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# Improving Productivity in the Apparel Industry Through Gain Sharing and Continuous Process Improvement: the Case of a Serbian Manufacturer

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## Abstract

*This paper analyses the effects of combined implementation of gain sharing wage incentives and continuous process improvement on productivity growth in the apparel industry. Results were obtained through empirical research conducted in a Serbian apparel manufacturer - Javor. A five step research approach was designed and applied in Javor, where productivity was continuously measured over a five year period. Results show a significant increase in productivity in Javor by the end of the fifth year, even though productivity was in decline in the apparel sector. The results were statistically tested, showing that productivity gains can really be attributed to combined implementation of gain sharing and continuous process improvement. The paper has significant practical implications, since it suggests that wage incentives can be used as an efficient tool for motivating employees to take an active role in improvement efforts while relying on existing knowledge and resources.*

**Key words:** productivity, apparel, gain sharing incentives, continuous process improvement.

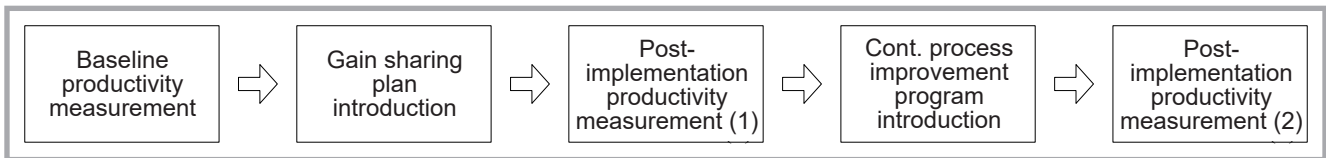
## Introduction

Textiles and apparel is a major sector for both industrialised and the lesser developed economies, contributing both to wealth generation and employment [1]. The sector employs in excess of two million people in Europe alone, and is dominated by a large number of SMEs [2]. Textile and apparel industries are among the most globalised industrial sectors [3], and European garment and textile manufacturers find it difficult to compete with manufacturers from Asia [2]. Delivering high quality garments at low cost in shorter lead times are the major challenges faced by apparel manufacturers [4]. Therefore it is necessary to transform the existing production and improve it by employing strategies that fulfill the expectations of global customers. However, major constraints that manufacturers face include limited financial resources, a lack of personnel and time, little or no experience, and limited confidence in implementing new systems [5].

Serbian textile and apparel manufacturers were once key players in industrial production, generating 11% of gross national income before 1991, and constituting 20% of country's national export [6]. However, the apparel industry fell into crisis, which brought about redundancies, decreased sales, issues with supply of raw materials, and a constant decrease in production indices and the number of

employees [7]. Serbian companies are well behind other transitional economies and the EU, especially with respect to efficiency [8]. Serbian apparel companies often try to replicate the Tayloristic approach to organization, which includes strict management control, narrow task definition, low skill (and often low pay) workers, etc [9, 10].

A high level of productivity is an important factor for a company to perform well, to compete successfully, and to survive [11]. Productivity can be defined as a ratio of outputs and inputs. Input factors might include labour, capital, or resources. Output factors might include the physical production volume or financial indicators. Improving productivity means increasing the efficiency and effectiveness of the transformation of inputs into outputs. Tangen sees that productivity can be improved through elimination of waste [12]. Most local apparel manufacturers seek alternative strategies in order to face the challenges of the market in a more efficient way, with lean and continuous improvement (CI) being one of them. Lean is a significant step in operations management development, whose principles have helped manufacturing companies around the world to realise significant quality and cost gains [1, 13, 14]. Lean and CI principles are widely applied in companies across the world, but not so much in the apparel industry. Certain authors present



**Figure 1.** Research phases.

the application of certain aspects of lean, such as value stream mapping [4]. Others discuss the holistic approach to lean management in the apparel industry [15], or the entire apparel supply chain [1]. And yet not too many papers address lean and continuous process improvement in the apparel industry [15].

