

Influence of TQM Practices and Service Innovation Types on Performances of the IT Romanian Companies

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Abstract

This paper presents a mathematical model intended to investigate the influence of TQM and service innovation types on service companies performance. The company performance is regarded as the model output and is built out of the financial performance and the non-financial performance. The two performances are generating competitive advantage. The estimated non-financial performances are represented by the quality performance and the innovative performance. The data used to build the model were taken from the IT Romanian companies.

Key words: mathematical model, service innovation, TQM, competitive advantage

J.E.L. Classification: C50, C52, M10, O32

1. Introduction

Increasing competition in the global markets leads to a rapid decline in the added value of the products and the services.

So, in the new global context, the service companies are compelled to adopt, using limited resources, new methods to increase their competitiveness. Quality and innovation are the two key elements leading to these companies success (Li, L., 2000, p.299-315).

Innovation is an important component of the competitiveness, it is included both in the organizational structure of a company and in products and services of it. So, innovation provides a strategic orientation of the companies for winning customers and obtaining competitive advantages.

Total management quality is the best strategy recognized at the global level to achieve higher quality services and products and it leads to a high performance of the company.

The relationship between TQM and services innovation is complex. The literature suggests pros and cons arguments concerning a positive influence of the TQM on services innovation. The pros arguments are supported by Eg EgAbrunhosa&Moura E Sa (Karani, S. R., & Bichanga, W. O., 2012, p.59-76); Lopez-Mielgo, Montes-Peon, Vazquez-Ordas (Kuswantoro, F. et al., 2012, p.50-60); Martinez-Costa & Martinez-Lorente (Leavengood, S., & Anderson, T. R., 2011); DI Prajogo & Hong (Marquez. R., 2009, p.1-13); Sarkees&Hulland (Martínez C, M., Martínez L., A.R., & Choi, T.Y., 2008, p.23-29), they affirm by adopting TQM principles, that the companies receive a platform for innovation and TQM practices are congruent with innovation. The principle focus on client stimulates the companies to innovate for new customer needs and so, this continuous improvement support the creative thinking on the labour organization. The arguments on TQM do not stimulate services innovation and are supported by Pekovic & Galia (McAdam, R., Keogh, K., 2004, p.126-141), Santos-Vijande & Alvarez-Gonzalez, Leavengood and Anderson (Pekovic, S., & Galia, F., 2009, p.829-842). However these researchers do not fully reject TQM practices help innovation.

Recent studies (Karani, S. R., & Bichanga, W. O., 2012, p.59-76) have investigated the relationship between innovation and company performance and they found the innovation strategy and culture are key performance factors.

Kuswanto, in his study "Impact of Distribution Channel Innovation on the Performance of Small and Medium Enterprises" showed the distribution of the innovation channels is positively related to the company performance.

Results of the researchers (Gunday G et Dutton J., 2011, p. 676) showed the process innovation and the product innovation have a strong positive influence on the company performances while the organizational innovation and the marketing do not influence them at all.

From the specific literature it can be observed the innovation is a key factor for long-term success of a company, helping it to survive in the dynamic markets and in critical situations created by the turbulences in the outside environment.

2. Relationship between innovation types and innovative performance

Specific literature leads us to the following issues regarding the relations between these four innovation types identified in OECD Oslo Manual, namely:

- A higher level of the organizational innovation involves a higher level of the process innovation and a higher level of the marketing innovation. Between the organizational innovation and the product innovation no significant correlation was observed.
- A higher level of the process innovation involves a higher level of the product innovation.
- A higher level of the process innovation leads to a higher level of the product innovation.
- A higher level of the marketing innovation involves a higher level of the product innovation.
- An improvement of the production performance involves an improvement of the market performance and no significant influence on the financial performance.
- An improvement of the market performance involves a real improvement of the financial performance (OECD, Oslo Manual, 2005).

The innovative performance is perceived in specific literature (Martínez C, M., Martínez L., A.R., & Choi, T.Y., 2008, p.23-29) as one of the most important factors influencing the issues of the organizational performance. It is the combination of the achievements such as: improvement of the organizational structure, new products, new processes, new projects, patents, and so on.

From the literature it can be noted as:

- If the marketing innovation and/or the product innovation and/or the organizational innovation increases then the innovative performance increases. The process innovation is not able to be influenced by the innovative performance improvement.
- The innovative performance positively influences the production performance (increases flexibility, quality, costs and rate of production operations) and the market performance (increases the existing customer satisfaction and the number of new customers) and the financial performance of the company, for a long time.
- An improvement of the innovative performance leads to the improvement of the production and the market performance.

3. Relationships between TQM dimensions, innovative performance and quality performance

Prajogo and Sohal (Marquez. R., 2009, p1-13) established a positive and significant relationship between the quality performance and the innovation, particularly the process innovation.

Specific literature (Juneja, D., Ahmad, S., & Kumar, S., 2011, p.93-98) allows the establishment of the following positive relationships between the TQM dimensions and the innovative performance:

- Market Orientation and Customer Focus significantly influence the innovative performance and the quality performance. These stimulates the companies to find new wishes of the customers and thus to guide the companies to be innovative discovering new products to meet these demands. The customer must be the attention center in all activities of a company, by bringing quality and innovation.

