

# Lean Strategies, Practices and the Role of Critical Factors on the Successful Lean Transformation in Public Companies.

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**ABSTRACT:** In the last decade, the worldwide economic recession has created numerous challenges in the Public Sector of Greece, which in turn affect the sustainability of public enterprises. Overall, there is a high pressure to increase productivity and reduce operating costs. The need to adapt to the new environment is pushing public organizations to implement Lean Management strategies in accordance with Private Sector standards. However, the limited budget, public deficits and debts, bureaucratic culture, political dependence and lack of transparency present several issues. These pose a serious threat to successful implementation of Lean practices in the long – run.

Lack of relevant research and dichotomous role of public service organization make this study special. On the one hand, they are subject to certain legislation and regulations while receiving public benefits and on the other hand they operate in a highly competitive environment. An additional contribution of this research is the establishment of a competent philosophy of Lean Management consistent with the special characteristics of public enterprises/ utilities. Not only will this assist economic growth, but also the entire reform of the Greek Public Sector.

Consequently, this challenge is being addressed by exploring and highlighting the best Lean practices and strategies, which are successfully being employed in Western countries with aim to reduce waste and increase organizational performance of public enterprises. The research method of this study consists of a combination of primary and secondary data collection techniques. In particular, qualitative research and systematic literature review were undertaken to identify the most important Critical Success Factors (CSFs) for prosperous integration of Lean Management principles in the public enterprises/ utilities.

Qualitative findings from top executives of Greek Public Power Corporation S.A. (PPC S.A.) showed that the implemented resource saving system does not produce desired outcomes. Although there are sufficient internal communication, change management team, and quality management practices, as well as business process reengineering towards new technologies (digital transformation), various pathogens prevent the smooth integration of Lean Management. These barriers concern lack of systematic training, engaged top management and Lean strategy, as well as the appearance of strong bureaucratic culture. Lack of transparency, dull business plans, and high levels of employee resistance to change also lead to high failure rates.

Important limitations of this study are the utilization of a convenience sample and the strict focus on the largest Greek public organization PPC SA operating in a competitive environment. Therefore, generalizations for the entire research population, including enterprises in the private and wider public sector, should be avoided. This is explained by the fact that they differ in terms of organizational culture, as well as structural and functional characteristics.

**KEYWORDS:** Lean Management, Critical Success Factors, Public Enterprises.

## I. INTRODUCTION

The recent global economic downturn has put intense pressure on almost every government in the European Union (EU) with the ultimate goal of cutting public spendings. According to Carter et al. [1] reducing budget expenditures is possible through the application of resource-saving methods, such as Lean Management. International findings have shown that the integration of Lean Management principles in the public sector can enhance

efficiency indicators as well as citizen satisfaction [2]. In addition, research in the service industry indicates that resource-saving techniques reduce waiting time and human error, while enhancing value and perceived quality for the end user [3].

McKinsey's research on public sector transformation, conducted in 974 public organizations, found that only 39% of the sample adopted Lean practices sustainably [4]. The main reason for the failure of these actions is the lack of systematic control [5]. Although the issue of saving resources in the public sector has been a concern for academics for many years, Lean Management is a relatively new topic, given the ongoing technological developments that constantly change the practices and strategies applied [5]. According to the findings of Gebre et al. [4] in order to achieve sustainable integration, not only the existence of various CSFs is necessary, but also the existence of effective Change Management that will prepare the whole company to accept the new changes and will effectively connect the specific factors.

The integration of Lean Management in public organizations is a difficult task given that their organizational structure and management are complex, while at the same time strong control is exercised at local and state level [6]. In addition, making a profit is not an incentive in the public sector as in the private sector [2], while the public budget is directly determined by the political system, which is structured to encourage the distribution of funds rather than reduce costs or to make a profit in public enterprises [7].

