

Semi-Autonomous Work Team Implementation in Manufacturing Cells Using a Simplified Project Management

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Abstract

A change in a social system such as semi-autonomous work team can be conducted in both ways - change management and project management - according to literature. This work developed a simplified project management methodology to implement self-management cells that are a type of organization in which employee groups are in charge of a complete sequence of work in the production process of goods for internal or external clients. The objective is to adapt a methodology used in project management as a way of organizing change to allow the empowerment of the workers in the manufacturing cells, through identifying the requirements for implementation and assessment of the self-directed concept. This work is a result of nine years of research-action methodology applied to a self-management cell in an auto parts manufacturing company and accomplished the implementation of semi-autonomous work teams. Improvements were achieved in logistics and inventory reduction, both for parts and for machining tools. The financial consequences of these improvements showed a break-even of the invested amount within 8 months.

Keywords: Semi-autonomous work team; self-management cell; change management; self-directed work teams; simplified project management; empowerment; manufacturing cells.

1. Introduction

The great range of products from external enterprises puts the customer in the position of being able to choose from several offerings for the same product. It changed the current vision of economy to that in which the market, and not the companies, dictates the laws of consumption. Traditional concepts outlined by Taylor and Ford at the beginning of the century based on individualized work for the pursuits of productivity were insufficient [1]. The adoption of semi-autonomous work teams, even called self-management teams or self-directed work teams, by world-class companies shows that such hypotheses are being abandoned. A simplified project management method [2] was applied for the change management and it was revealed a good tool for both monitoring and controlling the change. This work is a result of 9 years of research-action methodology applied to a self-management cell and accomplished the implementations of self-directed work teams.

1.1. A Brief History of Autonomous Groups

Several studies [3, 4] credit the Tavistock Institute in London and their socio-technical treatment for the creation of autonomous groups, as described in the beginning of the 1950s. The genesis of high performance organizations, through work teams, was described by Ken Bamforth, unionist and former coal miner who was a student of the Tavistock Institute for Social Research (Tavvy), co-founded by Eric Trist. Bamforth found out that miners created by themselves a work organization that brought out significant improvements in terms of productivity, cost, time-cycle, absenteeism and morale of employees. Bamforth was the pioneer in the socio technical treatment of the redesign of work [5].

During the 70s, the interest grew in Scandinavian countries, particularly in Norway and Sweden. In those countries, experiments carried out by Volvo (The Volvo Group-manufacturer of buses in Sweden) and Saab (Scania Group-manufacturer of heavy trucks in Sweden), succeeded and were discussed throughout the industrial world. From the end of the 70s to the mid-80s, the interest mixed with the movement for "Quality of working life", which

avored a profound transformation of the means of labor through agreements between unions and employers, and the creation of semi-autonomous groups of production workers [3].

Around 1985, the attention given to independent groups was eclipsed by the success, in Japan, of the Quality Control Circle - QCC and its adoption throughout the world. Japan has replaced Sweden as a model of teamwork. Its popularity declined in the beginning of the 90's when some of the experiments failed [3].

1.2. Organizational Culture

As it comprises a change of beliefs and work methods, there has to be an alteration of the state known as organizational or corporate culture. The implementations compulsorily lead to a change of the organizational culture. "A self-management team is usually empowered to share various functions with managers and leaders. If several of the typical responsibilities of leaders have not been transferred to the teams and the roles and responsibilities of the leaders have not changed significantly, the organization probably is not implementing autonomous teams. In other words, self-management teams require a complete transformation of the culture of the organization" [6].

Initiative and incentive culture. Taylor uses the term "initiative" to designate every worker's good qualities and points out that the average worker avoids giving their full initiative: "... workers believe that it is positively against their interests to employ their best initiative and, instead of giving efforts to achieve the biggest quantity of work with the best quality, they deliberately work as slowly as possible while trying to convince their employers that they work fast" [7]. The author states that, in order to obtain initiative, the administrator should provide a special incentive, calling it managing by initiative and incentive.

1.3. Characterizing Self-Management Cells

The autonomous work system is characterized by self-management cells or semi-autonomous teams, which are groups of workers organized for a specific process, a product, a service, or a group of clients [6].