Although evidence of increased efficiency gained through continuous process improvement is abundant, many companies still face the challenge of motivating their employees to actively participate in improvements. This is mainly due to the fact that employees do not see personal interest in production improvement. While apparel company owners and managers find motivation for improvement and success in operational growth or ‘being in the game’ [16], employee motivations can usually be identified at lower levels of Maslow’s pyramid [17]. Wages significantly impact employee behavior, performance and effectiveness in organisations [18]. Research shows that wage incentives (along with promotion incentives) can significantly influence employees’ work motivation to perform well [19, 20]. Gain sharing is a wage incentive approach that shares the effects gained through productivity improvement between employees and the company. Many gain sharing plans have been devised throughout the years. Most well-known are Scanlon’s plan [21], Rucker’s plan [22], Hunter’s plan [23], and the IMPROSHARE plan [24], all of which have shown to be able to provide significant improvements in productivity, even by the end of the first year [25, 26]. The main characteristic of all of these plans is the formalised participation of employees in process improvement. In addition, they include wage calculation formalised in a way that takes into account the sharing of effects of improved performance between employees and their company.

Having in mind the facts stated above, we strongly believe that the combined application of gain sharing incentives and continuous process improvement can help a company to significantly in-

crease its productivity. The remainder of this paper is organised as follows: Section 2 addresses the problem statement and research design; section 3 presents the research results and discussion, and conclusions, practical implications, limitations and directions for future research are presented in section 4.

### Problem statement and research design

The main research question (RQ) of this paper is:

Can significant production efficiency improvements in the apparel industry be achieved through combined application of gain sharing incentives and continuous process improvement, thus helping to overcome a crisis?

The exploratory case study method was chosen as the most appropriate for the research, because the contemporary phenomenon within its real life context is being investigated [27]. For practical purposes, the research is limited to the Serbian point of view. The research focuses on a single company which, according to Yin, can be appropriate if it provides ‘an opportunity to observe and analyse a phenomenon previously inaccessible to scientific investigation’ [27]. This research offers a unique possibility to gain empirical insight into how the combined application of gain sharing and continuous process improvement can significantly improve an apparel manufacturer’s productivity. The research was conducted over a considerable period of time, which further supports the rationale for a single case study approach [27].

Javor was chosen as a case company. It can be regarded as a typical apparel manufacturer operating in Serbia and dealing with a period of crisis. The company’s main product is men’s shirts, with a share of over 70% of the total production. In addition to men’s shirts, the product portfolio includes women’s blouses, nightgowns, men’s and women’s pajamas, knitwear programs, sports programs, PPE, white and green programs for healthcare, and programs for restaurants

and hotels, the army, police, and so on. Roughly 80% of production was exported. The production process in Javor was predominantly organised according to the principles of mass production. Small numbers of different products were manufactured in large batches; the equipment layout was fixed; material was ‘pushed’ through production in lots; internal transport was carried out by hand or by a fixed transportation line; employees were narrowly specialised and self-taught; the working method was not defined, and time standards were not precise. A distinctive feature of Javor was its willingness to acknowledge their shortcomings, and to initiate changes. Rather than taking a passive approach to solving problems (typical for most apparel manufacturers in Serbia), Javor opted for a more active role, undertaking countermeasures to buffer the effects of a crisis.

The research involved cooperation between researchers, company managers and employees. Having that in mind, as well as the fact that the research question ‘relates to describing an unfolding series of actions over time in a given group, community or organisation’ [28], the research can be further typified as action research, as a variant of the case research. A process consultation model was chosen. Here researchers help clients inquire into their own issues, and actively participate in the design and implementation of the solution [29]. A cyclical approach of data gathering, feedback, analysis, action planning, implementation and evaluation was used, as proposed by Coughlan & Coughlan [28]. A consistent approach was developed and well documented, and thus it can be followed by other researchers [30]. The researchers’ subjectivity was mitigated by including management and employee representatives in the research team. All decisions were made by consensus. In turn, employee subjectivity was mitigated by the presence of researchers.

Research was conducted in five phases (**Figure 1**): First, base productivity measurements were taken in order to enable researchers to understand the cur-

rent situation and to establish a baseline to which results obtained in later stages could be compared. Then a new gain-sharing plan was introduced, and another set of productivity measurements followed. After that, a continuous process improvement program was introduced, and a third and final set of productivity measurements followed. Additional data were gathered from archival sources and semi-structured interviews with managers, foremen and workers from Javor.

