Lean thinking with improvement teams in retail distribution: a case study

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Published online: 06 Sep 2011.

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Sectors associated with the distribution of products and goods have become more and more important in recent years. Globalisation and changing market demands are increasing competitiveness in these sectors, and as a result many companies have adopted new improvement methods to assure their survival. The adoption of improvement philosophies and a lean culture offer new opportunities to improve the quality and service of distribution networks and activities related with transport and warehousing. The application of these philosophies, widely used in industrial companies, has been little documented in distribution centres. However, these methods are difficult to implement in companies from the distribution sector due to the volatility of customer demand, the high degree of human participation and the demanding mechanical and repetitive activities in retail and storage activities. This paper presents a methodology for change management to adopt lean practices in distribution centres. The presented case study has been used to develop, test and refine the methodology. Results show that the methodology was suitable for establishing a lean culture in the company and it resulted in good outcomes in terms of productivity, employee attitudes and participation.

Keywords: lean thinking; improvement; teamwork; change management; case study

Introduction

Retail distribution and the grocery industry have recently become very important sectors in the European economy. This is due to the large growth of these sectors and also to changes in consumption and leisure habits. The current model of consumption has changed in response to a larger variety of easily accessible products from all over the world and simpler transportation of large amounts of goods.

Shopping has become an appealing social activity, customer needs and expectations are constantly changing, and the market environment is extremely complex and highly dynamic. There are a wide range of alternatives when designing the distribution of products and goods from suppliers to customers. Once the strategy has been decided upon, the two main factors are delivery volume and complexity, and service requirements in time and reliability. Taking those variables into account, the decision of whether to centralise or decentralise the stock in regional hubs near customers led to the need for distribution centres or logistic platforms for distribution networks. The reasons for these infrastructures are: short delivery times (24–48 h), a wider range of products, transportation economies of scale and the need for stock to fill the dynamic demand pattern (Lambert, Stock, & Ellram, 1998). In this context, traditional distribution centres or

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logistic platforms need to apply improvement programs and lean practices to their processes in order to compete in a competitive market (Gu, Goetschalckx, & McGinnis, 2007; Pagatheodrou, 2005).

The adoption of improvement philosophies and a lean culture offers new opportunities for improving the quality and service of sectors associated with distribution, such as the storage of goods (Gu et al., 2007; Lund & Wright, 2003; Wang, 2008). Initially, these kinds of tools were developed by manufacturing organisations and then further advanced in service sectors (Reichhart & Holweg, 2007). However, these methods are difficult to implement in companies from the distribution sector due to the volatility of customer demand (Huq, 2005) and the high degree of human participation in the job. Retail and the storage of goods for further distribution involve mechanical, repetitive and physically demanding activities which require human effort and attention (Melacini, Perotti, & Tumino, 2011; Rushton, Croucher, & Backer, 2001).

Thus, the method for implementing lean practices, such as improvement teams in a logistic platform, should consider the factors mentioned above. Consequently, this research project is focused on how to deal with change in a distribution organisation when lean practices are being implemented. The main research questions addressed in this paper are:

How can the change management principles help lean practices be adopted in a logistic platform or a distribution centre?

How to ensure management involvement and worker participation in the adoption of lean tools in those organisations?

Change management in lean projects has already reached advanced levels within manufacturing organisations due to its use in the automotive industry during the first part of the last century. The lean philosophy entails worker involvement in decision-making and problem-solving (Delbridge, Lowe, & Oliver, 2000). However, other sectors depend on a hierarchical and largely non-participative organisation, where cultural change, a crucial prerequisite for the implementation of lean tools, is difficult to establish. Adopting a culture of reporting and solving problems through the use of improvement tools is of utmost importance. Furthermore, the development of workers through participation in improvement teams is essential (Cooney & Sohal, 2004).

Organisational change during the implementation of lean tools in industrial environments has been reported in several studies, but very little empirical research has focused specifically on lean and improvement management practices in the service sector (Huq, 2005; Wright & Lund, 2006). However, certain studies of manufacturing firms may fail to include service organisations (Cohen & Ledford, 1994).

Literature on lean methods tends to be more focused on the description of production improvement activities than on the methodologies to involve workers in the lean philosophy, which is a common requirement for both industrial and service organisations. Consequently, the aim of this paper is to propose a methodology based on change management principles for adopting lean techniques related to improvement teams in a non-manufacturing organisation. Our methodology is presented as a result of the action research methodology in a retail distribution company.

First, we present a brief overview of lean concepts related to managerial change. The following section presents the developed methodology of change, based on selected activities related to the adoption of the improvement process. This methodology consists of three key steps for the adoption of change management and how those steps should be carried out. Those three steps are:

- preparing and planning for change,
- developing change,
- embedding the change.

Next, a case study illustrates the activities carried out and the results. Finally, the conclusions of this case are presented, including implications for management, and final comments.