Other characteristics may be added:

- a) It is partially administered by its own [8].
- b) It uses visual (transparent) control management systems [9].
- c) The collaborators are like shareholders and are committed to results [10].
- d) It prioritizes the teamwork, stimulating initiative [6].
- e) Workers' participation, recognition, and team belonging for motivating staff and workers [11].
- f) It performs audits in order to ensure continuity in the self-management process [12].

1.4. Implementation of a Self-Management Cell: Pre-Requisites

The interest in establishing a self-management cell should be expressed by the company's high administration, which will be possible with a change in its culture and the creation of the pilot cell, dividing the company into two environments. This characterizes the wish, top down, for establishing self-management cells. In order to make this new form of work management feasible, there are pre-requisites to be fulfilled, which, in project management, include countermeasures to the risks of the project:

- a) Involvement and support of the high administration, including the allocation of resources [13].
- b) Involvement and trust of the manpower [9, 14].
- c) A plan designing where to go [12].
- d) Profit centers to be subjected to change [15].
- e) Team-based management [12].

2. Case Description

Many organizations apply projects for organizing change [15]. The Project Methodology [2, 16] commonly applied to auto parts manufacturing, was used in the implementation of the self-management cells. This methodology has

a pre-requisite for its application i.e. the creation of a multidisciplinary team, the Project Team. The methodology was divided into 4 steps (see Figure 1):

1st Step: Planning, in which the project team’s mission, the stakeholders, the company’s strategic guidelines, the comparative benchmarks and the current scenario were analyzed.

2nd Step: Organizing the project in order to establish the sequence of activities and to define the project coordinator;

3rd Step: Executing the project, in which the autonomy to be delegated to the group is determined, and so are the supervisor profile, the pilot cell, and the audit implementation and period.

4th Step: Controlling, dissemination, enabling, monitoring, and results.