Productivity was measured as a ratio of industrial production and the number of employee indices (productivity per employee). The industrial production index shows change tendencies in industry's development and production dynamics. The industrial production index is calculated using Laspeyeres formula, which is a ratio of the weighted production volume in a given period and the weighted production volume in the base period. The number of employees index is calculated as a ratio of the number of employees in a given period and that in the base period. Measurements were taken continuously, which means that, for example, the first set of post-implementation productivity measurements (Post-implementation productivity measurement (1)) was taken from the end of the base period until the beginning of the continuous process improvement program. Productivity measurements were compared to the average productivity in the entire apparel sector. Data on the number of employees and volume of production in Javor were gathered by analysing the company's records for the period referenced. Data on the number of employees and physical volume of production in the apparel sector were obtained from the national office for statistics. In order to test whether productivity improvement can be attributed to gain sharing and continuous process improvement, data gathered were statistically analysed using the Kolmogorov-Smirnov test, variance homogeneity test, and Tamhane's multiple comparison procedure. We used a SPSS Statistics software package for statistical analysis.

### Baseline period

Management and union representatives analysed the situation within the company and concluded that with the way business was organized at the time, Javor would not be able to compete successfully on the global market. Costs were often greater than the value of produc-

tion. In addition, issues with insufficient productivity, poor material flow control, high absenteeism, poor workers' skills, and unwillingness of workers to change operations or workplaces were identified. Poor performance record keeping, which caused unearned wages to be paid, the poor attitude of employees, and the effect of informal groups were added to the list of problems. Workplaces were arranged around a central desk according to the sequence of operations for sewing a standard shirt. The workers were narrowly specialised in performing a small number of operations and were not interested in production improvement or in learning how to perform additional operations. They thought that it was the manager's duty to provide them with the work they know how to perform. Moreover, because of high absenteeism, some operations were not performed, which caused the material to be stacked in production for long periods of time. Production workers were paid according to the individual performance of operations they were acquainted with. Periods when there was no work were noted and paid as an overhead. As judged by the management, workers had skills to adequately perform 2 to 7 operations, and it was not uncommon that because of the absence of workers for key operations, a sewing brigade finished zero products, while workers that were present achieved a performance of over 100% in operations they were working on.

The main goal of the production improvement initiative in Javor was to increase the production and sales volumes of high quality products, which was to be done through the mutual work of all employees (from workers to managers), by better utilisation of resources currently available. Starting from the situation that was present at the time, an improvement program was formulated, with two primary directions:

- To motivate employees to take a more active role (through teamwork) in improving production efficiency by introducing a new gain sharing plan based on the output of the whole sewing brigade;
- To encourage the mutual work of all employees for continuous improvement of manufacturing processes in order to make work easier, safer, and more efficient.

### Gain sharing plan introduction

The basic intent of the new gain sharing plan was to stimulate the mutual work of all employees in the sewing brigade to improve the entire sewing process. In this new system, wages were calculated according to group performance, and it was decided that the basis for salary calculation should be the time spent at work, as well as achieved performance calculated according to actual hours and hours earned. Wages were then calculated on the basis of the individual wage rate, actual hours, and group performance. Earned hours is the time during which products are being manufactured, whereas actual hours is time spent at work. Standard time is that needed to manufacture one piece of a product. Earned hours are calculated by multiplying the standard time with the number of products manufactured during the day. Standard time was determined by analysing the previous year's production data. Apart from effective work time, this time covers all delays, stoppages and other overhead activities in production. Actual hours for the group were calculated as the sum of actual hours of all workers in the sewing brigade according to records on the presence of all employees.

If earned hours equal actual hours, then standard performance is met. Here each worker earns a full wage, otherwise wages are proportionally reduced (but not more than the minimum wage prescribed by law and other regulations) if standard performance is not met. Wages are increased if the standard performance is exceeded. Since all employees contributed to performance improvement, the results gained through improvements are shared equally among employees. The application of a new wage system based solely on group performance led to employee dissatisfaction. Workers thought that it should be taken into account that some of them work harder than others, and that the good workers are at a disadvantage. As such it was decided that the gain sharing plan should undergo some changes: (i) group performance was kept and used for calculating the wage fund of the entire brigade; (ii) individual performance was introduced as a way of determining the contribution of each worker to productivity improvement. The total wage fund was calculated by using group performance. However, the distribution of the wage fund was based on the individual performance of each worker. This