The success of Lean Management integration largely depends on how specific operating factors of public companies are utilized [8]. More specifically, successful implementation essentially requires a focus on CSFs, which ensure the smooth running of programs and increase their chances of success [9,10]. Of course, the adoption of this philosophy in various public organizations requires at the same time the adoption of an individualized approach depending on the needs of each organization and the country in which it operates [2].

## II. RESEARCH QUESTION

According to Antony et al. [10] every effort to implement Lean Management must be developed individually according to the needs of each company and its employees. At the same time, the connection of the specific authorities with all the organizational aspects of the company is considered important. Although the principles of Lean Management are standardized for the entire business sector, each

integration effort is unique and specific to each organization[11].

However, given that the aforementioned personalization can be achieved with CSFs, their precise definition of Simple Management is quite incomplete [2]. In addition, few findings are found in the international literature and adapt CSFs in the public sector and especially in the case of Greece [2,12,13]. More specifically, most of the research that has been conducted in Greece focuses on the private sector, so utilizing.

Utilizing the above research gap, this paper highlights the main strategies and practices of Lean Management in order to save resources by identifying the most important Critical Success Factors - CSFs (which are individual strategies) and their impact on the successful integration of Greek public sector companies

## III. LITERATURE REVIEW

### Approaches, Methods and Techniques

Shah and Ward [14], in order to identify successful methods of integrating Lean Management programs, identified 22 determinants that affect it which were classified into 4 major categories. The 1st category refers to Just-In-Time (JIT) processes, the 2nd to Total Productive Maintenance (TPM), the 3rd to Total Quality Management (TQM) and the 4th to Human Resource Management (HRM) [14-17].

Respectively, Moyano-Fuentes and Sacristan-Diaz [18], examining the international literature of Lean Management, classified their findings in 4 areas. The 1st section is related to the internal parameters of Lean Management (e.g. shop floor), the 2nd to the value chain, the 3rd to the work organization and the 4th to its impact on the environment.

More generally, it appears that there is a general agreement among researchers about the purpose of Lean Management, which is to reduce the production costs of products / services and enhance the overall productivity of a company. This goal is achieved through the elimination of all value-added activities [19]. Therefore, to complete the integration of Lean Management implies the indirect adoption of activity-based costing (Activity-Based Costing / Management, ABC / ABM) [20,21]. In fact, any activity that does not add value to the customer's eyes is eliminated using ABM programs [19].

In industry, total productive maintenance (TPM) programs also help reduce costs, maximizing the overall efficiency and effectiveness of machines, as they reduce their unexpected malfunctions [22]. In addition, another key element of Lean

Management is the high involvement and organizational commitment of human resources to the company [23,24].

Over the last 20 years, important tools and techniques for successful application of Lean Management have been identified, such as the SMED method (Single Minute Exchange of Dies), the Kanban technique, as well as production quality control through Poka -Yoke tools [25,26].

More recent findings by Mostafa et al. [27] shows that the adoption of Lean Management programs in any business must include 4 Stages: Conceptual, Implementation and Design, Implementation and Evaluation, Complete Lean Transformation. It is noteworthy that each stage is monitored and controlled at regular intervals in order to ensure the expected results and achieve the intended objectives [25]. Essential tools during the Lean Management Implementation Project Design phase are the SWOT analysis, the Value Stream Mapping (VSM) tool, the 5S (Sort – Set / Store – Shine – Standardize – Sustain) kanban technique, continuous improvement - kaizen, SMED, tact time etc. [15,27].

### **Restrictions on the Application of Lean Management Principles in the Public Sector**

The integration and implementation of the principles and system of Lean Management, especially in the public sector, does not guarantee that the applied improvements / modifications in the production system or in the service system will allow the achievement of the defined strategic goals [28], due to common limitations and objective lack of flexibility in decision making, such as [29]:

The inability to assess variability in demand, in business resources, as well as in possible production failures due to the different categories of products / services that have separate production planning.

- The lack of data analysis globally in order to understand the nature of the production / service system.
- The absence of evaluation of the interactions between the components of the production / service system.
- The lack of accurate identification of the future performance of Lean Management projects before their incorporation.
- The inability to prepare future scenarios and alternatives in case of failure to achieve the set objectives.