Change management for lean development

Toyota's philosophy, known as Lean Thinking (Womack & Jones, 1996), can help any company (including service companies) identify and eliminate all kinds of waste, thereby improving the business process. This philosophy has been especially widespread in the automotive industry, where most companies are manufacturers and overstock is one of the biggest problems they face.

However, lean manufacturing principles are often erroneously identified as improvement tools used to achieve zero stocks (Santos, Wysk, & Torres, 2006). In this case, as the company in question deals with stocks to satisfy customer demand, adopting those lean manufacturing principles would force it to close down. Indeed, the main focus of this philosophy is to reduce cost by eliminating waste, which is achieved through the use of rigorous problem-solving methods and continual improvement of those efforts (Wright & Lund, 2006). This approach must be rooted in the culture of the organisation and be in line with the vision and objectives established by management and through the development of the principles of the workforce (Liker & Hoseus, 2008).

The adoption of new improvement methods is not possible without a change in the workforce. The 14 principles of Toyota, developed by Liker (2004), emphasise the sense of teamwork carried out by workers. Changing towards lean management requires a combination of committed management, proper training and an environment that enables organisations to sustain improvement (Liker, 2004).

The key factor in instilling a lean culture in an organisation is establishing lasting managerial and worker involvement in the project. Regardless of the type of organisation, the adoption of lean implies a change in management mentality. Despite the fact that managers are focused on immediate financial goals, lean techniques look for sustainable improvements based on worker participation, meaning that in some cases an organisation's financial goals are unattainable in the short term. This change is more difficult for hierarchical organisations, where worker participation in company decisions or in problem-solving is almost nil. To assure the success of the project, both management and workers must develop a change in mentality. Therefore, it is important to plan a sequence of activities with the desired change in mind (Reichhart & Holweg, 2007).

Research methodology

The research methodology developed in this paper consists of two different phases: theory building and theory testing. Theory building consists of a proposal for a methodology for organisational change, which is necessary for the successful application of lean philosophy in an organisation. The proposed methodology should include elements for management involvement and worker participation during the change process. A literature review was conducted to identify an appropriate methodology by comparing key issues from different models. Key elements for establishing a participative culture in an organisation

were also considered. This analysis culminated in a methodology for organisational change which included key activities to ensure the success of the project.

For theory testing, we chose the action research process to develop and refine the methodology. This method is particularly appropriate for this case because it is especially applicable to the dynamics of organisational change (Coughlan & Coghlan, 2002). According to the action research methodology, a researcher is a not an independent observer but a participant in the process (Prybutok & Ramasesh, 2005). Unlike other research methodologies, action research is concerned with creating organisational change and simultaneously studying the process involved (Avison, Baskerville, & Myers, 2001). Therefore, members from the organisation under study actively participate in the process. This lowers resistance to change and increases the likelihood that the project will be successful (Middel, Coghlan, Coughlan, Brennan, & McNichols, 2006).

For test our methodology, we contacted a major Spanish distribution company which was interested in adopting lean techniques. The researchers acted as consultants, applying the methodology for change previously developed. The testing phase consisted of four phases. In the first phase, the researchers and managers of the company identified the desired outcomes and the principal objectives of the project. The second phase consisted of recognising the specific characteristics of the organisation, to adapt and developed the change management model to it. Afterwards, both researchers and managers laid out the development of the project and initiated its application. Finally, the methodology was evaluated and reviewed by analysing the improvements and opinion of the workers involved. Figure 1 shows the research methodology developed.
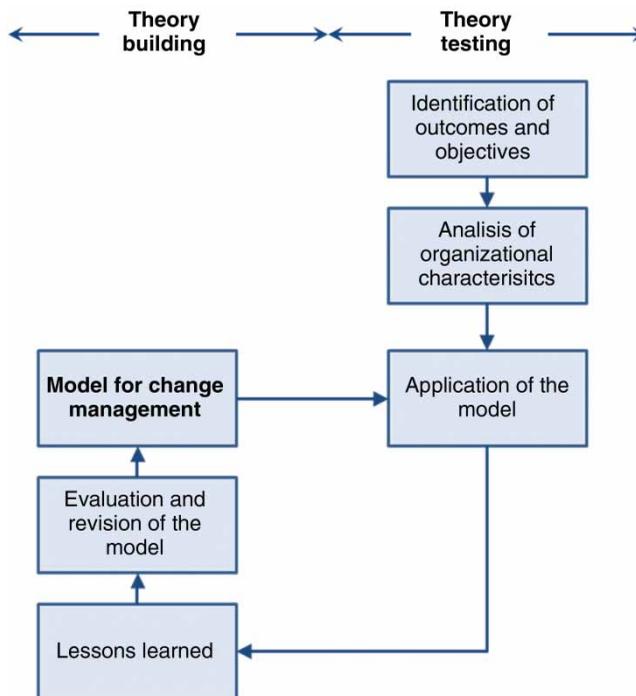

Figure 1. Research methodology.