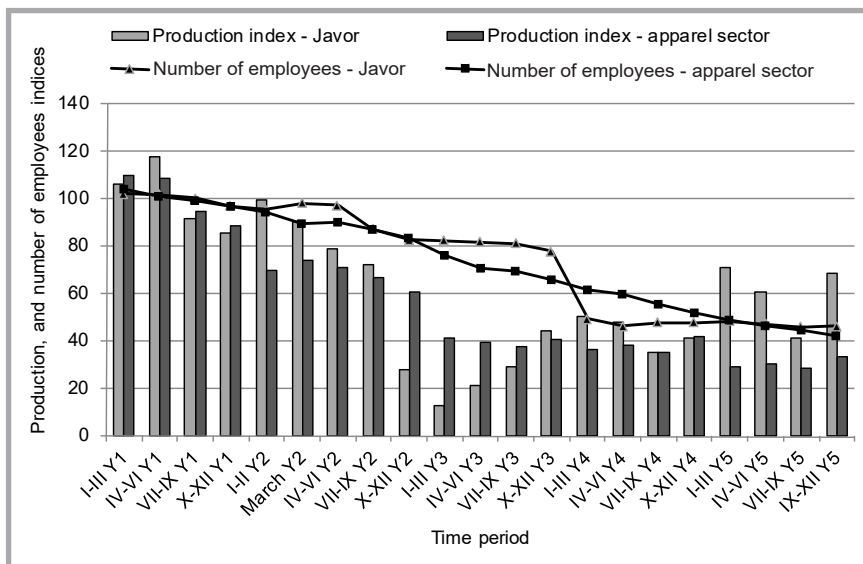


Figure 2. Five year basic production and number of employees indices for Javor and the apparel sector.

modification led to good workers earning more compared to a system based solely on group performance. Furthermore good workers were still interested in achieving the highest possible group performance, since it increased the wage fund of the brigade.

### Introduction of continuous process improvement program

Apparel manufacturing in Javor is organised in three phases: cutting, sewing, and ironing and packaging. Tailored pieces were 'pushed' to the sewing section. After finishing the first operation for the entire batch, it was 'pushed' to the next operation. This procedure was repeated until the last sewing operation was done. After that, the pieces from the batch were cleaned of extra thread, checked, ironed, and packed. Workers were highly specialised, self-taught, and able to perform only a small number of operations in a way they thought was appropriate. The workplace layout was poorly designed, with no predetermined place for placing materials before or after the operation was done. There was a lot of unnecessary material handling, causing fatigue and decreased productivity.

Four approaches of continuous process improvement were deployed: improving the layout of the sewing line, improving the material handling system, workplace layout improvement, and work method improvement. Workplaces were situated in two columns, with 2.4 meters of empty space between them, which was used for transporting material between workplaces. Electric, air and steam installations

were rearranged to support the flexibility of the line. Workplaces were grouped in four sectors: collar and cuff sewing, front of shirt sewing, back and sleeve sewing, and shirt completion. Material handling was carried out with the use of specially designed trolleys, each of which carried material in batches of 10 to 15 pieces. The trolleys were labelled by colour depending on the sector they were to be transported to. Carts were also marked with serial numbers that show which parts should be joined together. The carts are 'pulled' between workplaces in a predefined order, and pieces are sewn according to the First In – First Out principle. This way of material handling enables visual control during the production process. Material from each cart can be processed at one workplace at a time, thus preventing mixing and losing material. Workplaces were arranged in a way that enables taking and disposing material on the left hand side. They were equipped with fixtures and other devices for holding material. Each operation was studied and standardised in order to eliminate unnecessary movement and improve sewing quality. By placing material in an appropriate position in relation to the worker, unnecessary reaching and carrying movements were eliminated, while necessary movements were shortened and made easier. Moreover, poor worker skills were addressed through additional training.

### Results and discussion

The five year time period was subdivided into three shorter periods in order to ana-

lyse the change in productivity, as well as factors that influenced that change:

- First period: January of year one (labelled as Y1) to February of year two (labelled as Y2) – baseline period;
- Second period: March of year two (labelled as Y2) to December of year three (labelled as Y3) – a new wage system based on group performance was introduced; individual performance was introduced in addition to group performance;
- Third period: January of year four (labelled as Y4) to December of year five (labelled as Y5) – continuous process improvement program was introduced.

