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INCORPORATING THE RURAL AREAS' PARTICULARITIES IN THE WATER SUPPLY MANAGEMENT SYSTEMS IN ROMANIA

theoretical article

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Abstract

The existence of the safe water supply and sewerage systems, especially in the rural areas of Romania, are mandatory for the insurance of the public health. In this context, a series of Romanian regional water and sewerage services suppliers developed Total Quality Management Systems, starting with the implementation of multiple ISO standards and in response to the need for answering to high requirements, both for constant development / modernization of the infrastructure and expansions to new consumers, as for the permanent improvement of the water supply, sewerage and wastewater treatment's quality.

The Total Quality Management Systems inter-relate a series of quality components, all of them functioning in a unitary–integrated way, using specific rules and procedures for assuring the increase of the delivered services' quality and performance.

The results begin to be seen on all areas of the concerned water suppliers' activity: from the operational field to the commercial, staff's performance, environmental and customer care ones. one of the main fundaments of the monetary creation – aspect which is indissolubly related to the idea of evolution, more precisely, to the idea of economic development.

INTRODUCTION

The concept of Total Quality Management

The conceptual model of the Total Quality Management (TQM) evolved over time, with the important contribution of the theoreticians of the total quality management, starting with a quality model, at its very beginnings, until becoming a complex system, but still under development, even today. Among the TQM concept's main contributors, we will name here: Walter Stewhart, W. Edwards Deming, Joseph Juran, Phillip B. Crosby, Armand V. Feigenbaum and Kaoru Ishikawa.

The basis for TQM is considered to be the statistical charts developed by the American engineer, physicist and statistician, Walter Andrew Stewhart, in 1923, Walter A. Stewhart being considered to be the father of the statistical control (Orlando, 2016). Later on, Deming saw quality as a predictable degree of uniformity and dependability, at low cost and suited to the market. Deming's 14 principles of quality management to improve quality, productivity and the performance of the organization define his TQM core concept (Deming, 1986, cited by Dilber et al, 2005; Marquis, 2010). Deming also proposed the Plan-Do-Check-Act cycle for ensuring the quality management, considered to be very effective to follow. (Marquis, 2010). Along with Deming, Dr. Joseph Juran is another important veteran pioneer of the quality revolution. Juran is the author and editor of several books, among which: *Juran's Quality Control Handbook, Juran on Planning for Quality* and *Juran on Leadership for Quality*. He is, probably, most renowned for the phrase "fitness for use or purpose", which means that even if a product or a service meets its specifications, it still can be unfit for its purpose, as in the cases in which the specifications are faulty or they are not in accordance with the customers' wants. In other words, meeting product's specifications is a necessary quality requirement, but not a sufficient one. (Sallis, 2002). Kaoru Ishikawa is well-known in US and Japan for its efforts to spread the TQM tools and techniques, through a series of books he wrote on the theme of TQM. Furthermore, Ishikawa developed new tools, like the fishbone diagram, consisting in a chart resembling a fish skeleton, which helps in the identification and solution finding of the possible causes of the problems. (Sashkin & Kiser, 1993). Another important TQM theoretician, Armand V. Feigenbaum, underlines a series of principles of TQM, such as: customer satisfaction, management involvement, employee involvement, first-line supervision leadership and company-wide quality control. (Besterfield et al., 2011). After having observed Japan's success of addressing quality issues, western companies started to introduce, in the 1980s, their own quality initiatives. Developed as an overall concept for the broad spectrum of quality - focused strategies, programmes and techniques, from the 1980's to the '90s, TQM became the centre of focus for the western quality movement. The definitions of TQM included concepts such as: customer focus, the involvement of all employees, continuous improvement and the integration of quality management into the total organization. Although the definitions were all similar, there was a lot of confusion: it was unclear what sort of practices, policies and activities needed to be implemented in order to fit the TQM definition. (Raut et al., 2014)

The authors agree with and use the Poornima's definition of the TQM (Poornima, 2011): TQM is an integrated effort designed to improve quality performance at every level of the organization, where: "total" refers to the fact that quality involves everyone and all the activities performed by the company, "quality" refers to the conformance to the requirements or, in other words, meeting customer requirements and "management" refers to the must that this quality improvement process has to be managed. Therefore, TQM is a process for managing quality. It is seen as a continuous way of life and as a philosophy of perpetual improvement in everything the company does.