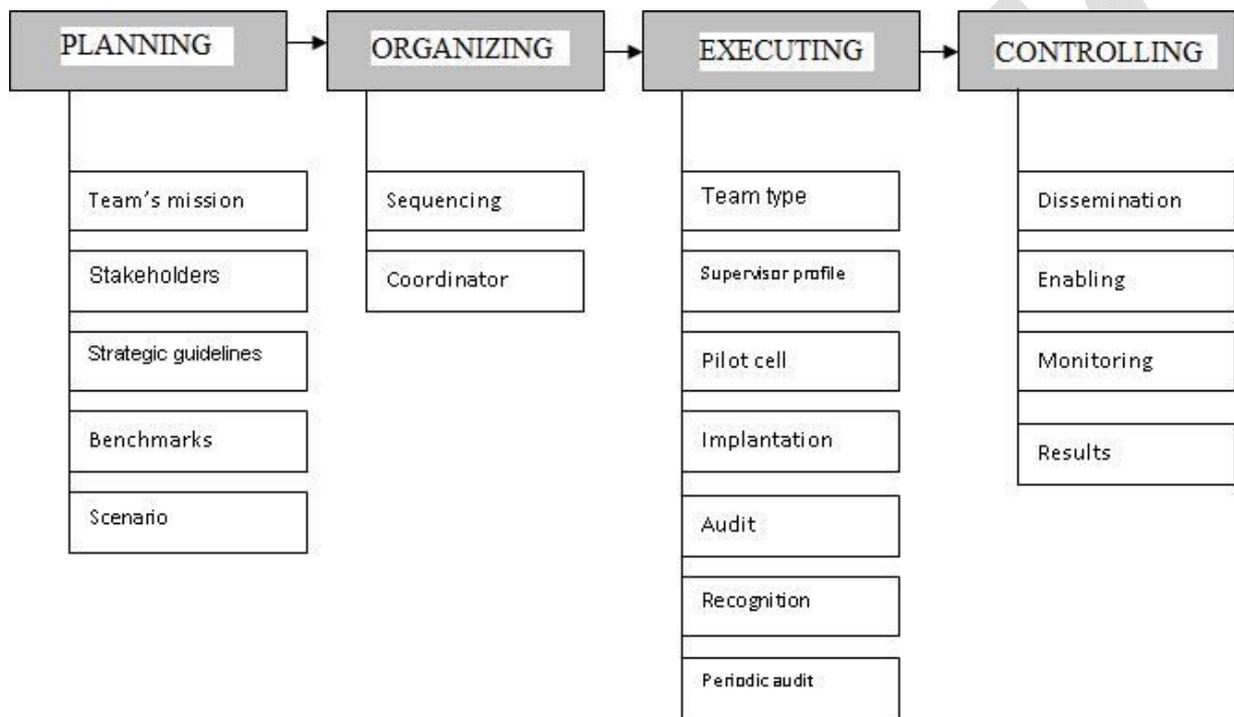


Figure 1: Project methodology. Source: [16] – adapted.

2.1. Planning

The planning consists of fundamental information gathering that can influence the success of the project. The first step of the methodology includes the phases of defining the team’s mission, understanding of the needs of the stakeholders, considering the strategic guidelines, the processes and comparative benchmarks, and the current scenario. These phases are discussed below.

2.1.1. Composition of the Team

It is not advisable to restrict the team to a single department. In order to ensure the group to be multidisciplinary and the participation of most of the company’s collaborators, an invitation should be made to the all areas of the company. Then, a meeting should be held with an interactive treatment and group discussions.

2.1.2. Elaborating the Project

The leadership and sponsorship of the changes are considered critical factors for success. The role of leaders, or project managers, is to support and commit to ensure that the process of change is carried out. "The sponsors support the changes in the organization and provide the necessary basis to assure that the transformations will take place" [17].

2.1.3. Project Team's Mission

The Volvo plant in Kalmar (a Volvo Group factory in which the self-management teams were installed for the first time in 1974) achieved good results because it had clear planning and goals [12]. These targets should be accepted by all participants of the team and should be measurable.

The mission of the team is to verify the expectations of the leaders in relation to the project expressed in the strategies of the company, making its deployment in specific objectives for a manufacture cell and promoting the implementation of the project. "The team project, using the information contained in the vision of the company, should drive the critical success factors, key variables that can determine the success or failure of the future performance of the organization" [6].

2.1.4. Stakeholders

Most organizations have the following factors: customers, manpower, shareholders and owners, suppliers and society. In the case of the cell, the key stakeholders are workers and the company. There are workers' testimonies which give evidence of the importance of the participation of all stakeholders in the process [18]. The interview held at Mercedes Benz with a unionist on November 26, 2003, serves as an example:

"... The company presented the whole project, and the content of the project was the creation of team work; the concept of continuous improvement, the staff of kaizen; outsourcings, which was very strong point of their project, the versatility; a series of elements of the project. Reduction of the inventory and all those things. Then, we concluded that the project, it was a project that aimed to improve the production, the product of production and that it had nothing to do with the life quality of employees. It was a project focusing on product quality, improving the product. It didn't contemplate the life of the worker".

2.1.5. Strategic Guidelines

The company's strategic guidelines in the study were defined for performing the basic attributes of a manufacture: a) establish a change in attitudes and behavior, b) disseminate self quality control, c) increase the motivation of the operators, d) create autonomous working teams and e) introduce systematic audit for monitoring, and periodic audits.

2.1.6. Process Searching and Comparative Benchmarks

Occur as follows: initially, research on the possible existence of similar systems in other industries is performed, which can be used as references in developing the project. "The logical attitude of finding out what others are doing regarding self management teams should consider that, as the interest in these types of teams started to grow recently, there are more teams in their initial stages than cultured mature teams. Teams that seem as model teams may be only examples of work teams in action" [6]. Bibliographic surveys on the matter are also part of the search for procedures and comparative benchmarks.

2.1.7. Analysis of the Current Scenario

After assessing the stage of implementation of the project, the team should seek strategies to neutralize identified threats and seize opportunities. "Most of the team's efforts fail in the team implementation phase because the organization did not give special attention to the needs and feelings of everyone involved" [6].

2.2. Organization

The second stage of methodology is organizing the project in a way in which the sequence of activities will be established and the coordinator of the implementation will be determined.