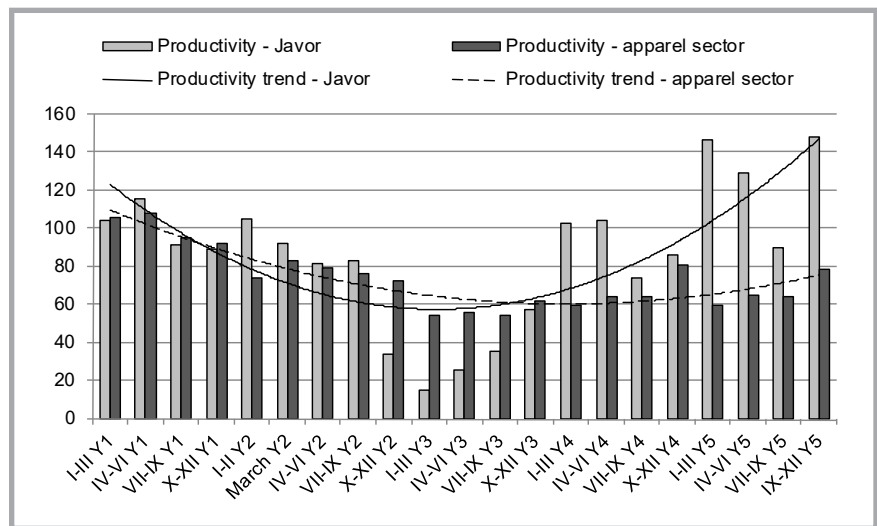
Figure 2 shows the basic production and number of employee indices (first year average equals 100 – the base) for Javor and the apparel sector in all five years. Although production (and productivity) and the number of employees indice were calculated monthly, for the sake of better visibility the data shown in Figures 2, 3 and 4 were grouped in trimesters. The first trimester of year two is divided into two parts: The first part represents the period when the old wage system was still in use (January – February), and the second part represents the period when the new gain sharing plan was introduced (March - the end of baseline period). Figure 2 shows that there was a steady decline in the number of employees and value of production in the entire apparel sector during the period referenced. The value of production in Javor was in decline from January of year one until March of year three. However, Javor experienced growth in production volumes in the period from April of year three to December of year five. The number of employees in Javor was in decline. A major change happened after December of year three due to the restructuring of the company, when large numbers of employees were laid off. It is also evident from Figure 2 that the number of employees index and value of production in Javor and the apparel sector were roughly at the same level from January of year one until February of year two.

Figure 3 shows the productivity, expressed as a ratio of industrial production and the number of employees indices. The company's productivity and that of the entire apparel sector were similar between January of year one and February of year two. Productivity decreased steadily both in the company and in

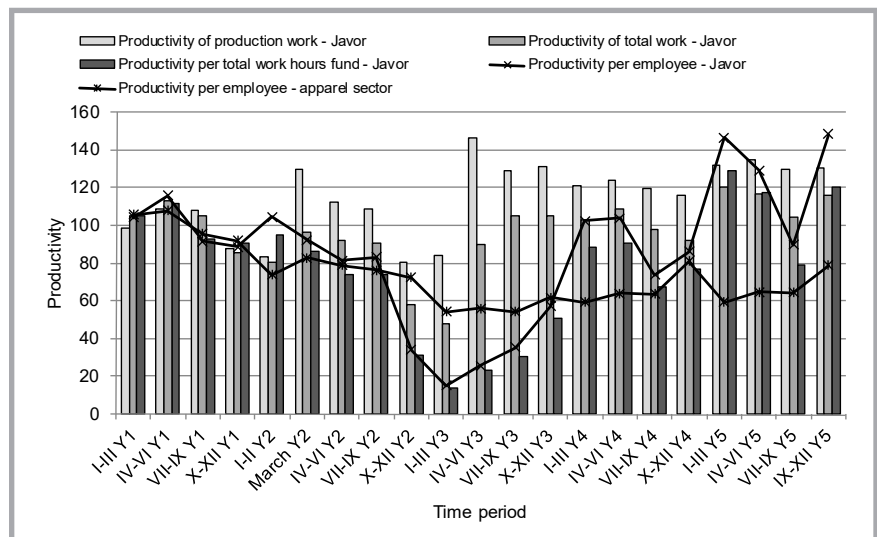
the apparel sector up until the middle of year three. While the apparel sector experienced moderate growth after the middle of year three, Javor's productivity grew significantly. By the end of year five, it had reached a level that was higher than that recorded at the beginning of year one.