The advantages of using the TQM system are, beside the increase of the business' results of the company, which further on would serve as a starting point for continued improvement, the increase in the dedication of the top management and of the employees towards the improvement of processes and of the consumers' auctioneers', delivering persons' and the community' content. (Mitreva, 2013; Cioca et al., 2007).

Short presentation of Apavital Iaşi Company

Apavital is the water, sewerage and wastewater treatment services supplier in Iaşi county, one of the 42 regional suppliers of these kind of services in Romania.

In 2014 (the latest data available), Apavital supplied with water from the centralized system a total of 396,115 inhabitants, out of which 283,949 in the urban area and 112,166 inhabitants in the rural area, being the fifth largest utility in Romania, with regard to the number of inhabitants supplied with water services. The population served with sewerage services was, in 2014, of 290,211 persons, out of which 268,321 persons lived in the urban area and 21,890 persons lived in the rural area, Apavital Iaşi being the 7th largest company, by this criterion, at that time, in Romania. Figure number 1 shows the map of the regional water supply, sewerage and wastewater treatment services companies in Romania, with focus on Apavital Iaşi.

As formulated by the company, its **mission statement** is the "continuous supply of water services, sewerage and wastewater treatment services to all its consumers, with high respect for the quality and cost-efficiency indicators". (Apavital)

The quality management system of S.C. Apavital Iaşi S.A.

According to the Apavital's on the company's website presentation, the idea of the quality management system was the result of establishing, by the top management, of the company's mission and strategic objectives, in the wider framework of the process of alignment to the quality and performance norms and standards regarding the supply of the public interest services at European level. Taking into consideration the present requirements of the society on the transparency of the activities and processes which take place within an organization, an adequate management, decisions making based on a series of qualitative and quantitative performance indicators, the implementation and the certification of the quality management system are the „engine" through which, according to the mission statement and to the strategic objectives set by the top management, Apavital Iaşi made public its intentions to continuously improve all of its activity fields, in the view of satisfying the requirements of the organization's clients.

The Quality Strategy of the Apavital company takes in consideration a series of **basic principles and approaches**, out of which the authors will name here the following ones (Apavital):

1. The client centered approach is the basis of all efforts for improving the quality of the services of public interest. The services' improvement has to underline the client's right to choose its supplier;
2. Clear understanding of the client's wants and needs is fundamental for the development of the services. The suppliers of services of public interest have to identify their clients and their potential clients and to address their basic needs regarding the level of services and to further develop the services' processes from this perspective;
3. The processes associated to the services have to be transparent to the client, having to be continually assessed and developed, allowing clients to take part in and to influence the development of new services;
4. The process is the fundamental producer of the quality. Constant development of the staff's skills, competencies and adaptation to the changes in the work activity constitutes an essential component of the effort towards increasing quality.
5. The persons responsible for the level of services of public interest, the managers and the personnel of these companies, have to continuously engage themselves to further develop the quality, the productivity and the availability of these services.
6. Continuous assessment of the services is a key point within the effort for their further improvement.

The integrated certification for quality and environment systems of Apavital Iaşi has been done by the Romanian Society for Quality Certification (in Romanian: Societatea Română de Atestare a Calităţii - SRAC) and has been confirmed by the International Certification Institute IQNet. With regard to this, starting 2011, Apavital Iaşi is certified SR EN ISO 9001: 2008 – quality management system, SR EN ISO 14001: 2005 – environment management system, SR OHSAS 18001:2007 – occupational health and security management system, SR EN ISO 27001: 2005 – information security management system and SR EN ISO 22000: 2005 – aliment safety management system. Figure number 2 presents the systems' management certificates of Apavital.