The classic Lean Thinking approach that emerged from the Lean Management application is ideal for organizations operating in a competitive market environment due to its focus on customer

value, its ability to contribute to a competitive advantage, increase market share and ultimately in enhancing the value of shares[2]. The adoption of the Lean approach especially by public services needs to be adjusted by recognizing the difference between private and public value by choosing how to achieve existence and public value beyond competitive advantage [8,30].

Public companies should not be uniquely focused on individual customers and the value they demand. The first Lean Thinking principle of Womack and Jones [31] "determine the value from the customer side", should be adapted to emphasize the determination of the public value to be delivered and related to the purpose of the public company targeting not unambiguously one customer, but the wider community [32].

The top management of a public enterprise should focus, in parallel with the possible competition that may exist, on understanding and determining the public value. The difficulty lies in the very determination of public value and the balance of its achievement with private value (eg customer satisfaction, revenue, etc.) which is extremely important for the viability of the public enterprise, especially if there is competition [8].

For classic public organizations where there is no competition (Ministries, Municipalities, Regions, National Health System, etc.) the definition of the concept of public value may not be fully in line with the concept of private value [23,30]. The key question that an administration of this kind should ask, according to Benington and Moore [34], is what gives more value to society as a whole than the action of a public enterprise / organization.

Public companies generally do not present their services / products to the public in the same way that private companies do, which then design the optimal value stream for delivering the product / service to the customer. In the other direction, public companies usually do the opposite, first waiting for the demand for products / services and then reacting [1]. This suggests that public companies / services should place less emphasis on value flow management, demand analysis and management, which in many cases try to limit and control it and focus on understanding the nature of demand (quantity and quality of products / services) by customers / citizens. Few researchers argue that the effective application of Lean Management in the processes of a public enterprise can not play a positive role in improving the public products / services it offers, supporting the prospect of increasing its public value and competitive

advantage that can to obtain it, where required [30,35].

In the private sector there is usually a clear relationship between the price paid and the service provided. A typical example is the Kano model, which refers to the performance or linear characteristics of an offer - "more is better" - where increased functionality or quality of execution will lead to increased customer satisfaction [30,32].

The above fills the gap of the dilemma faced by many Public companies and the key question is whether they should really try to operate as a commercial private enterprise by spending more and more resources (burdening taxpayers) or be transformed by philosophy and strategies such as those proposed by Lean Management by rearranging their business and operational processes [30,35,36]. It should be emphasized, however, that customer / citizen service should not be confused with value [36]. It is a notable example that the report of the British National Court of Auditors in 2015 comments that "the HMRC, the Royal Public Revenue and Customs Service (HM Revenue and Customs) is facing difficult decisions as to whether it should seek to meet the standards performance of the services of a private company while spending significantly more money to become significantly more cost-effective [37].

Public companies should strive to deliver a functional and positive experience to their customers / citizens (patients, businesses, consumers, etc.) by consistently and decisively applying methods and ideas such as those of Lean [38]. The results of its strategies and practices promise to provide just that, making public companies / organizations attractive and competitive [30].

### **Lean Management Techniques - Practices and Tools in Public Enterprises**

Over the past decade, many researchers have argued that Lean Management needs additional and innovative tools and practices to be successful, such as the Value Stream Mapping (VSM) model and the use of Simulations Programs [39,40].

The VSM model allows the distinction between a company's value-added operations and non-value-added operations to be discarded [29]. It is considered a strong but not customer-centric model as it focuses on the operations of the company and not on the work it performs [41].

The above obstacle can be overcome by applying Simulations Programs [29], which can accurately achieve a good prediction of how a function will behave, both before and after applying the Lean approach to a business.

In the Public Sector including Public Enterprises, in Europe (eg UK, Denmark, Norway) and USA, Lean Management practices typically used outside of the VSM model and Simulations Programs, Kaizen processes, Process Mapping), 5S, Just in Time (JIT) method and Kanban method. These practices / tools are often applied to enhance teamwork [42].