**Figure 3** shows that at the end of year two and beginning of year three, Javor experienced a decline in productivity that was more significant than that recorded in the entire apparel sector. Presumably this was the consequence of increased absenteeism during the process of restructuring. A list of employees who were supposed to leave the company was created in March of year three (the company was unsuccessfully offered for sale in September of the previous year, which led to great disappointment among employees). Although lay-offs did not start until September of the same year, those employees were disinterested in any further efforts for improvement, and were acting passively at best.

In order to get a clearer picture of productivity dynamics in Javor, we analysed the productivity of employees who were really working. An additional analysis of the productivity of production and the total work was done. The productivity of production work is calculated as a ratio of earned hours and actual hours. The productivity of the total work is calculated as a ratio of earned hours and the total amount of hours of work. Productivity per total work hours fund is calculated as a ratio of the production output and total work hours fund (which includes hours of work and absence). Data for calculating the productivity of production work, the total work and per total work hours fund were gathered from the company's records. Considering the fact that data about hours of work are not collected for the entire apparel sector, it is not possible to compare the above-mentioned productivity to the sector average. However, we did compare it to the sector's productivity per employee. With the assumption that average absenteeism was unchanged during the period referenced, it is possible to compare all these variants of productivity measures. **Figure 4** shows the dynamics of productivity of production work, the total work, per total work hours fund, per employee, and (per employee) the apparel sector. Year one average was used as a basis, and equals 100.



**Figure 3.** Five year productivity per employee for Javor and the apparel sector.



**Figure 4.** Five year productivity dynamics in Javor and the apparel sector.

**Figure 4** shows that the productivity per employee in Javor was similar to that in the apparel sector from January of year one to December of the same year, and that they followed the same trend. The productivity of production work (apart from the end of year two and beginning of year three) is significantly greater in the Second and Third periods compared to the First (baseline). A high increase in the productivity per employee and productivity per total work hours fund at the beginning of year four was induced by the decrease in the number of employees, as well as by the finalisation of restructuring within the company. The differences between the productivity per employee and productivity per total work hours fund can be attributed to overtime during certain months, as well as to differences in the amount of hours of work. In addition, a seasonal decline

can be observed in the third trimester, which can be attributed to the fact that most employees go on vacation during that period.

It is interesting to note two peaks in the productivity of production work. One is in March of year two, and the other is in third trimester of year three, both after the introduction of a new wage system. These peaks reflect the fact that employees embraced the gain sharing plan's introduction, and started to work harder. The decline in productivity between the two peaks is a result of employees' dissatisfaction with the initial wage system based solely on group performance. It was coupled with the attitude that good workers were at a disadvantage, with bad workers being stimulated as equally as good ones. This last two implications were as follows: (i) both peaks in produc-

**Table 1.** Kolmogorov-Smirnov productivity per employee test for one sample.

		Group 1 productivity Javor I'Y1 - II'Y2	Group 2 productivity Javor III'Y2 - XII'Y3	Group 3 productivity Javor I'Y4 - XII'Y5	Group 4 productivity Apparel sector I'Y1 - II'Y2	Group 5 productivity Apparel sector I'Y1 - II'Y2	Group 6 productivity Apparel sector I'Y1 - II'Y2	Total productivity
Sample size	N	14	14	14	14	14	14	120
Normal distribution	Arithmetic mean	100.650	100.650	100.650	100.650	100.650	100.650	100.650
Model parameters	Standard deviation	31.7954	31.7954	31.7954	31.7954	31.7954	31.7954	31.7954
	Variation ratio, %	31.6	31.6	31.6	31.6	31.6	31.6	31.6
	Significance (two-tailed)	0.886	0.886	0.886	0.886	0.886	0.886	0.886

tivity follow the introduction of the new wage systems, which implies that wage incentives can act as a great motivator, where employees are willing to give

more, if their efforts were recognised and stimulated, and (ii) the wage system has to be in line with employees' expectations in order to give results. In case of

Javor, employees expected distinction between good and bad workers, where company stimulates effort of good workers, and de-stimulates lack of effort of bad workers.

