In a hierarchical culture, following procedures to avoid errors emphasizes the importance of internal control. Also, uniformity and consistency are stressed in a hierarchical culture supports the production of products with minimal variation.

H5: Rational culture is positively related to process control.

H6: Hierarchical culture is positively related to process control.

Process management and performance

Process management aims to improve operational processes [11]. This occurs through multiple means: continuous monitoring, improvement of current processes, and the design and development of new processes. In the planning stage, process design should include customer requirements and design elements that will reduce defects, rework, and unit cost [9]. Process improvement should be focused on reducing variability that will increase yields and productivity that in turn impacts cost, quality, and delivery [12]. Processes must also be monitored and controlled to ensure performance [4]. Process control tools and techniques are used to track the stability of a process and make certain that the goods are produced consistently and conform to specifications.

H7: Process design is positively related to plant performance.

H8: Process improvement is positively related to plant performance.

H9: Process control is positively related to plant performance.

METHOD

Data

The unit of analysis for this research project is the plant level. Plant level data collection captures information about process management practices where they are used on a routine basis. Data were collected in multiple industries and multiple countries through the High Performance Manufacturing Study - Round 3 (HPM). An international group of researchers worked to collect data from three industries in eight countries. The countries were selected as representatives of industrialized countries. The three industries of machinery, electronics, and transportation parts suppliers were selected to represent mature industries that compete globally. Data were collected from multiple respondents in 238 plants representing a response rate of 65%.

Measurement

The cultural quadrants in our study were measured using items similar to the Competing Values Framework measurement instrument [8]. Items were also chosen that were representative of process design, process control, and process improvement based feedback from subject matter experts. Each item is measured on a 7-point Likert scale. The respondents included direct laborers, supervisors, and managers.

Competitive plant performance was measured by separate constructs of cost, quality, delivery, and flexibility. The plant manager responded to subjective indicators used to measure each of these four dimensions of performance. Each measurement item is measured on a 5-point Likert scale (poor-low end of industry to superior) in which the plant is compared to other plants in its industry on a global basis. These measures have been used in several other studies providing evidence of content validity.

Analysis

The proposed model is tested via Structural Equation Modeling using maximum likelihood estimation with the item level covariance matrix as the input. The two-step method of testing the measurement model using confirmatory factor analysis prior to the structural model was followed. The exogenous latent variables (cultural dimensions) were allowed to correlate. It is possible that cultural values and process management elements could vary by country and industry, thus inducing additional effects in the model. Data were standardized by industry and country prior to running analysis to control for potential industry and country effects. Normality and statistical power were checked and pose no issue for this analysis.

Validity and Reliability

Four models were examined each with a different plant performance measure of cost, quality, delivery, and flexibility. Because there are separate structural models for each dimension of performance, two measurement models were created. The first model included the cultural dimensions and elements of process management. The second measurement model consisted of the performance measures. Fit indices for both measurement models exhibit acceptable fit. All

factor loadings are statistically significant at the $p < 0.001$ level providing evidence of convergent validity. Pair-wise comparison method was used to evaluate discriminant validity. An analysis of all pairs of constructs showed a significant difference for all pairings at the $p < 0.001$ level. Cronbach alpha and the composite reliability were calculated to determine reliability. Both measures of reliability are close to or above the critical threshold of 0.70 for each construct.

RESULTS AND DISCUSSION

Fit indices suggest acceptable fit of the models to the data. The ratios of chi-square to degrees of freedom are approximately 2.0 for all models. Similarly, the models have acceptable RMSEA, NFI, and CFI values. For all models RMSEA ranges from 0.06 to 0.067. NFI and CFI are above 0.9.

Results of the structural relationships indicate that the developmental culture has a significant strong positive relationship with process design. There is also a statistically significant relationship between group culture and process design as predicted. The coefficients in all models are significant ($p < 0.0001$) giving strong support for H1 and H2. The flexibility dimension associated with each of these cultural types is a necessary aspect for process design. A flexible orientation helps organizations to adapt to new products, environmental uncertainties, and market changes [8]. An external orientation helps to identify customer needs which should be incorporated not only into the product design, but understood for the design of the process too [11]. Designing new processes is often a cross functional effort. A group culture helps to facilitate communication and an openness to others idea which is necessary when developing new processes.

Also, a significant link exists between group culture and process improvement for all models with $p < 0.0001$. However, there is a lack of statistical significance with rational culture. So while there is support for H3, there is a lack of support for H4. As expected, process improvement is supported by an organizational culture that values group interaction, teamwork, cohesion, and idea sharing. Valuing the opinion of others and a sense of common purpose helps to motivate creative problem solving for process related issues [10]. Group oriented cultural values will help create an environment where workers are empowered to not only share ideas, but to also individually improve certain aspects of the manufacturing process. A rational culture does not appear to influence organizations' ability to enhance their manufacturing processes. Although, values associated with a rational culture hinge on goal accomplishment and productivity, they are also oriented towards stability. Change is the essence of process improvement. A focus on stability and consistency may stifle the ability to change and improve.

Process control was hypothesized to have a positive relationship with rational and hierarchical cultures. Rational culture does indeed have a positive significant relationship with process control at the $p < 0.001$ level, providing support for H5; whereas, the results show a lack of relationship between hierarchical culture and process control for H6. Goals and objectives related to process and product quality are essential to operating a plant. Process control oriented practices are often implemented to monitor performance towards these goals. A rational culture is associated with maximizing output and the values are based on goal accomplishment and productivity, providing a cultural type conducive to the use of process control practices.

However, process control is not enabled by the hierarchical culture. A hierarchical culture can become too rigid and too controlling of routine tasks [13]. This mechanistic type of culture provides a less supportive environment for process-related quality practices [14]. Its emphasis on rules, procedures, and formalization diminishes employee empowerment.

Process design is found to be positively related to all performance dimensions at the $p < 0.01$ significance level which supports H7. The design of new processes turns out to be a significant factor in distinguishing higher plant performance. Plants can establish a competitive advantage by planning and implementing new processes to support the changing environment.

In contrast, there appears to be no significant relationships between neither process improvement nor process control and competitive performance dimensions. Thus, H8 and H9 are not supported. Process improvement and control are not factors in differentiating high performing from low performing plants. One possible reason for the lack of significant relationships between process control, process improvement, and competitive performance is that a majority of plants are using various tools and techniques to monitor process stability and improve processes, thus not providing any competitive advantage. As plants begin to institutionalize similar practices, the differentiating effect of those practices may dissolve over time and become a natural part of the manufacturing environment as opposed to a unique, inimitable resource that provides a competitive advantage. Hence, these practices may be necessary for plants to compete, but plants must implement additional practices to surpass the competition.

An alternate explanation is that the relationships between process improvement, process control, and operational performance may be contingent upon other factors. The context in which these practices are applied could potentially influence their relationship with plant performance [15] [16].

CONCLUSION

This study provides a starting point for future research by recognizing there are three components of process management; design, control and improvement. Not all of these three components are related to the same type of cultural values. The complexities of embedding these different value sets into a supportive culture can help to explain the challenges in implementation and institutionalization of process management. Those plants that have uncovered how to sustain this type of enabling culture, for instance Toyota, give themselves an advantage over the competition. Additionally, our results demonstrate that process design is the key component to achieving high performance. It is hoped that the results from this study will spur further research on process management.

Due to space limitations, all figures, tables, detailed statistical results, and references are available upon request from Janine Sanders, sand8871@stthomas.edu, 651-962-4158.