More specifically, the researchers Barraza et al. [43] examined the application of the "Kaizen Blitz" method (or Rapid Improvement Event, RIE) during the introduction of Lean Management principles in Public Sector Enterprises, with the aim of dramatically improving both their performance and the quality of their work human resource's.

Process Mapping is the mapping of each process of an organization / business with end to end flow diagram [44].

The 5S tool is accurately described as "a place for everything and everything in their place" and is based on the kaizen philosophy. It is essentially a method of organizing the workplace [45].

As a continuation of the 5S, comes the JIT method, which is used to declare that the required resources arrive just before the previous ones are finished or the services are provided when necessary. The basic principle of JIT is to save resources, reduce storage space and standby time between the steps of each process. Also the "heijunka" practice is used by JIT and it is a smoothing process used in the production stages. This practice makes it possible to react immediately to an emerging shortage of stocks and an understanding of the daily demand / consumption of each product is achieved [46]. Also noteworthy is the Kanban customer-centric technique which is a programming system that comes to improve production efficiency, and contribute to the achievement of JIT [47].

Finally, the Plan Do Check Adjust (PDCA) technique applied in Simple Management should be mentioned, providing a framework for improving a process or system [48]. The PDCA model is used to monitor individual issues or to guide an entire improvement project or initiative.

### **Lean Management Strategies in Public Enterprises**

#### Lean Six Sigma and Six Sigma Strategies in Public Enterprises

In the successful implementation of Lean Management, companies (public and private) to enhance their competitiveness, reduce their waste / expenses, make the best use of their resources, save energy, and enhance flexibility, quality and their



response, have developed numerous hybrid approaches [49,50]. Most characteristic of all are the "Lean Six Sigma" strategy and the "Six Sigma" approaches, which can reduce both wastes and quality-related challenges, combining in many cases Lean principles TQM elements [51,52].

The development of the Lean Six Sigma (LSS) approach is driven by a highly competitive global business environment. As a result, it is not just a quality tool, but a broader business strategy [53]. It is often referred to as an "improvement strategy" [54], as well as a "systematic methodology" focused on the customer [55].

A similar approach to the pursuit of waste disposal (wastes) offered by LSS is Six Sigma. Six Sigma (6s) is a set of techniques and tools to improve the process. It uses a set of quality management methods, mainly empirical, statistical methods and creates a special infrastructure of people within the organization who are experts in these methods. Six Sigma approaches seek to improve the production quality of a process by identifying and removing the causes of defects and minimizing the variability of impacts on productive and business processes [56].

Researcher George [57] demonstrated that the Six Sigma approach is a methodology for improving the performance of not only private but also public companies that aims to maximize the value of shares, improving quality, response speed and customer satisfaction, as well as and reducing operating costs. The latter is worth noting that it is achieved through the combination of tools and principles of Lean Management and Six Sigma [58].

In addition, according to the conclusions of Lee-Mortimer [59], Brady and Allen [60], the Six Sigma approach is a measurement-based strategy that aims to eliminate potential defects. At the same time, it focuses on the systematic improvement and reduction of process modifications.

The main difference between LSS and Six Sigma is that they identify the root cause of waste in a different way. In the views of Fazzari and Levitt [61], Sharma and Chetiya[62], Snee[63] and Thomas et al. [64] the LSS approach addresses an operational strategy and methodology aimed at reducing the cost of producing products / services, increasing process efficiency and customer / citizen satisfaction, and improving first-line production results. (bottom - line). In terms of the internal business environment, LSS provides a new way to improve processes so that a public or private enterprise can produce more efficient and quality world-class products and services [64]. LSS, according to several researchers, aims to create

initiatives for continuous organizational improvement [65].

The LSS strategy is also characterized as an effective model for developing a company's top leadership [63]. Beer [66] found that top management influences the magnitude of the success of LSS implementation by taking measures and decisions to support the entire process of integrating the method and smoothly accepting the changes it brings within the business.