2.2.1. Sequencing

“Once the direction and the parameters are clear, a work team representing all the departments of the organization is empowered to redesign the structure and to create a culture of high performance and involvement” [6].

2.2.2. Coordinator

The project coordinator will coordinate the working teams and should be chosen by the high administration of the company, which they trust and who has technical skills, as well as the following characteristics: a) knowledge of the policies and goals of the company; b) extensive experience in the factory floor, where the project will be developed; c) control of the production processes; d) easy relationship with the various levels involved; e) Autonomy to decide and control over the project [19].

The project coordinator (or PM) must aim at intrinsic motivation. “In the circus case, the almost self-directed team built its creation on the respect of each individual’s desires to engage in different types of challenges. For instance, one of the artists was more involved in storytelling, so he was responsible for the scenario. The one more concerned by the pure physical aspect of the show became responsible for the fitness and contortionism training and coaching” [20].

2.3. Execution

The third step: is that in which there is the definition of the type of autonomy to be delegated to the group, and the implementation itself. Each cell to be implanted must go through six phases in order to be self-management: definition of the type teamwork, profile of the supervisor, definition of a cell pilot, implementation, audit, recognition. The self-management periodic audit stage is part of the implementation, but is performed after a year, triggered by monitoring. Controlling phases (enabling, monitoring and dissemination) will work in parallel with the six phases above (see Figure 2).

2.3.1. Definitions for the Implementation

The necessary definitions should precede the implementation: definition of the type of team work (autonomy), the changes in the supervisor profile and the definition of the pilot cell.

2.3.2. Defining the Type of Team Work

The first definition is the level of autonomy to be delegated, and according to this autonomy, there can be different categories for the groups, characterized by different types of teamwork [1]:

Empowered team. This kind of group has restricted autonomy, controlled by the supervisor and other leaders in the structure of the organization.

SAT – Semi-autonomous team. Group of employees responsible for a number of tasks, in which supervision is not constant and the members have partial autonomy to perform both technically and administratively.

Self-directed work team. Group of workers responsible for a number of tasks, in which there is no supervision and employees have partial autonomy to perform both technically and administratively.

Type of Team Work for Pilot Cell

The type of team work chosen defines the level of management autonomy to be delegated. The pilot cell will be what is called an Empowered Team, as this is the preferred type for mass production manufacturers, such as auto manufacturers. As a matter of caution, the supervision initially kept control over the cells. "Empowered teams offer a viable alternative that co-exists easily with less profound changes organizational in infrastructure and power relations inside the plant" [1]. The team was formed only with workers of the cell in order to have great proactivity as stated for authors [21] that reported less favorable team climates when diversity increases, suggesting the diversity caused unhelpful conflict within the team, thereby inhibiting proactivity.