- Continuous Improvement has a significant positive influence on the innovative performance and the quality performance. Managers continuously obtain improvements from the research of new ways to improve the current processes, the use of the knowledge from the past experienced, the use of the experiences workers, and so on.
- Employee Management, teamwork, employee empowerment have a positive influence on the innovative performance by forecasting the production issues and by improving the quality of the current and future products and services. TQM practices create an environment and a culture influencing the employees in their work. In any company, satisfaction and motivation of the employees lead to the improvement of the processes and the services.
- Supplier Management has a positive effect on the innovative performance and the quality performance. The buyers and the sellers often work together to improve the product quality, to achieve new products and new services and to reduce the costs.
- The leadership is responsible for managing the organization's vision in relation to the customer satisfaction. The leadership urges the employees to responsibly participate with innovative ideas to improve the products, the processes and the services thus developing the company.
- The Process Management contains a set of production programs and work distribution to improve products quality.
- Factual Approach to Decision Making is another TQM activity with positive influence on the innovative performance. A relevant analysis of the data and the information is necessary for managers to achieve the strategic objectives of the company and to anticipate and respond to the internal and external disturbances of the company. Also, the managers time and again communicate information and data to all users, employees and providers to improve efficiency and innovation in the company.
- Organizational culture positively influences the Innovative Performance and the Quality Performance if its main objective is the positioning of the customer in the center of all organizational activities.

Three approaches of the companies may be observed from the point of view of the innovative performance and the quality performance, namely :

- Cost-conscious companies- are characterized by: low-level profit, relentless rival competition, low focus on innovation and average quality of products and services. To be competitive these companies are compelled to lower prices.
- Quality – oriented companies – have low-level focus on innovation, average costs. These companies are focused on high quality, providing competitive advantage until the rivals introduce a new product or a new service.
- Innovative companies - are characterized by developing new products and new services and therefore having a competitive advantage over their rivals. These companies support more time their competitive advantage by the quality and the cost control programs.

So the innovations give the competitive advantage and the quality and the costs control keep it.

4. Mathematical model regarding TQM influence and service innovation types on firm performances

This paper tried to assess the effects of the TQM and the service innovation types on financial and non financial performance of the IT service companies using available data from 40 Romanian companies during 2013-2016. The research was achieved at macroeconomic level and included the scores found in the questionnaires applied to the companies. The collected data ranged from 0 to 2.

The studied model consists of the following sub-models:

$$QP = f(TQM); IP = f(TQM, OI, PSI, PI, MI, QP); PP = f(OI, PSI, PI, MI, QP, IP) \\ MP = f(OI, PSI, PI, MI, QP, IP, PP); FP = f(OI, PSI, PI, MI, QP, IP, PP, MP)$$

where: *QP* – Quality Performance; *PI* – Product Innovation; *MI* – Market Innovation;

IP – Innovative Performance; *PP* – Production Performance; *MP* – Market Performance;

FP – Financial Performance; *OI* – Organizational Innovation; *PSI* – Process Innovation;

To calculate the input and output variables the indices based on the information sent by the 40 companies were used as follows:

- For the *Product Innovation* variable, an index of the components means: a) innovations lead to the improvement of the use of products and to the increase of customer satisfaction; b) development of new products.
- For the *Process Innovation* variable, an index of the components means: a) elimination of the activities without added value; b) lowering costs in the current processes; c) increasing quality of the outputs in the current processes; d) elimination of the activities without added value in the product delivery processes; e) lowering the delivery cost of the products; f) increase of the delivery speed of the products to the customers.
- For the *Market Innovation* variable, an index of the components means: a) design change of the current products without making any technical changes; b) change of the distribution channels without changing the logistic processes related to the delivering products; c) changing the promotion techniques of the products; d) changing the technique used to determine the product prices.
- For the *Organizational Innovation* variable, an index of the components means: a) changing in innovative ways both the procedures and the processes and the organizational structure of the company to facilitate team work; b) improving the supply management system; c) improving the management system of the human resources; d) improving the quality management system; d) improving the management system of the information exchanges from the company.
- For the *Quality Performance* variable, an index of the components means: a) time from product request to products delivery; b) customer satisfaction; c) number of customer complaints; d) number of services performed late.
- For the *Innovative Performance* variable, an index of the components means: a) ability to bring to the market the services ahead of the competitors; b) percentage of new products and new services their total; c) quality of new products and new services; d) innovations introduced for working procedures; e) number of innovations in intellectual property.
- For the *Production Performance* variable, an index of the components means: a) making products according to quality standards; b) production cost; c) products flexibility; d) production and delivery speed of the products.
- For the *Market Performance* variable, used an index of the components means: a) market sharing; b) all sales; c) customer satisfaction.
- For the *Financial Performance* variable, an index of the components means: a) overall profitability of the company; b) ratio of the profit and the total assets; c) ratio of the profit and the total sales.
- For the *TQM (Total Quality Management Principles)* variable used an index of the components: a) Market Orientation & Customer Focus; b) Continuous Improvement; c) Employee Management; d) Supplier Management; e) Leadership; f) Process Management; g) Factual Approach to Decision Making; h) Organizational Culture.