At the heart of the LSS approach is the application of Design Of Experiments (DOE techniques) [64]. These techniques are worth emphasizing as they help engineers and executives to identify factors that do not add value to the final product / service and to adapt them in order to achieve sustainable organizational performance [64]. However, they are not the only techniques that can be used to implement LSS [64]. Examples include tools based on strategies and processes, such as Quality Function Deployment (QFD), Statistical Process Control (SPC) and ANOVA [64,67,68].

#### Digital Transformation Strategy

Digital Transformation (DT) is defined as the strategy of integrating digital technology in all areas of a business, resulting in fundamental changes in the way it operates and the way it offers value to its customers. DT can be characterized as a Lean Management strategy, because it includes changes in the way of thinking in the leadership of the company, encouragement in innovation, improvement of its internal processes, specialization of employees, customers, suppliers and generally all involved in its activity.

Its main purpose is to improve the competitiveness of the company and ideally to gain a comparative advantage by minimizing its operating costs, saving resources and improving the quality of services / products provided to its customers [69].

The DT strategy is the effort of businesses and especially the public to benefit from new technologies, to gain flexibility and to take advantage of the large volume of data and information formats. Especially necessary is the creation of bridges between the new innovative technologies applied by the company and their acceptance by human resources and on the other hand between the desired goal and the final result[69].

The ultimate goal of this lean strategy is to improve processes in an innovative way, reduce costs, improve customer satisfaction, with the ultimate goal of increasing market share, while

achieving higher profit. Lean Thinking focuses on eliminating traditional waste by maximizing value for the customer. Lean Digital focuses on eliminating digital waste while maximizing data profitability. Through Lean Digital, digital waste is removed, which means a substantial improvement in their use by activating a "virtuous" cycle that will allow further increase of data production and the creation of a suitable environment for sustainable change through Lean Digital [70].

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### Change Management

A success key for a successful Lean Transformation of public enterprises is the implementation of an effective Change Management strategy [71]. The Change Management strategy aims to support in the best possible way the transition of an organization from the current state in which it is, to a desired state in order to increase its efficiency [72].

A public enterprise to succeed in the future, must have a strong Change Management strategy, which has the ability to insist on the implementation

of changes in its processes and if necessary in their continuous monitoring, to support the vision of management, giving the ability to react quickly to changes in the work environment that may occur. To achieve this, administrations must challenge the current state of operations and processes of a traditionally structured public enterprise and adapt it to modern activities based on new technologies and new leadership models [73,74].

For many companies, adopting a new way of managing waste / expenses is a significant change, which if not properly integrated into its functions and organizational culture, can have very negative consequences [71]. In particular, public companies are a representative example, because often their human resources resist the adoption and integration of Lean Management principles, resulting in any project not being implemented properly [75].

Public companies that decide to promote a set of radical changes in order to be competitive and sustainable must develop a solid understanding of the methodologies and flexibility that surround these changes and are inherent in today's demanding and uncertain global business environment[73].

Figure 1 illustrates a comprehensive strategic change management framework that a public enterprise must implement [76]. It includes the difficult question for public companies, which is the big difference from private companies, the required strategic agility that reflects the ability of a company to perceive and respond to external or internal threats and opportunities. Strategic agility is defined as the ability of a company to take advantage of changing the economic environment, demonstrating resilience to unpredictable changes [77].



Figure1: Framework of Change Management

**Lean Management - Critical Success Factors**

The Critical Success Factors (CSFs) method was first reported in the late 1980s. CSFs are mainly used to identify the factors that affect the success or failure of the implementation of Enterprise Resource Planning (ERP) projects [78]. However, very little research focuses on CSFs related to Lean Management [2,79,80].