Theory building: methodology for change management

Organisational change involves the adoption of long-term changes (Buchanan et al., 2005). Several studies published in the literature on change management have been dedicated to change models for transforming organisations (Mento, Jones, & Dirndorfer, 2002). However, one of the critical success factors for organisational change is fitting the methodology to the objectives of the company, including activities for sustainable change (Prajogo & Sohal, 2004).

The methodology we developed focuses on three key phases mentioned by different authors and also adds different activities specifically oriented to the introduction of lean thinking in organisations. The objectives of each phase, which are documented in the change management literature, are linked to those specific lean activities in order to assure true change. Figure 2 presents the methodology for change, which is especially focused on promoting teamwork among employees. Traditionally, improvement teams have been used to transform entire organisations (Teare, Ingram, Scheuing, & Armistead, 1997) and to encourage employees to use their experience and creativity for organisational improvement (Shapiro, 2000). The company featured in this paper managed to incorporate a constant and continuous cultural change through the use of teamwork and motivational activities.

Important aspects for bringing in a participative culture in an organisation were considered during the development of our methodology. According to the key activities for change process found in industry literature, there are three main categories of key issues (Davis & Bititci, 2007): Preparing and planning for change, developing change and embedding change in the organisation. The following sections explain the most important activities for creating effective and sustainable improvement teams.

Prepare and plan for change

Top management must be convinced of the need for change and must understand its purpose and context (Coughlan & Coghlan, 2002). The two most important questions that should be answered are: what do we want to achieve, and who are the stakeholders.

It is important for management to define the purpose behind the desired change and develop a vision of the desired outcome and regularly communicate why things must be changed (Bigwood, 1997). They must clearly define the steps being taken in the project. They also must identify the stakeholders involved in change. Creating successful
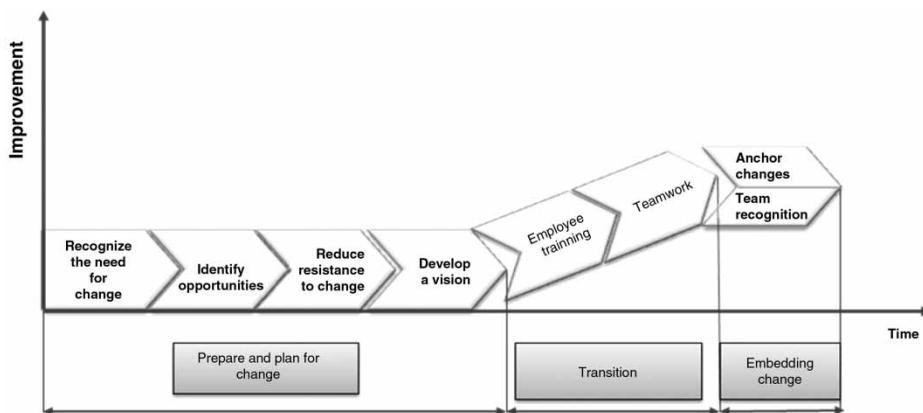

Figure 2. Methodology for change.

change requires anticipating people's reactions by understanding how they will be affected by change. It is also necessary to be aware of the sources of potential resistance. All of these factors must be carefully understood before developing a successful plan. The four steps for preparing and planning change are as follows:

- *Management must recognise the need for change* (Lewin, 1947; Paton & McCalman, 2000). Management must be convinced of the need for change, and the reasons for change must be specified and shared. Change strategists in the company are usually responsible for communicating with managers. Next, managers have to create a critical mass or support group (Kotter, 1995). This group must promote and encourage the following tasks for change. In this project, this group was called the Improvement Committee.
- *Identify opportunities*. In order to assure successful change, it is important to work on problems or improvement opportunities. Changes must motivate people, and employees must work together to reach their goals. This step involves the development of a shared assessment of problems and opportunities by management (Paton & McCalman, 2000).
- *Reduce resistance to change*. A company's history has a strong influence on its workplace environment. As a consequence, old ideas and feelings could be difficult to replace, even for people who want to change. Employees may feel threatened and concerned. Sources of resistance must be identified and understood, since previous patterns of resistance can be repeated if not dealt with properly (Mento et al., 2002). Other types of barriers must be identified, such as the fear of losing status or fear of the unknown. Regular communication, first with the stakeholders and then with employees, will reduce resistance.
- *Develop a vision*. This facilitates the understanding of the project and the establishment of goals and objectives. It also allows change-related problems to be anticipated. The committee is responsible for creating a vision which must be shared with the rest of the company (Kotter, 1995).