According to Apavital, certification processes serve the company in providing a constant quality to its consumers, both directly (through increase in the quality of the services), as indirectly (through improvement of the organization's image and constant effort for increasing the efficiency of the communication process with its consumers. All these are intended to meet the specific and implicit requirements of the clients, regarding the price, the quantity and the quality of the services, through: optimization of the resources' use, increase of the staff's competency and degree of motivation, and a modern management. The implementation of the certified management systems gives confidence, both to the organization, as to its clients, that Apavital is capable to supply products and services which consistently fulfill the requirements of all the parties involved in the process. (Apavital)

EFFICIENT COMMUNICATION WITH THE CONSUMERS

In defining an adequate communication strategy to the specific of a geographical area or even a hydrographical basin, all stakeholders have to be involved, such as: the local and regional authorities, the water suppliers, the industry, the commerce, the agriculture, the environment initiative groups, the educational units, the NGOs and, the most important, the target population, consisting in real and potential consumers.

An efficient communication with the stakeholders is very important under these circumstances, because its failure can be an obstacle in the initiative of a water supplier to implement a water supply centralized system in a rural area.

The communication's objectives can be both informational ones, as for example the importance to deliver a safe water for the communities' health, as raising the awareness on the risks regarding the water consumption from unsecure sources, with a quality which is not adequately monitored.
A communication strategy will have to contain a series of elements: the content of the message (what we communicate), the target audience (to whom we communicate), the coding process (how we communicate), the decoding process (how well we are is being understood) and the noise or interferences in the communication process. The communication process becomes better through feedback, which shows that the message's coding and decoding processes, as the channels used, conducted to an efficient communication (the communication's receiver understood exactly the information which we tried to communicate). Shortly, these are the elements of the communication process described by the Shannon-Weaver model, represented in figure number 3. For the continuous improvement of the communication, it is preferable to foresee the measurement tools. (Lakatos et al, 2013). Taking into consideration the Shannon-Weaver (Chaturvedi & Chaturvedi, 2011) model of communication, we can say that the communication process develops in two directions, from the supplier to the client and from the client to the supplier, through the feedback the last one provides. Moreover, the real or potential client can be the source of communication, if s/he is the one initiating the communication with the supplier, either by phone or in writing, the supplier becoming, in this case, the receiver of the communication's message and offering feedback. For this purpose, the supplier has specialized departments, which aim is to manage this kind of communication processes. The basic elements of a communication strategy between the supplier and its stakeholders and the factors which can influence it positively or negatively are being described by the authors in the scheme presented in figure number 4.

THE NEED FOR CONSUMERS' BEHAVIOR CHANGE CAMPAIGNS – A CHALLENGE OF EFFICIENT COMMUNICATION

In the rural part of Romania and in other places of the world, fountains can be the major water source for the inhabitants. This has several disadvantages, such as the deterioration of the ground water's quality because of the increased use of nitrate chemical fertilizers, with the purpose to increase the agricultural production; another issue is the use of septic tanks which do not correspond to the parameters required by the norms in place. In some cases, even industrial pollution led to the pollution of ground waters. Another cause of pollution is the increase of the nitrates content in the soil, surface and ground water, due to the high solubility of these substances in the water. This contamination of the ground waters is more frequent mainly in the regions where chemical fertilizers and manure are largely used on the agricultural fields (*Vinten & Dunn, 2001*). Water pollution with nitrates represents a major risk factor for the children's safety, the babies from 1 to 3 months old being the most vulnerable.
A study *(Lupulescu, Tudor & Iancu, 2008)* records 3,134 cases of methemoglobinemia in the period from 1985 to 2005, out of which 105 cases were lethal. According to the same study, the fountain water's concentration of nitrates overcame the maximum admitted value by the national regulation, of 50 mg/liter in 78% of the fountains correlated with the intoxication cases. Most cases have been reported from fountains which did not have a perimeter of sanitary protection and, in over 50% of the cases, the fountains had depths less than 10 meters.
As an alternative and, at the same time, request of the European Union, there is the connection of the rural inhabitants to the water supply centralized systems. The biggest benefit is that, unlike fountain water, the drinking water coming through a centralized public system is safe and secure for health, its quality being systematically monitored.

METHODOLOGY

An awareness campaign regarding the pollution of fountain waters with nitrates has been done by Apavital Iaşi during August-September 2015. The campaign's name was "Water in the Villages Caravan" and consisted in using a mobile lab for making free tests on the quality of fountain waters in three rural areas from Iaşi county, by specialists in the Chemistry and Biology fields employed at Apavital.