CSFs are defined as "the key players in various areas of activity, the results of which are considered absolutely necessary for a senior executive to achieve organizational goals" [81]. In addition, it is worth noting that they are important elements for identifying and prioritizing factors that could affect the successful implementation of the principles of Lean Management [52]. The strategic importance of

CSFs lies in the fact that on the one hand they can increase the probability of success, in terms of saving resources and reducing the operating costs of a business [7] and on the other hand they help to avoid confusion that may be caused in business, from the implementation of continuous improvement programs [7]. It is particularly worth noting that the number of studies examining the importance of CSFs for the successful implementation of Lean Management in public companies is quite limited.

The research of Finney and Corbett [824], Juliani and de-Oliveira [2], Lande et al. [79], Manville et al. [80], Psomas[13] show the CSFs most frequently reported internationally:.

Top Management Support	Management Commitment & Leadership
Change Management	Training & Education
Business Plan & Vision	Business Process Reengineering
Project Management	Selection of Staff
Organizational Culture	Communication
Customer Focus	

**Table 1: CSFs for Lean Implementation**

**IV. RESEARCH METHODOLOGY**

**Primary Research – Qualitative Method**

The primary data collection that this study used is the qualitative method, one of the most popular methods of data collection in recent years regarding Lean Management issues. In particular, this method identified CSFs and elements of implementation strategies and practices, Lean Management and resource saving, in the largest Greek public organization, which is Public Power Corporation S.A. (PPC SA) and consequently in the public enterprises of Greece.

The qualitative method used personal interviews technique at 20 senior executives of PPC SA in key positions (IT, procurement, energy management, strategic planning, human resources, production). Each interview was held in August-September 2019, during the morning hours of operation of the study company and lasted about 30-40 minutes. In addition, at the beginning of each interview, the consent of the participants was sought. At the same time, the researcher informed them of the purpose of the investigation, the confidentiality of their responses, ensuring the confidentiality of their private information and their anonymity [83].

**Bibliographical Secondary Research**

The secondary research method has also been used in this study, as data have been collected

from existing literature on the application of the Lean Management principles. Secondary research is carried out by collecting and evaluating data already collected in the context of previous primary research and is a major activity for a successful research project [83]. In this paper, the final use of the data was made through the utilization of scientific articles in scientific journals and online scientific sources, in an abstract manner and with particular attention, discovering and analyzing parts of existing knowledge concerning the subject of research. The main advantages of secondary data are the cost and time savings they offer to the researcher [83].

The study's bibliographical research has highlighted the main strategies and practices used internationally and in the Greek area regarding the implementation of Lean Management and resource saving in enterprises/organizations, with particular emphasis on its implementation in public enterprises/utilities.

The extensive bibliographical review conducted, also identified the main CSFs internationally recognized as potentially affecting the successful integration of Lean Management into public companies/ organizations.

**V. FINDINGS**

The major CSFs identified by the qualitative research, according to the frequency of the

responses provided, are the following:

- Human Resources Education and Training (13/20).
- Senior Management Commitment (10/20).
- Senior Management Support (6/20).
- Redesign of Business Processes (6/20).
- Business Plan (Systematic Assessment) and Vision (6/20).
- Project Management (5/20).
- Organizational Structure (5/20).
- Project Communication (5/20).
- Selection of Suitable Staff (4/20).
- Organizational Culture (2/20).
- Focus on (Internal and External) Customer (2/20).

The provision of staff education and training programs emerged as the most important success factor (with 13/20 responses). However, it was particularly striking that there were no training programs for staff in the field of practices and resource savings. Theoretically, human resources training provides knowledge about applying resource-saving tools and practices/Lean Management.

"Staff training is the first factor of success, as the enrichment of knowledge and the further development of the skills and competences of employees reduces the time of implementation of the relevant acts, the number of errors and the staff consumption".

[20th Responded]

The commitment (10/20) and support (6/20) provided by the senior management resulted from qualitative research as equally important factors. The commitment of the Senior Management has a leading role in guiding and participating in the role of Lean Management, and at the same time in stimulating the need to adopt the new working methods for the rest of the staff. In addition, it will explicitly support and communicate its work and results throughout the company.

