IBIMA Publishing
Communications of International Proceedings
https://ibimapublishing.com/p-articles/42HR/2023/4238123/
Vol. 2023 (12), Article ID 4238123

Application of Gamification to Motivate Employees who Implement 5S in Automotive Sector Companies in Poland*

Łukasz WACŁAWIK

AGH-University of Krakow, Krakow, Poland

Correspondence should be addressed to: Łukasz WACŁAWIK; lwaclawik@agh.edu.pl

* Presented at the 42nd IBIMA International Conference, 22-23 November 2023, Seville, Spain

Abstract

The aim of the article is to present the application of the elements of gamification to motivate employees in the 5S implementation. 5S is one of the modern management methods that have been under crisis for the last few years. The crisis was caused mainly by the bureaucratization of the 5S audits, which effectively discouraged assembly line workers. It seems that the application of gamification together with the arrangement of competition and cooperation among employees may be a valuable solution thanks to which they will effectively implement the 5S method. With regard to the 5S method, the application of gamification consists in arranging competitions that resemble European Football Cup. Thus, there are eliminations, group stages, semifinals and finals. As there are defined targets of particular phases, the employees compete and cooperate ; the ones whose teams have the best results, are rewarded. Such activities reinforce companies internally by increasing their competitiveness or innovativeness and they strengthen the integration between the recipients and suppliers, which is necessary in Industry 4.0. The withdrawal from bureaucracy and the application of gamification seems to change the employees' attitude to the 5S method. A rhetorical question remains how to maintain the staff motivation when the competition is over. An important objective of the article is to present the use of gamification outside its traditional areas of interest, i.e. marketing and human resources.

Keywords: Industry 4.0, gamification, 5S, motivation, crisis

Introduction

Poland has become an increasingly important manufacturer since its accession to European Union. Since that time Polish companies have become a significant element of the supply chain. This is clearly visible in the results of its foreign trade. Both the exports and imports exceeded 200 billion euros in 2018, and - as regards the trade - Poland with its exports that is similar to the exports of France to Germany is becoming a partner for the German economy. The contribution of Poland to international trade has some new characteristics that have previously been nonexistent. 30 years ago, the industrial cooperation with Western companies was most frequently based on manufacturing single parts or items of products that were subsequently assembled in target countries. Currently, cooperative ties have intensified. Polish companies still manufacture parts for products but they are also becoming significant manufacturers of finished goods. Two sectors should be mentioned where the contribution of Polish-based companies exceeds significantly the demand on the national market and whose finished goods or intermediate products are mainly exported to the EU countries. One sector where Polish companies are the European leaders is the TV set manufacturing industry and the other – which is going to be discussed below – is the automotive industry.

Industry 4.0 is associated also with the car industry. The article will discuss significant events that initiated the use of Industry 4.0 in the automotive sector. It should be pointed out that its elements originate both from the ideas that enhance and strengthen the technological position of Germany (Kagermann, 2013) but also have some significant

Cite this Article as: Łukasz WACŁAWIK, Vol. 2023 (12) " Application of Gamification to Motivate Employees who Implement 5S in Automotive Sector Companies in Poland " Communications of International Proceedings, Vol. 2023 (12), Article ID 4238123, https://doi.org/10.5171/2023.4238123

similarities to the American Industrial Internet (Annuziata M and Evens, 2012), (MacDougall,2014) or the *Made in China 2025* plan (Lin, 2018), (Tong, Lim, 2016).

Automotive sector has always been highly organized. The process improvement tools that are applied in the sector are among the best and they serve as benchmark in other industries. Cars and parts to them must meet numerous conflicting targets such as high quality, safety, efficiency, low fuel consumption, low noise levels, low weights and esthetical issues. The contradictions result in the necessity to improve constantly both the finished and the intermediate products. Car manufacturers are constantly upgrading new models and they permanently expect part suppliers to introduce improvements with regard to product features and the organization of production.

The cooperation between car part suppliers and car manufacturers is highly advanced. This is due to several factors such as the ownership changes in car companies, a permanent improvement of products and the use of new materials that have impact on safety, fuel consumption, etc.

Poland-based companies take part in the search for innovative solutions regarding the production of particular parts. One of the plants in the Krakow area has been the world top manufacturer of radiators for years and the organizational solutions used by the company are one of the best in the world.

Organizational changes that concern the whole car industry are also worth considering. Industry 4.0 is extremely frequently considered to be a concept that integrates the areas of delivery, production and distribution. In the case of the automotive industry at least three crucial events should be considered that preceded the emergence of Industry 4.0 several years ago. They had a tremendous impact in manufacturing and delivery processes which help car industry maintain its top position as regards the implementation of various solutions in the industry.