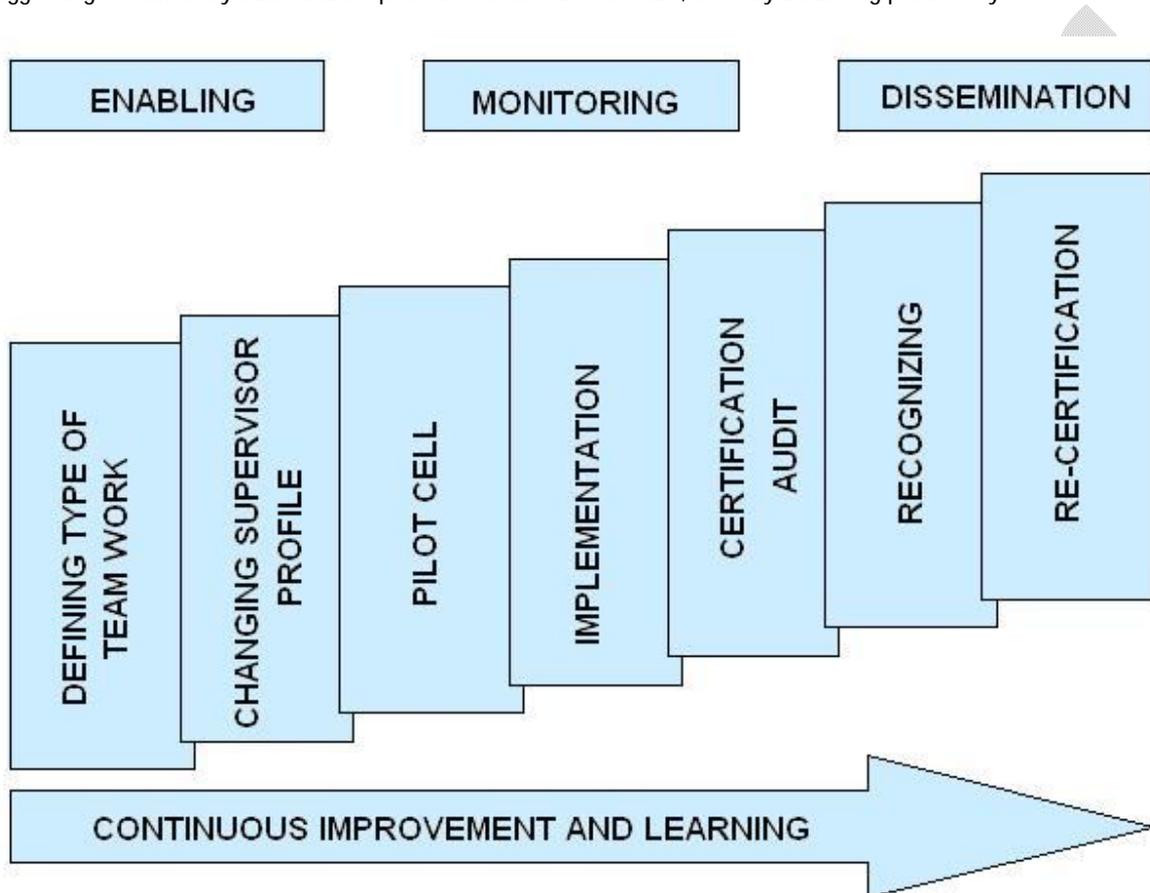


Figure 2: Project structure – execution and control. Source: Author.

2.3.3. Changing the Supervisor Profile

Since the beginning of the implementation of a self-management cell, a progressive change in the role of the supervisor should be taken into account (see Figure 3). "Team management is an evolutionary and developing process that needs times and training. A true self-management team should primarily deal with tasks, then control the budget and finally make decisions. The supervisor should learn how to comply with this structure of work" [12].

The culture change had an impact on the operator's behavior. Now he receives information, analyzes it and acts; time given to problem-solving increases; his motivation increases; he has a sense of propriety and searches for more effective solutions. In the same way, supervisors change their behavior. They sensed the loss of power, changed their attitudes in decision making and delegation, started to have more control over anxiety about results

and their actions are more analytical and tactical. "Although changing the hierarchical role of supervisors to facilitators, coordinators or coach, businesses will not let go of certain forms of control, such as, the key performance indicators" [22].

The change in supervisor profile can be applied to manage the aging workforce too. In a process called Leaving Expert Debriefing (LXD) at Siemens, critical knowledge is first identified and then the way this knowledge should be transferred to the expert's successor is decided [23].

