Communities of Practice in Quality Improvement Initiatives

Abstract

The field of Operations Management (OM) has evolved over time from being called Factory Management in the Post-Industrial Evolution era to Production Management post world war and recently as OM 1970s onwards (Sprague 2007). One of the important dimensions of OM has been the focus on Quality. Over the years many quality philosophies, like - Quality Control , Design of Experiments, Total Quality Control, Total Quality Management , Six-Sigma, Toyota Production System, Business Process Reengineering; were propounded. One such concept that emerged in the quality stream is Lean Manufacturing (LM).

The origin of Lean concept was from Japan in the aftermath of Second World War, when Japanese manufacturers were faced with massive resource constraint to rebuild their facilities. Toyota was one such Japanese firm which championed this concept by producing automobiles greater variety of products with lesser resources and defects (Stone 2012, Bhamu and Sangwan 2014). The benefits of LM such as improved cycle time, defects and scrap, inventory, and overall equipment effectiveness are well documented. In the recent time, LM is being implemented in many Small and Medium Enterprises (SMEs) firms across the world to avail the benefits such as reduced cost and improved productivity and quality so as to become competitive in a global scenario. But these SMEs face many challenges with respect to LM implementation and long term sustenance (Baker 2002, Blanchard 2007, Marvel and Standridge 2009, Bhasin 2012, Moyano-Fuentes et al. 2012) like resource crunch, lack of long term orientation, employee skill (Achanga et al. 2006, Pedersen and Huniche 2011, Rymaszewska 2014). LM in SMEs is observed to generally happen in solitude, where in the individual motivation and efforts of the firms are the main driving force. Due to the stand-alone implementation by firms, they face many obstacles and end up reinventing existing

solutions(Achanga et al. 2006, Pedersen and Huniche 2011, Panizzolo et al. 2012, Rymaszewska 2014) which needs to be addressed.

One of the way firms can overcome these shortcomings is by engaging in support groups like Communities of Practice (CoP) where in firms share their knowledge and experiences. The concept of CoP has existed in the knowledge management domain for many years and being adopted by many firms to enhance their knowledge (Li and Jhang-Li 2010). It was observed to have positively impacted employee skills, innovation, and responsiveness. CoP was also perceived to aid in implementation of change initiatives in firms (Borzillo et al. 2012), but have not been studied in context of SMEs (du Plessis 2008, Hughes et al. 2009).

Based on these insights, this work attempts to understand the impact of Communities of Practice on quality initiatives of the firms and the overall quality level of the community (industry) itself. This work focuses to answer the following research questions:

RQ 1: How do the communities of practice for quality initiatives affect the performance of participating firms?

RQ 2: How does adopting communities of practice for quality initiatives impact the overall level of the quality of the entire community (i.e., industry)?

Through a game theoretic approach this phenomenon is studied for the cases where the CoP efforts are perfectly substitutable and complementary in nature. The phenomenon is modeled as a two player game initially then extended to a three player game. The firms need to decide on their individual quality effort and CoP quality effort and then compete on the price. This decision making model is solved for the scenarios of Simultaneous case, Sequential cases for obtaining equilibrium solutions.

Then experiments were conducted to analyze this phenomenon in three condi-

tions of cost of individual quality, ϕ, and cost of CoP quality, ϕ_{cop}, ($\phi > \phi_{\text{cop}}, \phi = \phi_{\text{cop}}$ and $\phi < \phi_{\text{cop}}$) for the scenarios where firms were symmetric, firm 1 mildly dominant and firm 1 dominant based on their market shares. These experiments focused on two key performance metrics for the industry: Industry Profit and Industrial Quality. It was seen that the industry benefited if firms are asymmetric in their market potential. The higher the degree of asymmetry between the two firms, the better for the industry. However, if this process goes too far, the non-dominant firm makes losses and may leave the CoP.

Asymmetry in market potential improves the industry profits but there is a threshold beyond which it is not desirable for the non-dominant firm to stay in the CoP, Industry profits are highest when the cost of doing CoP is lesser than individual quality costs, and CoP for quality initiatives improves the industry quality levels. The firms are better off when the CoP efforts are perfectly substitutable as compared to when the CoP efforts are complementary. There were no significant differences in the firm's performance in the two sequential decision scenarios. The similar patterns were observed in the case of dyadic and triadic firms.

This study contributes to the extant literature in the following ways. The work models CoP quality as a collaboration function and explores the function as perfectly substitutable and complementary. The literature discusses collaboration functions, but this work is among the first to apply it to quality initiatives. The firm's quality is modeled as two entities, individual quality, and CoP quality. The literature seldom considers them separately. This study explores the effect on quality decisions when firms make decisions simultaneously and sequentially.