

TOTAL QUALITY MANAGEMENT AS A POTENTIAL SOLUTION TO RISK MANAGEMENT IN LOW-LEVEL WORKERS

Ali AGHAZADEH ARDEBILI¹, Elio PADOANO²

¹ University of Trieste, Trieste, Department of Engineering and Architecture
Edificio C₇, Via Valerio n° 10, Trieste (TS), Italy

² University of Trieste, Trieste, Department of Engineering and Architecture
Edificio C₇, Via Valerio n° 10, Trieste (TS), Italy

Abstract

Existing risk management tools are not sufficient to solve the problems related to uncertainty, especially when low-level workers are involved and complicated mathematical approaches are not suitable for solving this problem. This study identifies the risks associated with low-level workers and suggests Total Quality Management (TQM) as a systemic solution to face them, in order to reach the maximum efficiency in the workers' activities; also, we investigate effective features of TQM in activity risk management. An interview has been done to study existing situation in industry and the results show TQM could be a reliable approach to manage low-level activity risks.

Keywords: Total Quality Management, Risk Management, Blue-collar Workers Risk

1. INTRODUCTION

Continuous improvement and quality management are common means that all companies use to sustain their business, but the uncertainty in the functional aspects of each activity and the existing risks could be severe threats to achieve their goals, maintain sustainability and keep on improvements. Common practices in project-based firms classify risk levels into four categories (project level, function level, portfolio level, and enterprise level [1]) and risk management plans often target high, middle or low-level management in which improvement or mitigating measures are usually carried out by decision makers with a specific range of authority. However, these approaches are not always sufficient to effectively model and solve all the problems related to uncertainty and risks. Some risks can affect activities at the operative level in which blue-collar workers are involved, especially in production departments or building yards; on the other hand, complicated mathematical approaches are not suitable for solving problems at this level, as they need high amounts of data and specific expertise to implement them. In this paper, an investigation has been conducted to identify which kinds of risk are associated with activities at the operative level. From the quality management point of view, Total Quality Management (TQM) could be an efficient and effective approach to gain continuous improvement. TQM could be a systemic solution to face low-level risks in order to avoid unwanted deviations from objectives in any activity that is performed by blue-collar workers. There are plenty of effective features of TQM that could provide reliable solutions to manage risks. In the following sections, the most important risks in operatives' activities will be identified and the connection between TQM elements and potentials of risk management will be discussed.

2. LITERATURE REVIEW

A general rule for success in any activity includes predicting the problems and finding the solutions before they happen. However, when we speak about any scheduled operation, the effects of future uncertain happenings become more important because the uncertainty could include risk, and if the risky event happens, the result could be a threat or an opportunity [2]. In addition, a management plan to manage risks and its consequences are required [3]. In this situation, before making any decision, it is critical to identify the risks, their roots [4] and consequences; but also positive effects subsequent to uncertainty; so managers need to use risk management models to face risk as a way to optimize the performance [5]. As far as low-level activities are concerned, while several kinds of risk can affect them, using the existing models and risk

management tools can be problematic because the quantitative and probabilistic assessments that they employ [6-8] are more suited for highly skilled managers than for operatives who, on the other hand, are directly affected by the consequences of uncertainty. Indeed, these risks could adversely affect the safety of the workers, process, and quality of the final service or production. To address this problem, an integrated approach should be implemented that has an inclusive focus on each element that plays a role to achieve the goal, carry out the operation, and survey overall process. As a result, TQM could be a potential solution for risk management at this level.

The basic concept of TQM traced back to 1949 [9] but the implication as a part of quality management triggered around the mid-1980s [10]. TQM is an approach that considers the entire process of production or service, so it could be a potential tool for an integrated risk management through the entire process of operation [11-13]. Moreover, a survey of the literature has been carried out, the results of which are categorized according to the essence of each element in Table 1, while Table 2 illustrates the identified risks that could affect the objectives in blue-collar workers activities.

Table 1 – TQM elements

Category of TQM Elements	Sub Elements of TQM
Foundation	1. Ethics 2. Integrity 3. Trust
Framework	Communication
Practical Measures	1. Training 2. Teamwork 3. Leadership
Supportive Element	Recognition

Table 2 – The risks of the Blue-collar Workers Activities

Risk	Description
Strategic Risks	Intellectual property risk
Operational Risks	Process risks, product failure risk, maintenance risks, infrastructure risks, quality risks, production shortfall risks
Organizational Behavior Risks	Working culture, relation risks, and ethic risk
Human Resource Risks	Employee reputation risks, employee liability risks, law compliance risk, talent management risks, employee skills, staff size
Logistic Risks	Any risk related to logistics that is related to workers
Safety Risks	Personal protection, housekeeping
External Effects Risks	Force majeure risks include environmental, war and terrorism risks, social risks include strikes

3. METHODOLOGY

The main goal of the study here presented was to investigate the potentials of TQM to manage risk in activities performed by operatives in production processes at the shop-floor level. The first step of the study was to identify and classify the key elements of TQM and the types of risks that could influence the

objectives in blue-collar workers activities. Often, managers are responsible if a risk happens and impacts on the objectives, even if the blue-collar workers are directly involved with these risks; on the other hand, blue-collar workers follow the instructions and they do not have the authority to make decisions about the best strategy of risk response including acceptance, mitigation, avoid and transfer.