"I think that one of the primary factors influencing resource-saving projects is the Administration's commitment to the goals it has set itself, prioritising communication on continuous improvement that focuses on their benefits to the Enterprise, feedback that is taken into account and program's adherence [1st Responded]

At the same time, management's support is provided by allocating a significant part of the budget for the development of training programs. On the other hand, the commitment of senior management should be an example to be followed by middle management and front-line

management. In this way, the involvement of the entire human resources in the integration of the Lean Management principles is strengthened.

Redesigning business processes (6/20) is one of the greatest CSFs. More specifically, it's a methodology based on development and integration of new technologies, techniques, ideas and processes that are in line with the principles and philosophy of Lean Management. This redesign provides transparency in the procurement system, reduction of waste and costs, more flexible procedures and greater meritocracy.

Redesigning business processes (6/20) is one of the most important CSFs. More specifically, it takes place with the development and integration of new technologies, techniques, ideas and processes that are in line with the principles and philosophy of Lean Management. This redesign achieves transparency in the procurement system, reduction of waste and costs, more flexible procedures and greater meritocracy.

Creating a business plan Business and providing a vision (6/20) for integrating resource-saving practices are equally important CSFs. In this case, it is necessary to set out clear and realistic goals, the continuous evaluation of the progress of the project and the processes of saving resources, the creation and application of Lean Management methodology for the identification of wastes and their elimination.

Among other important CSFs was the project management (5/20), which improves the organization's efficiency and productivity:

"Property project management reduces delays, prevents potential risks and properly manages time and budget" [20th Responded]

Project selection study will be done by quality assurance managers, who are actively involved in the integration of the Lean Management principles. Finally, the resource-saving project in each case must be directly linked to the broader corporate strategy.

According to the results of the responses, communication tools (5/20) were considered relatively successful, because of the progress was made in reducing waste:

The information shall be provided in the form of type 1) local assembly, (2) in groups and (3) individually. Whatever way is used, the senior executives are not satisfied to learn about salary and operating reductions. Communication was successful in the sense that everyone was informed not only by me but by the Manager" [7th Respondent]

"It was successful because it brought a better economic result without affecting the



planned process. In any case, there was a justification for the decision to reduce costs through meetings and I think it was understood by the existing staff" [17th Respondent]

On the other hand, there were participants who considered that the above methods of communication of the resource-saving project were not successful, because the objectives were not clearly defined and any efforts made were incomplete:

"All the employees were informed, without meaningful analysis. We did not come back at regular intervals to check and measure the savings and potential benefits of communication. We do not know if it was successful as the required value was not given" [20th Respondent]

Regarding the updating of the results of saving resources to PPC S.A customers and suppliers there were mixed responses (2/20). On the one hand, several people have argued that there is no relevant information. On the other hand, many responded that press releases, advertisements, print or electronic information campaigns and private meetings and updates are used for removal, replacement or reduction of supplies/materials.

According to the majority of participants, change management and organizational culture (2/20) affect the success of resource-saving projects:

"Change management is very important because saving resources through [the] lean philosophy brings about changes in the way the business works. Also, it is called upon to prepare the transition/change of corporate culture by reducing resistance" [13th Respondent]

In particular, it was found that new resource-saving principles and working methods are well integrated with the help of change managers, who are implementing a strategy to minimize internal reactions.