RESULTS

1. Overall, 127 samples of water from fountains have been analyzed, the results showing that the water was undrinkable in more than 70 cases (46 exceeding the maximum admitted limit for nitrates, 5 for ammonium and 22 for nitrites).
2. With regard to the result of the microscopic exams, the quality of the water was found to not be adequate at more than 88 fountains, more than half of the fountains analyzed, being especially frequent the presence of the flagellates and mobile ciliated.
3. The conclusions resulted from these analysis have been brought up to the knowledge of the inhabitants.
4. For their health and for their families' health, Apavital recommended to all inhabitants to connect to the centralized water supply network, through which the quality of the water supplied is being controlled both by the supplier, as by the

Public Health Authority of Iaşi county. (ApaVital, 2015).

CONCLUSIONS

The information obtained is being integrated in the management decision making supporting tools (based on all performance indicators). On the basis of the study's results, SWOT analysis of the communication strategies' themes are presented in the figure number 5, regarding communication themes with its rural customers and in figure number 6, regarding the communication themes from the supplier to the potential rural customer. Overall, we can conclude that:

1. Apavital Iaşi company, one of the largest providers of water supply, sewerage and wastewater treatment services in Romania, makes permanent efforts in order to ensure a constant, high level of quality of the services offered to consumers.
2. Taking into consideration the importance which the utilities company gives to quality, the company's management makes permanent efforts in order to ensure or even to improve the level of services provided in the production process, but also for the insurance of the best quality of the services provided to consumers, level of quality which is also certified by national and international quality standards.
3. The quality of the communication process, both towards its consumers, as towards its potential consumers, is an important part of the level of services offered.
4. In the rural areas which do not benefit yet from a centralized system for water supply and the inhabitants use water from fountains, the quality of the water is frequently not good enough for drinking purposes, especially because it is negatively affected by the agriculture, but also as a result of the bad positioning of the toilets and of the manure.
5. The awareness raising campaign "Water in Villages Caravan", implemented by the company, showed that, in more than 70 cases out of the 127 water samples collected from fountains in three villages from Iaşi county, villages which don't benefit from water supply from a public network, the water's quality was not good enough for drinking. Regarding the result of the microscopic test, at more than a half of the fountains analyzed, 88 fountains, the water did not have a corresponding quality, there being especially remarked the presence of flagellates and of the mobile ciliated.
6. Starting with the study's results, the authors developed the SWOT analysis of the communication themes for communication strategies for the rural areas, with accent on awareness raising on connections to water supply and sewerage public networks which are to be constructed.

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FIGURES

Figure 1. Map of the regional water supply, sewerage and wastewater treatment services companies in Romania, with focus on Apavital Iaşi (NE of Romania)

Figure 2. Systems Management Certificates at Apavital Iaşi

Figure 3. Shannon – Weaver model of communication (Chaturvedi & Chaturvedi, 2011)