In the second step, a survey was designed and administered by means of a questionnaire to practitioners of several companies. The respondents are managers or consultants who intended to share their opinion and experiences. The questionnaire was semi-structured: the questions required to rank the existing risks in low-level works, the importance of each risk regarding TQM elements, the potentials of TQM in managing the risks and, finally, some questions concerned the organization in which the respondent works. In addition, it included open-end questions about the interviewees' personal idea on any positive effects on risks after the implementation of quality programs or tools carried out by the company. Face validity has been established to improve the validity of the questionnaire. The questionnaire was implemented in SurveyMonkey® and distributed by a link; the link was open for 37 days and 30 responses collected during the period. Taking part in the survey was voluntary and averagely took about 10 minutes –according to SurveyMonkey report and analyses – to complete. The information respondents provide were treated confidentially and collected data reported on anonymously and in aggregate form. The respondents were chosen from different sectors and different size of organizations to avoid impact limitations of the study. 44.83% of the participants in the survey are working in a project-based company/organization (e.g. engineer-to-order), 24.14% are working in a manufacturing company and 31.03% are working in a service provider company. 13.79% of the respondents work in a company with less than 50 employees, 31.03% in a company with between 50 and 249 employees and 55.17% in companies with no less than 250 employees.

4. RESULTS

At first, Figure 1 illustrates the importance of the seven major risks that could happen in the blue-collar worker's activities and affect the objectives. Operational risks have the most significant relationship with Blue-collar workers with score 5.14 and also the relation between organizational behavior risks, human resource risks, and safety risks are pretty significant.



Figure 1 – The importance of the risks of Blue-collar Workers Activities

Table 3 gives the importance of each risk in respect to TQM elements. Participants were asked to indicate the importance of the elements of TQM in the first column to address the types of risk in the first row, at the blue-collar level, according to their experience in the company. A five-level Likert Scale (1, 'not at all important' to 5, 'extremely important') was used for this part of survey; Table 3 displays the results. Table 4 tabulates the assessments related to the question 'To what extent the TQM tools are effective to manage risks at the operative level' according to respondents experience. According to survey results, 81.48% of the companies commonly use a risk management plan and 29.63% use TQM tools or programs. The operative level risks are significantly important because 72.41% of the companies have suffered deviations from their goals because of risks at the operative level and 96.43% of respondents experienced that continuous improvement programs had been effective to manage risks at the operative level. Open-end questions answers display that quality tools, continuous improvement and risk management methods affect the final quality of production/service. It is worth noting that one respondent stated: "Some risks could be translated into opportunities".

Table 3 – The Weight of the TQM Elements Regarding Risks

TQM Elements [14]	Risks							Rank
	Strategic risks	Operational risks	Organizational behavior risks	Human resource risks	Logistic risks	Safety risks	External effects risks	
Integrity	3.07	3.41	3.65	4.00	2.58	3.42	2.52	4.06
Trust	3.04	3.70	3.88	3.83	2.79	3.33	2.43	4.08
Ethics	2.96	3.12	3.83	3.82	2.82	3.27	2.50	4.05
Training	2.50	3.77	3.36	3.65	3.09	3.91	2.91	4.04
Leadership	3.35	3.32	3.25	3.50	2.77	3.50	2.67	4.03
Recognition	3.00	3.44	3.33	3.32	2.86	3.14	2.76	4.02
Teamwork	2.80	3.48	3.54	3.52	2.78	3.27	2.59	4.05
communication	3.33	3.80	3.63	3.73	3.36	3.59	3.33	4.00

Table 4 – TQM tools score on potentials to manage the risk at operative level

TQM tools	Seven basic quality tool	FMEA	Flowcharts	Quality circles	Poka-yoke	Six Sigma	Taguchi methods	Quality function deployment, QFD	Systematic analysis and improvement of work processes
score	3.32	3.19	3.43	3.04	3.12	3.18	2.79	3.30	3.89

5. DISCUSSION

The study here presented is a first attempt at investigating the risks at the operative (i.e. blue-collar workers') level and if total quality management (TQM) can be useful to manage them. Regarding managers', academics and practitioners view, based on their experience and the results of the survey, TQM significantly could address the risks at operative level. According to the results of this study, operational risks, organizational behavior risks, safety risks and human resource risks are the most important risks. It shows that most of the practitioners suffered from process, quality and maintenance risks. On the other hand, all of the issues related to human resources, including behavioral, safety, knowledge talent and skills, are worth to consider.

According to total rank in table 3, Trust is the most important Element of the TQM regarding tackling the operative risks; Generally a team can dominate obstacles and gain the objective if there are constant collaboration and trust among the team members. The highest rank in results shows that team working beside collaboration and trust could be effective to manage all kind of the risks. On the other hand, regarding to the results of importance of each element of TQM on each risk, if we want to focus on specific risk, different element of TQM could be the most effective to manage a that risk. In the following we would discuss the results of each element regarding table 3. Communication can address operational risks, logistic risks, and external effects risks simultaneously. Binding all factors of the working process together and cementing the relationship of the employees with the element of quality is effective in risk management. Providing an inspirational vision for the employees and making strategic moves and guiding subordinates could address the strategic risks. Obviously, training could play an important role in risk management, especially in safety risks and the rank of this element prove the fact. Finally upholding values/virtues such as honesty, justice, morals, and sincerity that are providing integrity, could organizational behavior risks.