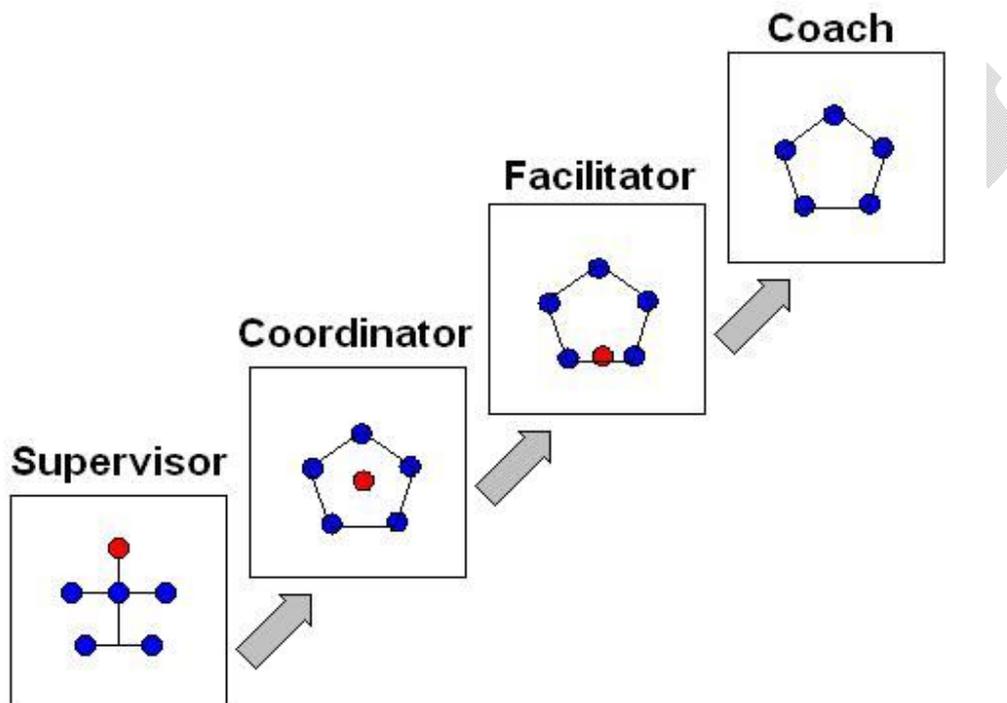


Figure 3: Progressive changes in the supervisor profile. Source: Author.

2.3.4. Definition of a Pilot Cell

A cell chosen to be the pilot was defined by the production, had low complexity, stable and experienced operators and its process was stable. The pilot cell can be seen as a mirror by the whole organization so it is important to select functional areas that have more chance of being successful in order to avoid excessive risks that can eliminate the chance of a second attempt [1].

2.3.5. Implementation

Authors [6] show the need for supervisors sharing responsibilities in activities. Each group of activity can be interpreted as a tip of a star, which once combined; they represent the figure of a star. The tips of the star would be the activities to be designated to team members, such as Human Resources, Logistics, and Maintenance.

2.3.6. Audit

Many autonomy programs have been wrongly implemented in order to de-authorize, instead of authorizing employees. To counteract, managers and companies can provide environments where people authorize themselves. "This is not so much to give autonomy to the manpower, but on the contrary, alleviate the power over

the manpower, so that they can have initiatives, feel trust-worthy, be flexible and do the right thing" [24]. A cell must be subjected to an audit of the Type of Team Work after the training of its components.

2.3.7. Recognition

The way to reward the employee was chosen through the attitude. Rewarding through attitude means praise the attitude adopted by the employee towards the improvement of methods and processes. The recognition is the act of considering the cell self-management. To do so, recognition took place through a "diploma".

2.4. Controlling

The plan shows what one wants to do and how monitoring is being performed. If placed side-by-side, planning and monitoring, they show the situations in which what was desired and what was performed, allowing for identifying where an action plan should be implemented to align the project to the plan. The control includes from taking of preventive actions to anticipating potential problems. You can control the project using project management and it is important to note that it is included in the group of processes, called control, both monitoring and controlling [2]. It advises that the project performance should be measured regularly to identify the variations to the planning. As for variations of the project where the objectives were not accomplished, adjustments must be made in order to overcome problems and reach the planning. For example, lack of compliance with a deadline should go through adjustments such as overtime or other redeeming acts in order to maintain the deadline.

2.4.1. Dissemination

A plan of internal communication should be prepared in order to motivate employees and inform them about the program. The social aspect of the change implemented must be communicated showing what is more relevant in terms of efficiency and production objectives to the shareholder value mind dissemination. The pressing for best financial results is only over the production management and did not come to the production shop floor yet. The production people are charged only in operation terms [25].

2.4.2. Enabling

In order to enable employees, technical and behavioral trainings must be performed. "The training (usually much training) must be available both for the team members and their leaders" [6]. Competences include the skills, procedures, knowledge and experience of an organization's members. Thus, the ability to accomplish a specified objective is heavily reliant on an organization's people [26]. If people should assume new responsibilities and perform new functions in a high-performance organization, it seems reasonable to argue that they need new skills (technical, administrative, interpersonal, decision-making and problem solving) [5].