Develop change

Transition activities are intended to move the organisation towards the desired situation. Once objectives have been defined and the plan has been established, the following step consists of involving workers in the project. Employee involvement and participation have been considered the most successful ways to implement change (Crane, Dillard, & Hamilton, 2003). Creating formal teams and holding meetings are necessary for sharing information and solving problems (Bayo-Moriones & Merino-Díaz de Cerio, 2004). Communication and teamwork are key issues when it comes to activating change within the company. The following two activities represent two important steps in involving employees:

- *Employee training*. Training is necessary for the people in the organisation who will be responsible for implementing the vision (Kotter, 1995). People need resources to manage change, including training and access to information. Change based on improvement through teamwork must include training in problem-solving, quality tools and teamwork development (Bessant & Caffyn, 1997; Eguren-Egiguren, Goti-Elordi, & Pozueta-Fernadez, 2011; Teare et al., 1997).
- *Teamwork*. Teamwork is useful in the implementation of change and is also necessary to keep the organisation adaptable for the future (Crane et al., 2003). Teamwork

helps encourage worker participation when carrying out improvements (Bayo-Moriones & Merino-Díaz de Cerio, 2004). When people work together to reach an objective they are establishing the basis for further successful changes (Crane et al., 2003). In fact, lean methodologies (Kobayashi, 1995) include key elements such as 'rationalizing the system' and 'improvement team activities'. These activities focus on small teams of workers under a continuous improvement system. As will be explained later in greater detail, once workers have been trained in lean techniques, they will be capable of identifying and eliminating waste by adapting the tools used in a manufacturing environment.

Embed change

Change must be rooted in the company's existing culture. After successful implementation, changes and improvements must not only be validated by managers, they must also be communicated to the rest of the company. Top managers and shop floor employees need to accept and understand these changes. Moreover, the communication of achievements is an important factor in terms of getting employees involved and increasing commitment to change. It is also useful in reducing resistance to the change process. The validation and recognition of change will encourage people to take on new challenges (Bessant, Caffyn, & Gallagher, 2001). The following issues are integral to this philosophy:

- *Team recognition*. Employees involved in projects should be recognised. Recognition is a way to validate improvements that have been made and to communicate the success of the project to the rest of the organisation. Without specific rewards, people may give up and return to their previous state of resistance (Cano & Cano, 2006; Mento et al., 2002).
- Anchor changes. After validating improvement made in teams, it is important to permanently integrate those improvements within the organisation. This step involves the standardisation of processes as well as the concept of learning by doing. The first objective is not only improvement in itself, but also the extension of change throughout the rest of the organisation. Directly reinforcing and institutionalising change in the organisation leads to more people becoming involved (Bessant & Francis, 1999; Swank, 2003).

The methodology we used for change is based on the above steps. Our methodology involves different activities to facilitate and assure organisational change in companies, as detailed in Table 1. Every activity is important when it comes to successful implementation. Details about the implementation and activities undertaken are explained in the next section.

Theory testing: case study

The purpose of this study was to validate our change management model through the implementation of a successful and sustainable lean culture within a retail distribution company. This implementation allowed us to test, validate and refine our methodology for change. The study lasted 12 months, six of which were dedicated to the planning and design of the methodology. Those involved in the project have given it a very positive assessment. Moreover, the results of this study indicate that after change was set up, there was also significant progress in quality and productivity.

The company in question is a distribution company that specialises in food distribution. Founded in 1967 in the Basque Country (Spain), it was initially dedicated to the

Table 1.   Summary of the activities for change management towards the implementation of lean tools.

Model steps	Related activities
Prepare and plan for change	
Recognise the need for change	Meetings with researchers, development of the model, set up Improvement Committee, recruitment of a facilitator
Identify opportunities	Improvement opportunities detected, worker desire for training
Reduce resistance	Presentation of challenges to workers, involvement of representatives
Develop a vision	Vision of final results presented to committee, communication of project to workers
Develop change	
Employee training	Training in teamwork and improvement methods
Teamwork	Teamwork in improvement opportunities, communication of the results by workers
Embed change	
Team recognition	Reward by holding a special event
Anchoring changes	Reviewing and improving the process of change, formalisation of the procedures and norms of the model, including more people in the process of change, applying lean tools to organisation management as well

distribution of food and goods to traditional grocery stores. A few years later the company's strategy changed and they started to develop their own supermarkets. Nowadays, the group operates in the Basque Country and Cantabria (Spain) and owns more than 150 supermarkets.

The competition in warehousing and distribution is growing due to the introduction of various food and goods distribution companies, which are developing diverse strategies to stimulate consumption. During this study, the company in question increased the number of its supermarkets, which are characterised by core values of high quality in both fresh products and customer service. In this context, the improvement program was established in the company's main warehouse with the objective of increasing competitiveness. The management board wanted to introduce a cultural change to promote employee involvement in a new culture of lean philosophy. The next section shows how the methodology for the change was applied and the different activities that were developed in the company. Then, we discuss the results obtained.

Preparing and planning for change

The adoption of the lean philosophy represents a cultural change in an organisation (Bamber & Dale, 2000). First, top management must recognise and be convinced of the need for change in the organisation in order to promote and tackle the process head on. In the company in question, the warehouse managers, the human resources department and the methods department were convinced that a change in mentality was necessary for the entire company. To promote this change within the company, a successful improvement activity undertaken through teamwork was recommended. This experience would later become the seed of change for the rest of the organisation. The promotion, support and organisation of an improvement project require an appropriate organisational structure. To that end, we set up an Improvement Committee, formed by middle managers: the warehouse manager, the human resources manager, the methods department technician

and the person in charge of warehouse activities. An additional person was recruited to coordinate and assist teams during the improvement process. The committee promoted the system and acted as a team to identify problems, establish improvement objectives, and define the rules for the improvement teams.