More specifically, the human resources of the entire enterprise understand the need to reduce waste and change working methods that have a positive impact on its efficiency. The organizational culture of the organization is therefore changing with regard to adaptability and flexibility indicators:

More specifically, the human resources of the whole company understand the need to reduce waste and change working methods that have a positive impact on its efficiency. Therefore, the organizational culture of the organization changes in terms of adaptability and flexibility indicators:

"It must be established by both staff and administration that reducing waste through rational

resource management will only be good for the Enterprise and therefore for all staff" [16th Respondent]

On the other hand, there were responses which claimed that the already existing corporate culture of PPC S.A. follows the wrong mentality (e.g. public sector intolerance, bureaucracy, etc.), with the result that any amendments and changes are not successfully implemented:

"The present Organizational culture, which runs through all stages of the Enterprise, does not contribute in this direction. Conflicting messages, as we have mentioned, and the lack of strategy adversely affect employees, view of reducing waste. However, the vertical hierarchy could facilitate a correct message. Work culture refers to "how things are done here all these years" without realizing that we have to change it to "how things are done from now on" [7th Respondent]

In any case, most of the answers given emphasized the fact that change management and organizational culture contribute to a smooth modification and evaluation of all activities and to the enforcement and observance of the regulations governing Lean Management with the emphasis on the employee. As a result, the organizational culture at all levels of the company effectively contributes to the culture of saving resources as it focuses on the employee, who is mature and aware of the active role he has in achieving the new organizational goals.

On the other hand, the selection of human resources (4/20) has a significant influence on the process of integrating the principles of resource saving. Since PPC S.A operates in a public sector status, the recruitment of new staff over the past decade or more has been largely determined by the governments and by relevant announcements with objective scoring through examinations or criteria of Supreme Council For Civil personnel Selection of Greece. Therefore, emphasis is given to skills required according to needs and not on the selection of specific staff to cover them, so training existing staff with a view to more efficient saving resources plays an important role:

"In Public Enterprises there is no selection of personnel. Staff exist and should be used as a key resource as far as possible. Education and continuous information is a first-line issue" [1st Respondent]

Of course, the selection of talented and competent people is particularly important in setting up an effective project team, which receives the appropriate training in resource-saving techniques.

## VI. CONCLUSIONS

The study focus on the strategic role played by key factors (also sub-strategies), called "Critical Success Factors (CSFs)", in the successful integration of Lean Management Principles in public enterprises in Greece. In order to specify the research query after a thorough bibliographical research, the strategies and practices for the implementation of Lean Management in public companies were identified and CSFs determined for its successful implementation. Then, a qualitative method conducted to identify the most important Critical Success Factors (CSFs) in the largest public company in Greece, PPC S.A, determined the CSFs affecting the successful implementation of Lean Management in public companies.

The findings of the qualitative method showed that Education and Training of Human Resources, Commitment and Support of Senior Management, Business Process Redesign, Business Plan and Vision are the most important CSFs.

Consequently, is confirmed Antony et al. [84], Antony et al. [9], Brun [85], Manville et al. [80] Angelopoulos and Pollalis[86], who found that Support and Commitment of Senior Management are the most important CSFs having a positive and strong impact on the existence of successful Lean Management. At the same time, the findings of Iverson and Zatzick[87], Lande et al. [79], Leong and Teh[88], Suresh et al. [55], are verified and they concluded that HR Education & Training has a positive effect on the successful integration of waste reduction principles, leading to higher success rates and adoption of Lean Management principles.

In general, it seems that the long-term Senior Management Support and Commitment is a key factor in the success of resource savings projects, since adequate management of large investments is required (e.g. technical equipment, human resources, etc.) [89]. In addition, qualitative research has shown that creating a comprehensive business plan and setting clear and achievable goals lead Lean Management projects to long-term success. In any case, the specific goals to be achieved require the participation and commitment of the senior management, which is responsible for strategic planning and decision-making [90]. In detail, senior management is responsible for monitoring and controlling resource saving projects, resolving potential problems and taking necessary initiatives at the initial stage of integration [91]. At the same time, senior management is invited to inform human resources about new working practices and to present the

roadmap for achieving the predefined goals in order to reap the expected benefits of Lean Management projects over long-term [89].

The Change Management has emerged as one of the most important CSFs as it prepares the entire organization towards a smoother acceptance of the changes brought about by Lean practices. A key role has a change agent/ leader, who incorporates changes and new working methods into the organizational culture of the public enterprise. In any case, however, it is considered necessary to commit human resources in this direction [92].

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