**Table 2.** Productivity per employee variance homogeneity test.

Levene's test	Degrees of freedom - df1	Degrees of freedom - df2	Significance
9.961	5	114	0.000

**Table 3.** Productivity per employee in Javor and apparel sector variance analysis.

	Sum of squares	Degrees of freedom - df	Mean square	F	Significance
Between groups	59744.494	5	11948.899	16.105	0.000
Within groups	84582.139	114	741.949		
Total	144326.633	119			

**Table 4.** Tamhane procedure for comparing the average productivity per employee; \* Mean difference is significant at the level of 0.05.

(I) Group	(J) Group	Mean difference (I-J)	Standard error	Significance
1 Javor I Y1-II Y2	2 Javor III Y2-XII Y3	51.1455(*)	10,8099	0,001
	3 Javor I Y4-XII Y5	-8,8833	12,1689	1,000
	4 Sector I Y1-II Y2	4,4286	9,1997	1,000
	5 Sector III Y2-XII Y3	35.0409(*)	8,8792	0,018
	6 Sector I Y4-XII Y5	33.8708(*)	8,8740	0,024
2 Javor III Y2-XII Y3	1 Javor I Y1-II Y2	-51.1455(*)	10,8099	0,001
	3 Javor I Y4-XII Y5	-60.0288(*)	10,9780	0,000
	4 Sector I Y1-II Y2	-46.7169(*)	7,5544	0,000
	5 Sector III Y2-XII Y3	-16,1045	7,1606	0,394
3 Javor I Y4-XII Y5	6 Sector I Y4-XII Y5	-17,2746	7,1541	0,292
	1 Javor I Y1-II Y2	8,8833	12,1689	1,000
	2 Javor III Y2-XII Y3	60.0288(*)	10,9780	0,000
	4 Sector I Y1-II Y2	13,3119	9,3966	0,935
	5 Sector III Y2-XII Y3	43.9242(*)	9,0831	0,001
	6 Sector I Y4-XII Y5	42.7542(*)	9,0779	0,001
4 Sector I Y1-II Y2	1 Javor I Y1-II Y2	-4,4286	9,1997	1,000
	2 Javor III Y2-XII Y3	46.7169(*)	7,5544	0,000
	3 Javor I Y4-XII Y5	-13,3119	9,3966	0,935
	5 Sector III Y2-XII Y3	30.6123(*)	4,3652	0,000
	6 Sector I Y4-XII Y5	29.4423(*)	4,3545	0,000
5 Sector III Y2-XII Y3	1 Javor I Y1-II Y2	-35.0409(*)	8,8792	0,018
	2 Javor III Y2-XII Y3	16,1045	7,1606	0,394
	3 Javor I Y4-XII Y5	-43.9242(*)	9,0831	0,001
	4 Sector I Y1-II Y2	-30.6123(*)	4,3652	0,000
	6 Sector I Y4-XII Y5	-1,1701	3,6288	1,000
6 Sector I Y4-XII Y5	1 Javor I Y1-II Y2	-33.8708(*)	8,8740	0,024
	2 Javor III Y2-XII Y3	17,2746	7,1541	0,292
	3 Javor I Y4-XII Y5	-42.7542(*)	9,0779	0,001
	4 Sector I Y1-II Y2	-29.4423(*)	4,3545	0,000
	5 Sector III Y2-XII Y3	1,1701	3,6288	1,000

A moderate decrease in productivity after the second peak shows that there are limits to productivity improvement based solely on wage incentives. The company was in need of new knowledge, and the results show that principles devised in a completely different manufacturing environment (namely, the automotive industry) can be used in the apparel industry. Wage incentives increased motivation among employees to embrace new knowledge, mainly through the 'learning by doing' principle. This helped employees to work 'more smartly', in addition to working harder. This also has two implications: (i) it shows that the continuous process improvement initiative can be adapted to specific needs of the apparel industry, and(ii) it opens up opportunities for apparel manufacturers to use improvement initiatives not often used among apparel manufacturers.

In order to test if productivity increases can be associated with the gain sharing plan and continuous process improvement program, additional statistical analysis was conducted. **Table 1** shows the results of the Kolmogorov-Smirnov test. Productivity measurements are divided into six groups. Groups 1, 2, and 3 address productivity in Javor in the First (baseline), Second, and Third periods, respectively. Groups 4, 5, and 6 address the productivity of the apparel sector during the First (baseline), Second and Third periods, respectively. Sample size is given in months, and corresponds to periods over which the productivity measurements were taken. The results show that the significance for all six groups is greater than the significance threshold ( $\alpha = 0.05$ ), meaning that all six groups have a normal distribution.