Then, the Improvement Committee analysed the current situation to identify opportunities to help introduce lean activities in the warehouse. Several opportunities were detected, such as: Worker need and desire for training, improvement opportunities in warehouse processes (order picking, shop returns, etc.), improvement in order preparation, warehouse cleanliness, storage location improvement or reduction of maintenance costs. The Committee selected only those improvement opportunities that were most feasible in terms of time, cost and impact to warehouse management.

The next step in the implementation of the project was to reduce the resistance of certain warehouse employees. Forces of resistance must be reduced for any change to occur (Stewart & Garrahan, 1995). Usually, these forces reflect the history of the company and are traditional attitudes from the past (Davis & Bititci, 2007). For the company in question, an important agent of resistance was trade union representatives, with whom a special meeting was organised to explain the project. One of the consultants, a specialist in logistics processes and retailing, gave a presentation about the challenges and opportunities in the sector which could be tackled by an improvement program. The representatives recognised the need for the project and some of them even volunteered to take part in further training sessions and improvement teams.

After reducing resistance, a vision for the future was needed to be developed. The company was convinced about making changes, but it was unsure of how to begin and what resources or changes were involved in the project. The Improvement Committee was invited to visit another distribution company, this one dedicated to appliance supply and storage. This company's warehouse had seen a high degree of improvement, with organisation based on employee involvement and teamwork in lean activities. This visit allowed the Improvement Committee to better understand the final result of the project.

After that, the project was officially presented to the warehouse, explaining the elements of the program, which included voluntary participation, training financed by the company and team recognition. The criteria for evaluating and choosing team proposals was also set up and explained in the meeting. The number of people initially interested in participating in the project exceeded all expectations as 30 out of 50 warehouse employees asked to participate. The Improvement Committee decided to include all interested employees in the project and chose to develop it in two phases: the first would take place during the first year of the project and the second phase the following year, during which the rest of the interested workers would be trained and included in the improvement project. All interested employees were interviewed by a consultant in order to form groups that were mixed in terms of experience and personality. Those interviews led to the conclusion that employees were motivated to contribute their ideas and knowledge, something that was previously unheard of in the company. As one of the interviewees told the consultant, the company's unofficial slogan before the change had been: *You are not paid to think.*

Developing change: introducing lean activities in the warehouse

The project's first action was employee training. The first 15 workers selected were trained for 20 hours in teamwork and improvement methods with the aim of providing workers

with tools to identify and solve problems. The last training meeting focused on selecting the improvement opportunities that the teams would solve. During the last training session, workers expressed their ideas and prioritised them using two different criteria: difficulty and impact on the whole organisation. These criteria are shown using a selection matrix tool (see Figure 3).

The Management Team organised the following improvement opportunities into groups to be assigned to different improvement teams:

- procedures and guidelines,
- computer tools for improvement,
- equipment,
- locations,
- infrastructure,
- sort, set in order and shine.

The improvement opportunities were also classified according to their level of difficulty (Figure 4).

Afterwards, three teams were formed and assigned to different areas:

- *Improvement team 1*: Service improvement, which included the following sub-projects: (1) Better understand the number of customers per pallet in traditional service (service to small grocery stores). (2) Reduce movements during retrieval. (3) Improve pre-sale store service.
- *Improvement team 2*: Order and cleanliness, which included: (1) Solving the problem of the accumulation of white pallets (the company's term for empty pallets). (2) Improving order in the aisles. (3) Improving the storage of machines.
- *Improvement team 3*: Quality and order, which included: (1) Reducing broken products on shelves. (2) Eliminating dirtiness in the warehouse. (3) Improving recyclable plastic and wood storage (actually mixed).
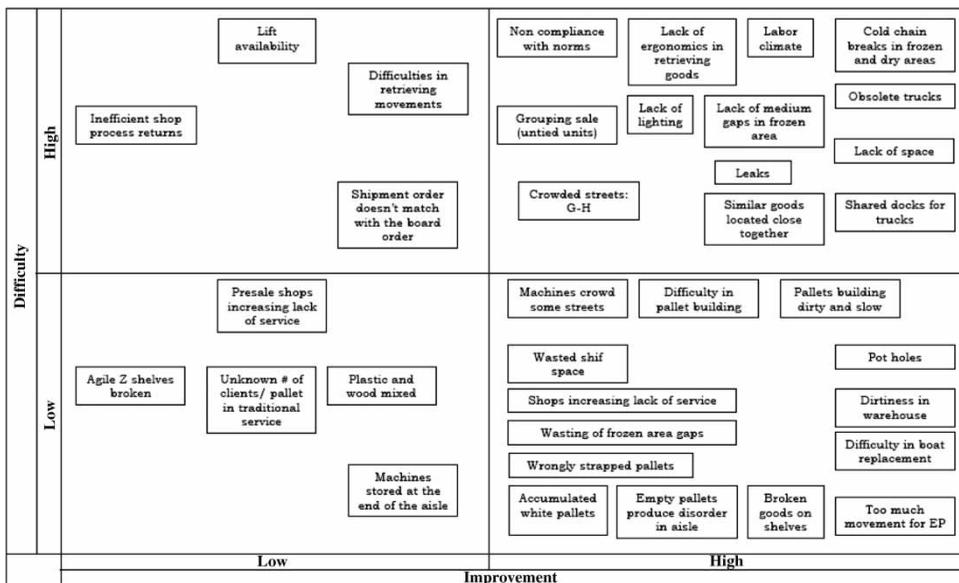