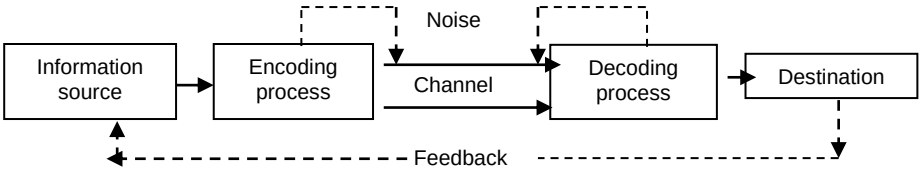

Figure 4. Schematic model of a communication strategy in the rural area

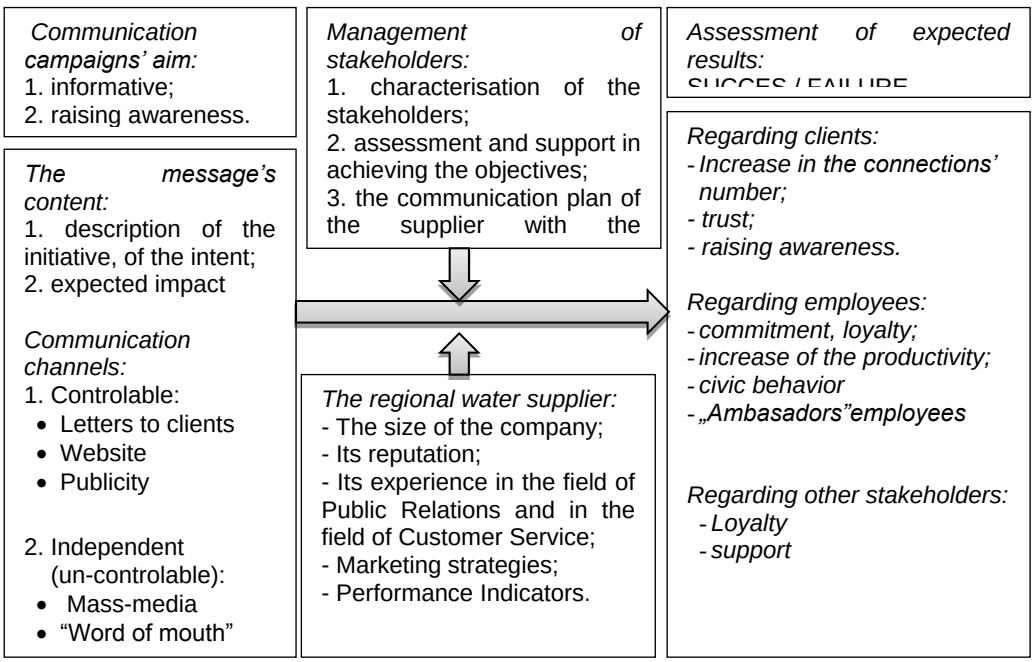

Figure 5. SWOT analyze for the supplier – rural customer communication themes

Strengths	***Weaknesses***
1. The investments made by the regional water services suppliers, in the rural area and financed mainly trough European funds, conducting at the increase of the services' quality, increase of the life quality in general, but also to regional development; 2. Endowment of suppliers with efficient machinery, which can serve large geographic areas; 3. Economies of scope and scale due to regional management of the water supply and wastewater treatment in comparison to small suppliers.	1. Unpleasant effects of the investment works, such as: temporary loss of access to the utilities, noise, etc.
Opportunities	***Threats***
1. Finding a solution for using "grey water" or wastewater treated accordingly, used for irrigations in agriculture, fact which would reduce the negative pressure on water from centralized system in conditions of drought, due to use of tap water for irrigations; 2. Identification of the vulnerable groups from the rural areas, with regard to the affordability, which can lead to finding solutions for the consumers for which the bill is unaffordable, within the limit of a certain amount of water. 3. Promotion of using sludge from wastewater plants in agriculture, within the law provisions. This would benefit both the supplier and the client from the rural areas holding several kinds of agricultural cultures. 4. Soil and water pollution with nitrates and nitrites avoidance campaigns, through an adequate depositing of manure.	1.Climate changes, through prolonged drought, make many villages downstream suffer of low water pressure at the tap, due to excessive consumption of water upstream, mainly for gardens' watering during summer and in drought conditions. 2. Beside drought, a big problem consists, in the last years, in the prolonged and frequent storms and torrential rains, conducting to the increase up to 100 times of the turbidity in the catchment area.

Figure 6. SWOT analyse for the supplier – potential rural customer communication themes

Strengths	***Weaknesses***
1. According to the EU Directives, the present funding programmes aim, among others, to further develop centralized systems for water supply, even for smaller rural communities, with less than 2,000 inhabitants.	1. Low coverage degree of the water supply services, for only 27% of the rural population in 2014, at national level (NSI, 2014).
Opportunities	***Threats***
1. Connection to the sewerage systems became compulsory, wherever these networks are physically accessible (through Law no. 224/2015) 2. The identification of the vulnerable groups in the rural areas, from the point of view of the financial problems which could impede the connection to centralized systems. 3. Use of sludge from the wastewater treatment plants in agriculture, respecting the law provisions and only for the approved agricultural cultures. 4. Awareness raising campaigns for avoidance of soil and water pollution with nitrates, through an adequate deposit of the manure.	1. Psychologic resistance towards connection to the water and sewerage public supply networks 2. Bad influence of the local authorities when they don't understand the importance of extension of the water supply and sewerage public networks in ensuring people's health and the environment.