Regarding results, almost all of the TQM tools gained high score on having potentials to manage the risk in the operative level. Systematic analysis and improvement of work processes (SAIWP) and flow charts have the highest potentials. As the flowcharts aim to communicate how a process works and SAIWP has a process

focused vision as well, this may suggest that considering the whole activities of a company as a process from the senior management to blue-collar workers could be beneficial to manage the risks at the operative level in order to reach the maximum efficiency in the workers' activities.

6. LIMITATION

The main limitation is the number of respondents that could be increased in future field study. The survey was directed only at managers and consultants, while blue-collar workers were not interviewed. A more thorough investigation should take into consideration these workers to have a broader picture, but a very different structure of the survey would be required in order to collect and analyze information from different sources as managers and blue-collar workers.

7. CONCLUSION

According to the findings of this investigation, operational risks and organizational behavior risks are the most important risks in the operative level works, so managers should consider these risks to avoid any deviation from objectives. This study found that there is considerable potential in TQM to manage the operative level risks. According to results and discussion sectors, companies could focus on each TQM element for a specific kind of risk. For example, if a company suffers from operational, logistic and external effect risks, they can focus on communication factor of TQM to tackle the existing risks. Some Quality tools are naturally playing a risk mitigation strategy associated with blue-collar workers activity Systematic analysis and improvement of work processes and Flowcharts, Therefore, companies concurrently could use these tools to address to address risks and quality issues.

8. SUGGESTIONS FOR FURTHER RESEARCH

The presented study, even considering its limitations, showed that TQM has significant potentials to manage the risks at operative level. Additional research should be conducted on this topic to confirm or challenge the above-mentioned findings; particularly, case studies to investigate to what extent specific TQM tools could be helpful to decrease negative effects of risks are needed. Case studies concerning specific companies, in which more thorough investigations could be carried out, could also improve the limitations that were described in the 'Limitation' section.

9. REFERENCES

- [1] Arena, Marika, et al.: *Integrated risk management through dynamic capabilities within project-based organizations: The Company Dynamic Response Map*, Risk Management 15.1 (2013): 50-77.
- [2] Snyder, Cynthia Stackpole.: *A Guide to the Project Management Body of Knowledge: PMBOK (®) Guide*, Project Management Institute, 2014.
- [3] Pritchard, Carl L., and PMI-RMP PMP: *Risk management: concepts and guidance*, CRC Press, 2014.
- [4] Kasap, Deniz, and Murat Kaymak: *Risk identification step of the project risk management*, Management of Engineering and Technology, Portland International Center for. IEEE, 2007.
- [5] Aghazadeh Ardebili, A., Padoano, E., and F. Harsej: *Prepare Organizations to Accept Risks: A Feasible Risk Management Model*, 7th International Conference "Production Engineering and Management". E. Padoano and F.-J. Villmer, 28-29 September 2017 Pordenone (2017): 75-86
- [6] McNeil, Alexander J., Rüdiger Frey, and Paul Embrechts: *Quantitative risk management: Concepts, techniques and tools*. Princeton university press, 2015.
- [7] Raz, Tzvi, and E. Michael.: *Use and benefits of tools for project risk management*, International Journal of Project Management 19.1 (2001): 9-17.
- [8] Raz, Tzvi, and E. Michael.: *Use and benefits of tools for project risk management*, International Journal of Project Management 19.1 (2001): 9-17.
- [9] Powell, Thomas C.: *Total quality management as competitive advantage: a review and empirical study*, Strategic management journal 16.1 (1995): 15-37.
- [10] Martínez-Lorente, Angel R., Frank Dewhurst, and Barrie G. Dale.: *Total quality management: origins and evolution of the term*, The TQM Magazine 10.5 (1998): 378-386.
- [11] Fuentes-Fuentes, M. Mar, Carlos A. Albacete-Sáez, and F. Javier Lloréns-Montes.: *The impact of environmental characteristics on TQM principles and organizational performance*, Omega 32.6 (2004): 425-442.

- [12] Creech, Bill.: *The five pillars of TQM: how to make total quality management work for you*, New York (1994).
- [13] Houston, Archester, and Steven L. Dockstader: *A total quality management process improvement model*. No. NPRDC-TR-89-3. NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER SAN DIEGO CA, 1988.
- [14] Jesal Shethna, <https://www.educba.com/the-8-crucial-tqm-elements/> , May 7, 2016

10. ACKNOWLEDGEMENT

We have to express our appreciation to the Ms. Dalia Vodice who greatly assisted the research, we are also grateful to all of participants for sharing their pearls of wisdom and experience with us during the course of this research and specially PMI® Northern Italy Chapter (*PMI-NIC*) that kindly help us in data collection for this study.