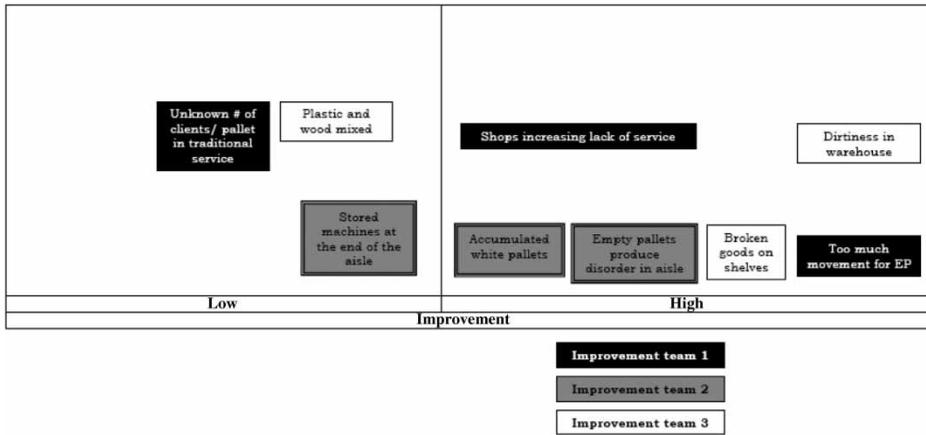Figure 3. Selection matrix for analysis (difficulty vs. improvement).

Figure 4. Groups of selected improvement opportunities.

Although lean activities are commonly associated with production, other sectors can be improved through the application of lean concepts, such as the ones used in this paper. Efficient storage depends on the organisation of goods held in warehouses in order to efficiently utilise space and facilitate efficient handling of materials. In the case study, activities relevant to the flow of goods in the warehouse were considered. The overall process in the warehouse is as follows: Goods are delivered by trucks, which are unloaded at the receiving docks. The quantities received are verified, and random quality checks are performed. All returned goods are also verified at the reception desk. Subsequently, products are prepared for transportation to the storage area. This means that a label is attached to the pallet, which consists of a bar code with an EAN number assigned by the computer. Next, the pallets are transported to a specific location within the storage area. Those pallets are moved to the picking area or used to fill an order to be sent to a shop. This whole process is illustrated in Figure 5. The lean philosophy is mainly focused on process improvement, which is based on waste elimination. Lean principles were introduced to workers during training and later strengthened during the problem-solving process. Therefore, the teams focused on improving issues related to reduction of both movement and waste, the latter being linked to accumulated materials or broken products. In what follows, we briefly present the work carried out by the groups. The Improvement team 1 improved a number of aspects related to service within the warehouse, applying waste reduction techniques to movement and reorganising work procedures. These new procedures involved changes in the management software used to schedule orders and job assignments. The total time used by warehouse workers to complete orders for traditional shops was reduced, as was the distance covered by lift trucks during order preparation. Improvement team 2 worked on order and cleanliness, focusing on an area which was full of pallets. After analysing the problem, the team identified that the origin of the problem was the accumulation of broken and useless pallets (due to their dimensions). Developing new procedures in the purchasing department and monitoring the area in order to detect and avoid undesired situations were proposed. After those lean actions to improve order and cleanliness were established, overall warehouse management was improved. The third team was tasked with avoiding the presence of broken products on shelves. This team carried out an exhaustive analysis of the problem, which took longer than initially expected. After the analysis, however, the team realised that finding the
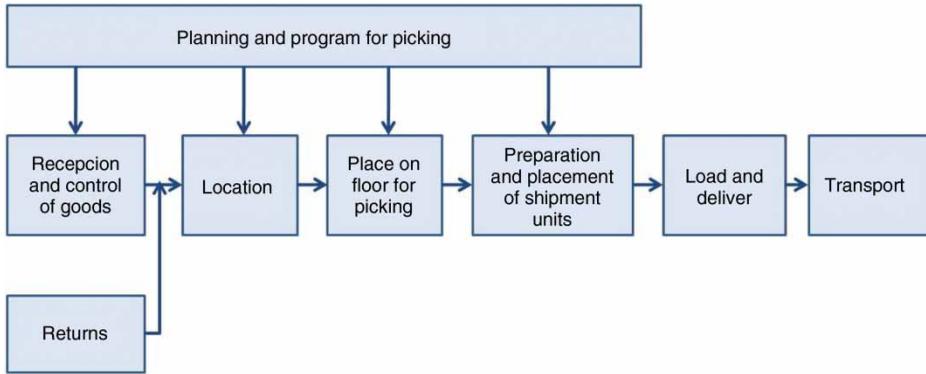
Figure 5. Warehousing processes.

root of the problem was essential if they hoped to solve it. The team chose to improve shelves (size, devices) and operator habits and to develop procedures for receiving and storing goods.