The three events in questions are: the emergence of the just-in-time type of methods, the development of the Clio project by Renault and the implementation of 9000 ISO standards in car factories together with the verification of the suppliers' compliance with the standards (Midler,2012).

Just-in-time (JIT) is the concept of delivery that was created in Japan after the second world war. Initially, its development resulted from the specific features of the Japanese market where there were numerous small plants without capital and space to store the supplies. One of the reasons why JIT appeared in the car industry was that there were no delivery standards and the implementation of JIT allowed for the determination of the number of references or parts to be delivered. However, a real change occurred with the implementation of MRP. This is more frequently referred to in the American and European practice as the zero inventory concept. The integration of JIT with even the first MRP versions led already in 1980s to the achievement of flexibility, efficiency, competitiveness and speed, i.e. the key features of Industry 4.0.

The next factor that contributed to the fact that the automotive sector preceded the Industry 4.0 concept were the Renault Clio and Twingo projects. The Renault factory applied innovative methods of developing car models and subsequently a unique manufacturing method that– thanks to a modular assembly system – made it possible not only to modernize but also to simplify production processes while the suppliers, who gained in significance, became an indispensable element of the cooperation with the car manufacturer. Despite a significant simplicity and a small number of versions, both models belonged to best selling cars in France for over 10 years.

The third fact is the application of the ISO 9001/TS/QS standards. A quality standard system of production in car (and cable) industry was applied before it was formally written. In time, the standardization included other numerous areas of company operations that can be found in the Industry 4.0 concept among which the cooperation and supervision of selected processes at suppliers belong to the most significant ones from the point of view of this article.

One of the key requirement areas that are necessary in an effective implementation of Industry 4.0 is that the suppliers should use the 5S approach. The article below will present the application of gamification to improve the use of 5S as regards car industry suppliers.

Publications on gamification have been appearing for several years now. They usually concern two application areas: marketing and recruitment. The supporters of gamification point out to its specific function, which is to motivate employees in an interesting and attractive way. There are only few examples in the literature on the subject that describe the use of gamification outside the areas of marketing and recruitment. The aim of the article is to fill this gap and to present gamification as the response to the crisis in the implementation of the 5S method. The article uses publications on 5S and gamification and it presents solutions that are implemented by automotive sector companies and support the integration between manufacturers and suppliers that is necessary from the point of view of Industry 4.0 as they force the suppliers to use modern management techniques which result in the development and improvement of the quality of car parts.

The concept of Gamification

The connection between gamification of HRM is obvious. This is due to the objectives of HRM which according to Armstrong include the provision for the management of the conditions that enable reaching the targets thanks to staff commitment, the development of an environment that supports the development of individuals and their cooperation for the sake of the organization, and the flexibility of operations which results in company's adaptability to the changing environment (Armstrong, 1996,). Gamification includes all themes that are related to game-design and relates them to non-game contexts. Thus, it combines the concepts of real-world games, advertgaming and games-for-change into one cohesive system that takes advantage of the latest achievements of behavioral psychology and the success of social games (Cunningham, Zichermann 2011).

There are three features of games that refer to gamification:

- rivalry, which is typical for human nature. Employees easily acquire information and tasks that are based on interactive games and activities. These processes are strengthened when accompanied by competition or cooperation;
- a plot, which is an inspiring story. When the plot is well developed, the tasks are well spaced and the awards motivate the players to act and reach better results, it can be assumed that game participants will be keen on taking part in it even if the satisfaction from reaching another game level is the only prize;
- detachment from everyday life as the inspiring story turns a monotonous routine into an interesting task, exciting game or fun (Piotrowski, 2015).