2.4.3. Monitoring

To analyze the performance of the cell functions, a set of indicators for each of them is created. The monitoring of these indicators should be done through visualization with Information Boards located in the cell [9]. The indicators used to monitor the respective functions, according to the company in which the self-management model is being implemented, can be related to the "star points": human resources, logistics, production, quality, maintenance, and continuous improvement.

3. Discussion

The essence of a high performance organization, which should resist over time, is to be flexible and adaptable. This organization would foresee changes in the market in order to sustain competitive advantage without the need for effort to stay behind changes. The workforce would be composed of talented and adaptable people who learn how to be continuously successful. These companies should have their ideals linked to performance and present performance results on several fronts as: customers, shareholders, employees and partners [27]. The performance

indicators like scrap, efficiency of the bottleneck machine and set up, may present improvements of 50, 50 and 60% respectively, in the first semester of the implementation [28].

In the description of the planning step, the importance of (compensating) rewarding and recognizing employees was considered during the development and training process, thus preparing them for this new management model and the need for leadership in terms of autonomy. Another important consideration was that achieving a consensus (commitment from the high management to implement the project and the acceptance and support from the shop-floor level), is important for the cultural change to be performed. This consensus should be reached after the analysis of the current scenario. The need for searching models already implemented, as well as the definition of the level of autonomy to be delegated are also worth remarking.

As for the motivation, employees must be shown the tangible benefits that will be offered if the implementation of the teams is successfully achieved. Another point is that the high management should make the middle management aware about their new roles. Carrying out these activities after training operators of the manufacturing cell and introducing the autonomy concepts showed a significant improvement in the reduction of inventories and increased productivity. The most important item is the level of trust among members of the process improvement team. If the members do not trust each other and the management, they may hold off ideas to improve quality and productivity, as they may be afraid that their jobs are threatened due to increased efficiency of the plant. However, if members of the team have a high degree of trust, they will be more willing to take the necessary risks to learn things and cooperate with each other, even if there are no immediate benefits.

4. Conclusion

It is concluded that the financial results are derived from the activity in which more opportunities for improvement are identified. In the study case, we discovered that the greatest opportunities to reduce costs lie on logistics, which was responsible for a large cost reduction of about US\$ 24,600 a year versus costs of US\$ 16,000 a year, thereby providing a rate of return on investments of 8 months. Therefore, the practical application of an experimental model was validated and its effectiveness was proven.

Competing Interests

Authors declare that they have no competing interests.

Authors' Contributions

LAJ carried out the research-action applied to a self-management cell in auto parts manufacturing and drafted the manuscript. ON participated in study design and oriented to draft the manuscript.

References

- [1] Marx R, 1998. Trabalho em grupos e autonomia como instrumento da competição (2nd ed.). São Paulo: Atlas.
- [2] PMBOK, 2008. A Guide to the Project Management Body of Knowledge (PMBOK Guide). (4th ed.) USA: PMI Standards Committee.
- [3] Roy M, Bergeron JL, Fortier L, 2001. Équipes semi-autonomes de travail: recension des écrits et état de la situation au Québec. *Psychologie du Travail et des Organisations*, 7: 243-256.
- [4] Tremblay DG, Rolland D, Davel E, 1998. New management forms for the knowledge economy? HRM in the context of teamwork and participation. Canada Research Chair on the Socio-Organizational Challenges of the Knowledge Economy, Télé-université, Université du Québec. [<http://www.teluq.quebec.ca/chaireecosavoir/cvdgt>]