As a result of the improvement teams' work, a high level of motivation was detected among those who worked on the teams, not only because of the positive results, but also because people were personally involved in the development of the project. Although teams had specific scheduled meeting times, a large amount of work was done outside of working hours. A number of people in the groups took pictures, wrote reports and prepared figures outside of their normal work schedule.

After an initial problem analysis, the teams were required to give a presentation to company managers during a formal meeting. Representatives from the purchasing department, sales department, human resources and the IT department attended the meeting. This was an enriching experience for the team members, who later presented the results to their own colleagues. Communicating the improvements was important for securing the collaboration of all warehouse workers.

Embed change in the organisation

Though their first experience with improvement teams using lean principles was successful, the participants and the Improvement Committee were concerned about the continuity of the project. On the one hand, first phase participants were worried about bringing in new people to the project because they feared that they might be replaced by the newcomers. On the other hand, the Improvement Committee was convinced that a new participative culture had been introduced to the teams, but they were unsure as to how to transmit this new culture to the rest of the warehouse workforce.

As a result, the second phase of the project was carefully designed to ensure that changes in culture and management style were embedded in the organisation. The steps needed to effect this during the second phase are explained in the upcoming section.

After participants presented the results of their work to managers at a formal meeting and to their workmates during a presentation in the warehouse, top management understood that a reward or special recognition was necessary. Therefore, the company offered them the opportunity to visit another company in the area. Those selected to visit the company were expected to learn something of technological interest or information regarding warehouse management. The participants chose to visit a supplier

with an automated storage system for retrieving orders. The visit reinforced their motivation and generated new improvement ideas.

Although integrating changes and improvements is difficult during any transformation in an organisation, it is also of vital importance. In this project, teams in the warehouse first began to work with concepts related to process management, waste reduction and other activities from the lean philosophy. Two different methods were used to extend this culture to the rest of the company: the creation of new improvement teams and improvement process management.

In order to simultaneously involve new people and maintain the motivation of the previous phase, a new participation system was designed. This second phase triggered further participation by forming new teams made up by people who had participated in the first phase and newcomers. Another training course in lean tools was organised for the new participants. As a consequence, the thirty trained employees were divided into teams of five to work together for a year. During each quarter three teams worked simultaneously to solve or improve a problem. As a result, by the end of the year twelve improvement teams had worked on any given area, which meant that each person worked on two different teams. Consequently, both camaraderie and knowledge were improved. A system was created so improvement teams could present results to warehouse workers and to top management whenever possible. In addition, the teams formalised their improvements and successful methods in documents or procedures to be used by the rest of the company.

Parallel to this project, different processes began to be mapped with the help of the warehouse workers. These processes were analysed to reach a consensus in order to eliminate incoherence, inconsistency and inefficiency. Furthermore, a number of indicators were also incorporated, some of which had been previously defined by former improvement teams. Additionally, a plan for change was developed to improve warehouse management. The company in question has five workers who are considered heads of the warehouse, each of whom works three different shifts. They are also in charge of various warehouse workers and tasks. They become involved in integrating the lean philosophy into their work. These workers were trained in quality tools, teamwork and workforce management. Their communication and organisation systems were analysed and improved with their participation and ideas. The workers' objective was to develop a system where five people from two different shifts could work in a coordinated way. Before this analysis, the shift managers had a limited vision of their particular work area and shift. After the analysis, however, they were able to manage the whole warehouse as a team, in an efficient manner. Visual indicators were introduced to reinforce process management and problem-solving.

In this way, a warehouse with a hierarchical structure evolved into an organisation in which people participate in an active way to implement process management and improvement.