Development of 5S and other management methods

In 1990s numerous new management methods appeared in the Polish literature on the subject: Lean Management, benchmarking, reengineering, SMED and 5S. Since that time benchmarking and Lean Management have become canons and SMED and reengineering have reached a top position among management concepts. In contrast, the 5S method has been qualified as a management quality tool and there are not many publications on the evolution of this method. A traditional approach to 5S is maintained in the literature on the subject and it is usually restricted to a discussion of its key principles. However, business practice shows a significant evolution of 5S and the implementation of gamification resulted in new solutions that lead to the perception of the method as of a dynamically developing management tool that is commonly used in industry and is not restricted to the area of quality management. The changes in the 5S method are contrary to the idea of traditional evolution of management methods that was presented by Mouchon and Moles (Martyniak, 1996). In the initial period of its implementation, 5S quickly became a tool where strict procedures resulted in automatism and conformity. The change caused demotivation among employees and a crisis in the use of the method particularly in national companies where the recipients did not enforce its application within the framework of the supplier assessment policy. As auditing procedures were complicated and the reluctance of employees significant, companies ceased to apply 5S, and the ones which used the method restricted their efforts to the first 3S. Currently, attempts are made to overcome the crisis by introducing a new form whose methodology replaces procedures that demotivated employees. The new methodology aims at motivating employees to implement 5S. It is difficult to predict whether the new approach to 5S will result in the return of the method. However, it seems worth discussing the changes in the implementation of 5S that aim at replacing bureaucratic procedures by the competition between employees. In the author's opinion such approach may be inspiring.

The concept of 5S

The name of the 5S methodology originates from Japanese words seiri, seiton, seiso, seiketsu i shitsuke which mean sort, set in order, shine, standardize and sustain, respectively. The creation of 5S is related to the awareness that company development and the implementation of modern management methods require the provision of adequate conditions that allow for their effective implementation. Thus, the implementation of 5S is a stage where organization is organized in a rational way; this is followed by the application of more effective management methods and some authors even believe that the implementation of 5S is a necessary condition. The way of action that is characteristic for 5S brings order to work organization from the level of workstations to whole companies. Moreover, the objective of the method is to cause an evolution in staff attitudes as 5S contributes to an easier employee adaptation and preparation to changes. The results are obtained through the implementation of five stages that bring concrete effects through the use of simple methodology. The objective of the 5S method which is defined in this way is the effect of previous failures in the implementation of modern management methods that were most commonly caused by the lack of preparation on the part of companies and a hostile attitude of the staff to changes that went too far. Thus, the implementation of 5S makes it possible to improve organization, to systematize and rationalize current company's work system and to identify both the leaders and the main opponents of change. Consequently, the 5S method is a company operating standard as the effectiveness improvement may be achieved only when the following prerequisites are met: cleanliness, safety and orderliness. However, if the programs to eliminate losses, waste and its sources are

to be effectively implemented, the staff must be convinced to them. And this is the strength of the 5S method.

Formalization of the methodology – the 5S audit

When the method became more common, companies stopped considering 5E as a method that aims at preparing both the company and its staff to implement other management methods. 5S became a common practice, a standard and a company's showcase. This is the reason why managements began to formalize the implementation of the method. Initially, external auditing appeared that was conducted by product or service recipients, which strengthened the integration between manufacturers and suppliers. In time, companies started developing their own procedures to check compliance with the 5S principles and they frequently appointed system auditors. In order to ensure effectively the compliance with the 5S standards, entrepreneurs started using check-lists that defined in detail the levels of compliance with the 5S principles.

With regard to every S a separate list of questions concerning company's particular areas was prepared. In one of the companies 28 questions were formulated that concerned the first S with reference to the issues of its warehouse, finished products, tools and facilities, machinery and installations, waste, documents, notice boards and instructions, etc. and other problems regarding 5S project management. A weight was assigned to each question with regard to its significance to 5S. A minimum of 80% was the condition for accepting the audit. The auditors could either accept or reject a criterion. After a positive audit of the first S, a similar bureaucratic certification procedure was started for each of the subsequent levels. Thus, companies launched 5S auditing bureaucratic mechanisms which effectively discouraged their staff. As a result, the operators did not cooperate. If one area received a certification for one of the 5S levels, it was not in the interest of employees for other areas to receive an equal level of certification. Due to the protraction of the process in other departments, the areas with certification had to wait for them to cope with the problem. The necessity to wait was one more demotivating factor. Consequently, in order to benefit from the implementation of the first 3S, companies treated them as organizational standards and frequently skipped the last two stages which required a significantly higher involvement of human resources.

As a result of the formalization of 5S, the auditing of particular stages started resembling ISO auditing. ISO audits are one of the most bureaucratized and the least creative tools of quality management. That is why a similar attitude to 5S audit led to the opinion of employees that it is another bureaucratic procedure whose implementation is troublesome and the effectives are doubtful.

Thus, while the initial operations typical for the 5S method were spontaneous, the formal audits resulted in the demotivation of the staff both during and after the implementation. Bureaucracy and the lack of motivation became the main reasons of the failure of the 5S implementation.

Championship - competitions among staff members as a method to make 5S more attractive

The crisis in staff motivation resulted in the decrease in the interest in the 5S method. There was a growing difficulty for companies to maintain 5S and they increasingly limited the application of this method.

