Analysis of Performance Improvement Brought by the Application of an ISO 9001 Quality Management System With TOPSIS Approach

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ABSTRACT
Quality management systems (QMS) are applied by companies to improve their performance in their processes, service or product quality measures. The application of QMSs force the companies to evaluate their existing processes and develop action plans to improve their middle and long-term performance levels. The applications also require inspection, approval, and certification by independent audit firms. In this study, improvement in the performance level of a real company brought with the application of ISO 9001 QMS is evaluated with Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). The analysis shows that the company’s performance improves considerably with the application of ISO 9001 QMS.

KEYWORD
ISO 9000 Standard Series, ISO 9001, Quality Management System (QMS), TOPSIS

INTRODUCTION
Companies must improve their internal structures and processes continuously to meet or even exceed their customers’ expectations and requirements (Taşçı et al., 2013). The continuous improvement must be performed within a company in a consistent, coordinated and controlled manner. ISO 9000 series of quality management system (QMS) standards provide companies a systematic improvement approach. It is noted in the literature that as soon as the ISO 9000 QMS is installed, companies can start to observe performance improvements brought by the application (Kusumah et al., 2018; Nikabadi et al., 2014).

There are various studies about QMS applications available in the literature (Şale, 2001; Manders & Vries, 2012; Huoa, Hana & Prajogob 2014). For example, Jain and Samrat (2015) surveyed 62 companies to understand the difficulties in establishing a QMS. Pheng and Teo (2004) analyzed QMS applications in construction companies and found QMS applications

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brought lower quality costs and higher job satisfaction. Nowicki (2015) focused on applications of ISO 9001 QMS standard series and provided application examples in different sectors. Padma, Ganesh and Rajendran (2008) and Bandyopadhyay (2000) measured the impact of decisions made during ISO 9001 audit and certification process by using various performance criteria in Indian companies. A similar study is performed by Hamza and Alinazi (2013) in petroleum and natural gas companies. Their study showed that the three most important factors affecting the companies positively are “working with the certification bodies operating globally, qualifications and training of auditors and communication between auditors and the companies that are being audited”. Ilkay and Varinli (2005) compared the companies with ISO 9001 certification in Turkey, Europe and other parts of the world. Corbett et al. (2005) studied the financial influence of ISO 9000 certification in the companies in the USA. In a similar study, Terlaak and King (2006) found that ISO 9001 QMS certification provides a competitive advantage for companies in the USA. They observed that certified companies grow rapidly after their certification. In another study, Buttle (1997) showed that the most important benefit of the certification process is increased profits and more satisfied customers. In another study, Escanciano, Fernández and Vázquez (2001) analyzed 749 companies in Spain and concluded that application of QMSs brought reduced managerial complexity and increased competitiveness in markets. In a national study performed by Koçyiğit and Duran (2011), 274 small and medium sized companies are analyzed in Turkey and they found that TQM practices improve the overall performance of the companies.

Although there are many studies available in the literature related with the ISO 9001 QMS applications in various industries, the authors could not find any study focusing on oil drilling and distribution industry sector. The authors’ literature survey also showed that a performance analysis and measurement model that quantifies the effects of ISO 9001 certification process on a company’s success before and during the application is not available in the literature. This study aims to fill these two gaps in the literature by developing a performance analysis and measurement model to quantify the performance levels of a company in oil drilling and distribution industry sector at various criteria and then combine them to a single overall performance score using TOPSIS approach. In this study, the developed model is applied to compare a company’s performance over the years, before and during the ISO 9001 application.

CONSTRUCTION OF A PERFORMANCE FRAMEWORK FOR ISO 9001 QMS APPLICATION IN A STATE COMPANY

ISO 9001 QMS standards present steps and requirements of a systematic QMS application for companies to implement. The implementation of the QMS generally requires auditing and certification after its application. This study aims to measure the improvement brought by a real application of ISO 9001 in a public company, which is 100% state owned and whose activities range from oil exploration and drilling oil wells to trade and distribution of petroleum and its products, by comparing the performance levels at various criteria before and during the application. A diagram showing the implementation model of ISO 9001 QMS in the company is provided in Figure 1.

An important part of implementation of the ISO 9001 QMS is to establish a performance monitoring, measurement and analysis framework to determine the achieved performance levels and determination of whether the achieved levels are satisfactory or not. If the achieved levels are not considered as satisfactory, improvement actions must be applied to increase the performance to the appropriate levels. Within the scope of performance framework, it is necessary to determine appropriate criteria to evaluate performance. The quality team, which is responsible for the implementation of the ISO 9001 QMS in the company, selected “lost time incidence rate”, “training hours per person (hour)”, “number of corrective actions started”, “number of corrective actions finalized”, “number of
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