- [5] Boyett JH, Boyett JT, 1998. *The Guru Guide: The Best Ideas of the Top Management Thinkers*: John Wiley & Sons.
- [6] Wilson JM, Wellins R, Byran A, 1995. *Liderança Zapp! Estratégias para liderar organizações através de equipes energizadas*, 4th ed., Rio de Janeiro: Campus.
- [7] Taylor FW, 1995. *Princípios da Administração Científica* (8th ed.). São Paulo: Atlas.
- [8] Roy M, 1999. Les équipes semi-autonomes au Québec et la transformation des organisations. *Gestion Revue Internationale de Gestion*, 24: 76-85.
- [9] Womack J, Jones D, Roos DA, 1992. *The machine that changed the world* (15th Ed). New York: Rawson Associates.
- [10] Jacques DS, Roy M, 2003. Les équipes semi-autonomes de travail amélioren-elles vraiment la situation des employés? *Revue Interactions*, 6: 105-122.
- [11] Tabassi AA, Bakar AHA, 2009. Training, motivation, and performance: The case of human resource management in construction projects in Mashhad, Iran. *International Journal of Project Management*, 27 (5): 471-480.
- [12] Denton DK, 1999. How a team can grow. *Quality Progress*, 32: 53.
- [13] Roy M, 2003. Self-directed work teams and safety: a winning combination? Université de Sherbrooke: 359-376.
- [14] Brandão DC, 2004. Associação GSA e TPM como base para consecução do planejamento estratégico. Master's thesis. Universidade Estadual de Campinas, Mechanical Engineering Department.
- [15] Gareis R, Huemann M, Wien WU, 2008. Change management and projects. *Projektmanagement Group*, Franz-Klein Gasse 1, 1190 Vienna, Áustria. *International Journal of Project Management*, 26: 771–772.
- [16] Mannesmann Sachs (Automotive), 1998. *Designing Manual*. Quality Engineering Report, São Bernardo do Campo.
- [17] Seldin R, Rainho MAF, Caulliraux HM, 2003. O Papel da Cultura Organizacional na Implantação de Sistemas Integrados de Gestão - um tratamento sobre resistência à mudança. In: *Proceedings of the 23rd ENEGEP*, Ouro Preto.
- [18] Furtado OHP, 2004. Grupos Semi-autônomos e Times de Produção: Novas Formas de Gestão do Trabalho em Duas Montadoras de Caminhões e Ônibus (Mercedes Benz e Scania). Doctoral thesis, Universidade Estadual de Campinas, Social Department.
- [19] Medeiros SF, 2002. Metodologia para Implantação de Células Autônomas ou Semi-autônomas Focada no Desenvolvimento de Competências. Master's thesis, Universidade Federal de Santa Catarina, Production Engineering Department.
- [20] Simon L, 2006. Managing creative projects: An empirical synthesis of activities. *International Journal of Project Management*, 24: 116–126.
- [21] Parker SK, Bindl UK, Strauss K, 2010. Making things happen: A model of proactive motivation. *Journal of Management*, 36 (4): 827-856.

- [22]Salerno MS, 1999. Projeto de Organizações Integradas e Flexíveis: Processos, Grupos e Gestão Democrática via Espaços de Comunicação-Negociação, 2nd ed., São Paulo: Atlas.
- [23]Streb CK, Voelpel SC, Leibold M, 2008. Managing the aging workforce: Status quo and implications for the advancement of theory and practice. *European Management Journal*, 26: 1.
- [24]Spreitzer GM, Doneson D, 2005. Musings on the Past and Future of Employee Empowerment: Hand Book of Organizational Development. 1st ed., Thousands Oaks: Tom Cummings Sage.
- [25]Marx R, Soares JPRF, 2008. A influência da orientação à geração de valor ao acionista nas práticas de gestão de pessoas no ambiente da produção. *Gestão & Produção*, São Carlos - UFSCAR, 15: 215-230.
- [26]Sullivan J, Beach R, 2009. Improving project outcomes through operational reliability: A conceptual model. *International Journal of Project Management*.
- [27]Katzenbach JR, Smith DK, 2001. *Equipes de Alta Performance: conceitos, princípios e técnicas para potencializar o desempenho das equipes* (2nd ed.). Rio de Janeiro: Campus.
- [28]Ferrari CA, Antunes JAV, Klippel M, 2004. A perspectiva do enriquecimento mútuo entre o Sistema Toyota de Produção e os Sistemas Sócio-Técnicos: o desenvolvimento de práticas semi-autônomas em célula de manufatura com o uso de elementos psicanalíticos. In: *Proceedings of the XXIV ENEGEP*, Florianópolis.