A change in the attitude occurred with the emergence of the gamification concept. The idea was to replace the previous ways of supervising 5S by involving employees in competitions aiming at the selection of departments that were the leaders in the 5S implementation. To achieve the target, the above mentioned game features were used. A game story was developed that resembled European Football Cup. The company was divided into areas which implemented 5S with the compliance to the rules of rivalry and cooperation. A lack of conflict between the competition and cooperation was ensured in a very simple way: the move to the next stage of the game is possible when all company departments reach subsequent 5S levels. Thus, competition was substituted by the cooperation with the areas that had problems with the 5S implementation.

There are two stages in the implementation of the Championship program: the preparatory phase and the game phase.

The first stage concerns mainly the company management staff. Regardless of the fact whether the company used the 5S method before or not, it is necessary to present the specific features of the gamification-based implementation of 5S. The previous practice of 5S involved an active participation of management in the 5S program. The superiors had their areas of responsibility within 3S. Most frequently, the areas had a symbolic dimension and the presence of a director or president aimed at showing the staff the significance of 5S for the management. In the case of gamification, the heads of companies are not the participants of the program but they become its referees.

Another extremely significant change is that the implementation of 5S ceases to concern individual operations and the audit results are not limited to only one person or area. In the conditions of gamification the whole company must reach a defined level in order to be able to move to a further stage. This approach requires cooperation. Probably this is the major benefit of the application of gamification in 5S. The implementation of 5S by employees should be started

with an information campaign which should on the one hand explain the assumptions of 5S and on the other to emphasize the participative character of the method. This is particularly important in companies where 5S is associated with negative experiences of extremely bureaucratic attempts to implement the method. In the places with such negative experience it is difficult to explain the staff that the new methodology does not seek the guilty ones but aims at a real improvement of working conditions. Apart from changing the attitude, trainings are an important factor. In order to point out the significance of the program at least one day should be devoted to staff training so that the operators have the opportunity to conduct exercises that involve 5S implementation and to validate their knowledge on the program.

The training should not only include assembly line workers but also team leaders. Managers should be made responsible and on the one hand they should provide team leaders with the knowledge on the 5S implementation and on the other they should focus on the cooperation between the leaders. The cooperation is indispensable for an effective implementation of each of the five S.

The use of gamification in 5S is also associated with the acceptance of the assumption that the previous achievements in the 5S implementation are not taken into consideration. All departments and all assembly lines are treated as if 5S were not applied there; consequently, the starting point for all teams is the same.

The development of the story starts with the assignment of formal roles. For obvious reasons gamification uses the language of football games. Thus, there is a captain (a shift leader or a head of the area), team (production team at particular line or the employees of a given area), a coach (a management representative), a referee (an employee from the Process Optimization Department and the game supervising body (top management and the Process Optimization Department)

Implementation of 5S through gamification

The objective of gamification in the 5S implementation is to reach all 5 levels in the whole company. The process is conducted in 4 steps:

1. **Qualifications – an introductory stage**

This stage lasts approx. 4 months during which particular assembly lines or areas should implement the first 3S. The next stage can be reached by the teams that achieved 3S in every aspect. The target is that all competing teams should qualify to the next stage. When gamification is applied, bureaucratic questions are limited and the list of questions for the first 3S is reduced to slightly over 20. The only condition for moving on to the next S is to reach a complete compliance with the standards.

2. **Group stage**

This is the next stage and is definitely more difficult. It requires long-term preparations during which teams implement 4S and 5S. The validation of 4S is conducted by a representative of the management while 5S is validated by the top management and the Process Optimization Department. The difficulty of this stage is caused by the fact that - while in the case of the first 3S, the departments closely cooperate with one another – differences emerge that result not only from the staff commitment or rivalry but also from the technical limitations of particular lines. The second stage is completed by the selection by the top management representative of the best line in a given area. This is an extremely difficult task as although it is fairly easy to choose the area that has the best results, the characteristics of the competition in further stages should favor the choice of a line where the implementation of 5S is the most difficult and consequently requires the greatest effort. The time duration of this stage depends on the problems that may be encountered in the course of the 5S program implementation. Although 4 months are most commonly assumed, in fact the stage sometimes lasts twice as long. One should keep in mind the objective of the stage: 5S must be achieved by the whole company. It is difficult to determine in practice the time for the best and worst company areas that is necessary for the 5S implementation. As a result, at this stage particular supervision is required so that each of the competing teams has a similar chance to succeed.