In these models were introduced the following control variables were introduced:

- *Business Uncertainty variable (IMA)* can take the following values: 0- small uncertainty; 1- average uncertainty; 2- high uncertainty.
- *Company Size variable (DM)* can take the following values: 0 – very small size; 1-average size; 2- large size.
- *Financial Resources variable (RF)* can take the following values: 0- no resources; 1- there are resources but not enough; 2- there are enough resources.
- *Company Culture variable (CF)* can take the following values: 0 – it does not exist; 1- there is an average level; 2- there is a high level.

The model equations are of the following form (1):

$$\lg y_i = a_{0i} + a_{1i} \cdot TQM + a_{2i} \cdot OI + a_{3i} \cdot PSI + a_{4i} \cdot PI + a_{5i} \cdot MI + a_{6i} \cdot QP + a_{7i} \cdot IP + a_{8i} \cdot PP + a_{9i} \cdot MP + \sum_{j=1}^4 b_{ji} x_{ji} \quad i = \overline{1,5} \quad (1)$$

where: y_i - submodels outputs, QP, IP, PP, MP, FP and a_{ki} , $k = \overline{0,9}$ are submodels coefficients, x_{ji} , $j = \overline{1,4}$ are control variables, b_{ji} - coefficients of the control variables.

The accuracy of each model is given by R^2 - the adequacy degree of the model. The model will be adjusted until its value has reached a value closer to 1. To show in the presented models some coefficients were insignificant, the T-test (Student) was performed for each coefficient of the model. Regression results are presented in the table 1.

Table no1 Regression results

	V1- lg(Quality Performance)	V2- lg(Innovative Performance)	V3- lg(Production Performance)	V4- lg(Market Performance)	V5- lg(Financial Performance)
TQM	0.104	0.098	0	0	0
OI	0	0.069	0.055	0.002	0.0022
PSI	0	0.054	0.09	0.104	0.0035
PI	0	0.0001	0.004	0.0071	0.12
MI	0	0.07	-0.003	0.09	0.002
QP	0	0.0017	0.0003	0.005	0.02
IP	0	0	0.2	0.22	0.14
PP	0	0.08	0	0.4	0.11
MP	0	0.061	0.33	0	0.11
IMA	0.024	0.002	0.0022	-0.021	0.3
DM	0.00018	0.045	0.0035	-0.067	0.00032
RF	0.08	0.005	0.00011	0.008	0.11
CF	0.09	0.0003	0.07	0.004	0.0001
Free term	1.93	3.02	1.7	7.4	2.03
Accuracy of the model	0.99	0.99	0.92	0.99	0.97

Source: Processing data modelling

From the results of the model some aspects are noted, namely:

- Quality Performance is influenced significantly positive by TQM, Financial Resources and Company Culture. There is no significant correlation between Quality Performance and the Company Size.
- There are no significant correlations between Innovative Performance and Product Innovation and between Innovative Performance and Company Culture. Also, Innovative Performance is influenced significantly positive by TQM, Organizational Innovation, Process Innovation and Size Company.
- Production Performance is influenced significantly positive by Innovative Performance, Market Performance, Process Innovation and Company Culture and it is influenced negatively by Market Innovation. There is no correlation between Production Performance, Financial Resources and Quality Performance.
- Market Performance is negatively influenced by Company Size and Business Uncertainty. Market Performance is significantly positive influenced by Product Performance, Innovative Performance and Process Innovation.
- Financial Performance is influenced significantly positive by Product Innovation, Innovative Performance, Market Performance, Business Uncertainty and Financial Resources. There are no significant correlations between Financial Performance and Size Company, Organizational Innovation and Company Culture.

This paper has some limitations, namely: the small size of the sample companies, the sample companies belong only the Romanian IT services. The low number of companies take into account in the model have limited opportunity to apply the advanced statistical techniques.

5. Conclusions

This paper is based on a study carried out during 2013-2016, on the 40 Romanian companies with a special focus on IT services. This approach does not provide the details regarding the trends about the quality management practices and the service innovation types, the future researches will approach a more comprehensive analysis.

Generally, one can observe a positive relationship between TQM practices, service innovation types and the financial and non-financial performances of the service companies. However, there is a number of disturbing factors such as: business uncertainty, company size, financial resources, culture company, these factors can sometimes lead to a negative relationship.

Also, we can draw the following conclusions:

- Innovation is a necessity resulting from the increased requirements regarding the quality of products;
- TQM has the deciding role in finding the ways to innovation;
- TQM implementation can hinder the creativity due to the compelling imposition of standards, the employees dealing more with the routine issues and less to produce innovative solutions;
- Focus on clients of the companies can lead the companies not be aware of the uncertainties occurring in a dynamic market with turbulences and so the companies are not prepared to deal with these situations;
- In order to avoid the financial risks, the companies applying TQM often become copycat companies and not innovative companies;
- To implement the innovation it takes time. The innovation process becomes unprofitable if it requires too much time to be applied. A long time to implement the innovation leads to increased costs.

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