Results

The objective of this research project was to propose a methodology for change in a distribution company for the development, application and adoption of lean techniques in a distribution centre. The methodology was successfully implemented and both management and members of the Improvement Committee perceived a positive change in this organisation's culture. However, it is difficult to measure and assess variables related to any organisational change. Traditionally, the effectiveness of organisational settings has been categorised into three major dimensions: (1) performance effectiveness in terms of
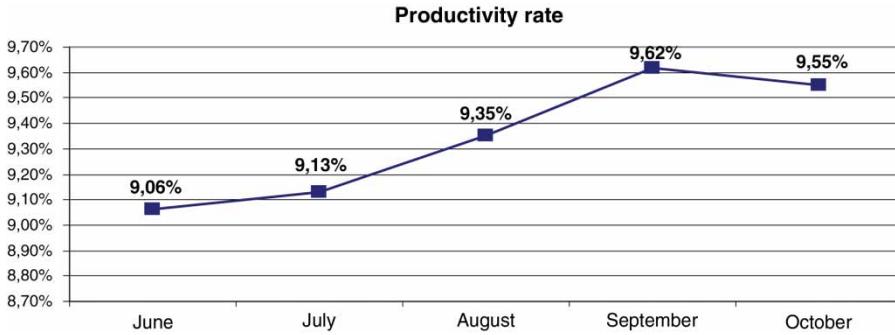
Figure 6. Improvement in productivity rate.

the quantity and quality of outputs, (2) people's attitudes and (3) behavioural outcomes (Cohen & Bailey, 1997).

In terms of warehouse performance, the productivity rate was significantly improved, as shown in Figure 6. This figure shows improvement in relation to the same month of the previous year. Even though the proposed improvements helped lead to positive results, worker awareness and the prevention of warehouse inefficiencies proved to be instrumental. Measurements related to employee attitudes include perceptions of the project (Crane et al., 2003) such as worker satisfaction, communication and managerial support, etc. These are also key elements of the project's success. The variables were measured on a scale of 1–5 on a questionnaire filled out by the employees participating in the project. All of the results were over 3, with an average of 3.51. Results are shown in Figure 7.

Behavioural outcomes are connected with routines (Becker, 2004) and with the way in which people internalise new concepts. Although these outcomes are difficult to measure, an increase in worker motivation was detected. Figure 8 illustrates the rate of voluntary participation as an indicator of motivation, which was influenced by the improvement of organisational culture and climate. Those workers now have more responsibility and are participating in the detection and solving of work-related problems. During meetings with the Improvement Committee and teams, we recognised that workers were able to change regulations through problem-solving and that other departments began to participate in similar lean projects. So, the first question addressed in this paper, namely how can

Figure 7. Employee perceptions about the project (feedback from employee questionnaire).
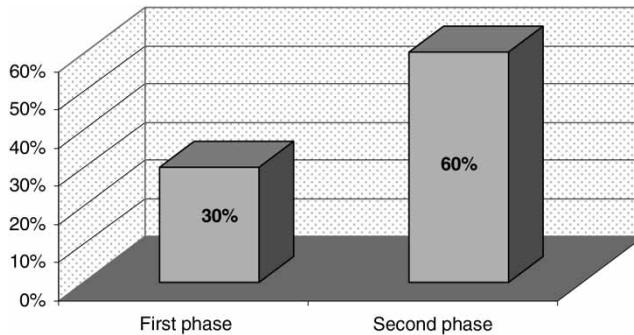
Figure 8. Rate of voluntary participation.

changing management principles facilitate the adoption of lean practices, can be answered in terms of the results mentioned above.

In terms of the involvement and worker participation highlighted in the second research question, the results show a positive trend in participation and involvement, echoing the success of the project. The results from the methodology for change confirm that it has been successfully developed and applied.

Conclusions

The present study offers a real application of our methodology for change management, which is a crucial aspect when a lean project is going to be undertaken. The proposed methodology is based on the development, application and adoption of lean techniques as well as the key aspects for the organisational change.

In the case under study, the company was a hierarchical organisation with traditional management methods which had become obsolete, inefficient and impractical. While implementing the methodology, important implications were detected. First, the study found that the use of lean tools with improvement teams is also useful in organisations that are not directly related to production. Moreover, it has also been shown that worker participation in the project increased the motivation of warehouse employees. This motivation directly influenced productivity and process efficiency. These results indicate that organisational change is possible through worker participation in process improvement. The main elements for achieving both motivation and participation have proved to be training, teamwork and recognition.

Another aspect detected as being decisive in the methodology was the sustainability of the changes made. The participation of warehouse managers was determinant in embedding changes within their company's organisational culture. Even though the methodology yielded positive results, some aspects of it should be considered in greater depth. For example, there were difficulties in communicating the project's evolution and the results to non-participant workers. Due the fact that not all the people in the warehouse were able to participate in improvement teams, the actions taken and their results did not reach the workers who were not involved. To improve this aspect, teams made special presentations about each of the projects, and posters on the development of each improvement opportunity were displayed in the warehouse. Another important aspect to keep in mind for the enhancement of the change model is the inclusion of higher level improvement activities, which involves deeper knowledge and the development of specific tools for experimentation.

However, this experience was limited to only eighteen months of study. Thus, more research on the level of implementation and the sustainability of improvement systems should be carried out. Future lines of research in this field could explore the level of participation in those systems and how long other companies take to establish which anchorage mechanisms are used to implement change. As lean techniques have tended to focus exclusively on assembly lines and the automotive industry, we believe that it is worthwhile to conduct further research into application of lean techniques to the service sector. Finally, research into the measurement of behavioural outcomes of improvement projects is also needed.

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