3. **Semifinals**

The stage lasts about 3 months and, despite its name, it does not consist in the selection of two out of four teams. Company management selects several lines or areas, matches them in pairs with the consideration of their similarity and then points at the pair of lines under analysis that implemented the 5S principles in the best way. Obviously, apart from the substantive criteria, an important role is played by such factors as the implementation lead time, difficulties in the implementation resulting from the complexity of the process and the condition of facilities, the number of machines, the complexity of the line or the number of employees. The winning teams receive financial rewards.

4. **Finals**

The stage lasts 3 months. The objective of the stage is to select a model line that constitutes the best practice. As in the case of semifinals, it is not easy to make a decision. Such factors have to be considered and weighed as the results of the teams, the problems they encounter as well as the interest of the company.

Conclusions

The implementation of 5S with the application of gamification seems to be an interesting solution. In the conditions of Industry 4.0 the objective is both to integrate the suppliers and recipients and to maintain innovativeness and high quality. Assuming that a company achieves 5S, it is worth asking a rhetorical question whether it will be able to maintain it in the long term. According to 5S, the practice of the first 4S becomes a continuous process and the employees are committed to maintain the system. The above question is difficult to answer. Gamification is an interesting solution for companies that failed in their previous 5S efforts and are aware of the decrease in their staff motivation. However, there is a strong probability that the finals of the competition will be followed by a natural feeling of disengagement. And this probably is the choke point in the application of gamification in 5S. In such cases it will be much more difficult to maintain the implemented system than in the case of the traditional methodology. One should know about it before making the decision of starting the game.

As it was said above the use of gamification in the 5S implementation seems to be an interesting solution. However, one should be aware of the possible risk of failure. In the case of the traditional 5S, the implementation of the method begins with the development of a line or referential area, which is to constitute the best practice for further activities of the company. Such traditional approach makes it possible for the company to gain adequate experience and at the beginning to apply 5S in the areas selected for this purpose by the management. In the case of a failure it is fairly easy to withdraw from the project. That is why it is difficult to recommend the implementation method that is different from the traditional one to entrepreneurs who previously did not apply 5S. However, if a company bureaucratized 5S significantly and the employees lost their motivation, it is worth considering the application of gamification in 5S and then the risk that is involved with gamification will be considerably less significant.

It is worth considering whether other management methods or techniques that are applied by manufacturing companies may be supported by gamification. The answer is affirmative. In fact, the practice of improvement suggestions, which is one of the Kaizen techniques, includes the elements of a competition whose aim is to win a reward for the best solution. It is fairly easy to apply gamification for example in the SMED method. However, in this case extremely significant cost limitations will appear, which will discourage the staff.

References

- Annunziata, M., Evans, P.C. (2012), *Industrial internet: pushing the boundaries of minds and machines*, General Electric, available [22 september 2023] at: www.ge.com/docs/chapters/Industrial_Internet.pdf
- Armstrong M., (1996) Zarządzanie zasobami ludzkimi, strategie i działania, Wydawnictwo Profesjonalunej Szkoły Biznesu, Kraków
- Cunningham Ch., Zichermann G., (2011) Gamification by Design. Implementing Game Mechanics in Web and Mobile Apps, O'Reilly Media
- Gwiazda A. (2010), „Ewolucja metody 5S", Ekonomika i Organizacja Przedsiębiorstwa, nr 3 pp.30-37
- Kagermann, H., Helbig, J., Hellinger, A., Wahlster, W. (2013), Recommendations for implementing the strategic initiative INDUSTRIE 4.0: securing the future of German manufacturing industry, Final report of the Industrie 4.0 working group, Forschungsunion, München, pp.1-84
- Lin D., Lee C.K.M., Lau H., Yang Y., (2018) "Strategic response to Industry 4.0: an empirical investigation on the Chinese automotive industry", Industrial Management & Data Systems Vol. 118 No. 3, pp. 589-605
- MacDougall, W. (2014), Industrie 4.0: Smart Manufacturing for the Future, Germany Trade & Invest, Berlin, available [22 septembre 2023] at:www.gtai.de/GTAI/Content/EN/Invest/_SharedDocs/ Downloads /GTAI/ Brochures/Industries/industrie4.0-smart-manufacturing-for-the-future-en.pdf
- Midler C., (1994) L'auto qui n'existait pas. Management des projets et transformation de l'entreprise, InterEditions
- Tong, S. Lim, W. (2016), Made in China 2025: A Grand Industrial Ambition, East Asian Institute, National University of Singapore, Singapore