**Table 2** shows the results of variance homogeneity analysis. It can be concluded that the probability of productivity variance in each group being equal is 0.000, which means that the hypothesis that all variances are equal can be rejected, with a significance threshold of 0.01.

Based on the variance analysis shown in **Table 3**, it can be concluded that the gain sharing plan and continuous process improvement influenced the productivity per employee since the probability of this influence being identical in all six groups equals 0.000.

Based on the comparison of mean values shown in **Table 4**, it can be concluded that productivity was influenced by the combined application of the gain sharing plan and continuous process improvement because:

- There is no significant difference between groups 1 and 4. This means that average productivity in Javor and in the apparel sector were the same in the baseline period;
- There is a significant difference between groups 1 and 2 and between groups 4 and 5. This means both Javor and the apparel sector experienced lower average productivity per employee levels. However, **Figure 4** shows a productivity shift in Javor after the first trimester of year three, corresponding to the modifications introduced to the gain sharing plan;
- There is a difference in average productivity between groups 5 and 6, but the probability of averages being the same is such (1.000) that the hypothesis of equality of these two productivity averages can be accepted. This means that the apparel sector did not experience an increase in productivity per employee in years four and five;
- There is a significant difference in average productivity indices between group 3 and groups 2, 5 and 6. This shows that the productivity per employee in Javor significantly increased in years four and five compared to the previous period, and also compared to the average productivity per employee in the apparel sector for the same period.

The results unambiguously show that the combined application of wage incentives and continuous process improvement can have a significant positive impact on a manufacturer's productivity. The re-

sults obtained from the research have several important implications:

- The combined application of wage incentives and continuous process improvement presents a powerful tool for productivity improvement in the apparel industry. This gives an answer to the research question posed earlier in the text, where evidence show that productivity was elevated to a level above the business branch average in a company that operated at the business branch average level. This helped the company to overcome crisis;
- Employees are willing to give more if their efforts are recognized and stimulated, and the effects of productivity improvement are shared between the company and employees, and hence wage incentives can act as a (universal) motivation factor. However, the wage incentives plan should reflect employees' expectations, and must be perceived by employees as 'fair';
- Although continuous process improvement is not widespread in apparel manufacturing, the results show that it is as efficient in the apparel sector as it is in other industries. Statistical analysis shows that productivity per employee in Javor significantly increased in years four and five, which was a period of continuous implementation of the process improvement program. The results show that existing knowledge of continuous process improvement could be adapted to reflect the needs of apparel manufacturers, which opens a new set of possibilities for apparel manufacturers to obtain and maintain their competitive position on the market. Furthermore this should encourage apparel manufacturers to actively explore possibilities of utilising other improvement programs (e.g. Six Sigma, Theory of Constraints, Business Process Re-engineering, etc.) and adapting them to the needs of the apparel sector;
- Opportunities for obtaining a competitive position on the market lie within the company. Yet passivity and unwillingness to change things usually cloak them.

## ■ Conclusions

Increasing productivity is one way of improving the competitive position on a global market. The basic idea of this research was to see if the combined appli-

cation of a gain sharing plan and continuous process improvement could lead to productivity improvement in an apparel company. Through application of a combined method for wage calculation, workers were motivated to improve production efficiency as much as they could, relying on existing knowledge and resources. Moreover the workers were interested in improving production efficiency even more since they saw financial benefits in working both harder and smarter. A new set of knowledge and skills was needed in order to further improve production efficiency, hence a continuous process improvement program was introduced. The employees improved their knowledge through usage of the 'learning by doing' principle. By motivating employees to take an active role, the combined application of these two approaches can help a company to elevate the productivity level above the apparel sector average. Additional statistical analysis shows that an increase in productivity can truly be attributed to the combined application of a gain sharing plan and continuous process improvement.

The advantage of this approach lies in the fact that it requires workers to work more smartly (in addition to working harder) in order to increase the production of high quality products by using resources that are currently available. By doing so, employees also work on increasing their earnings and improving employment security. That is why the gain sharing plan can be used to 'sell' the idea of continuous process improvement. It harnesses all of employees' knowledge, and makes them ready to accept additional knowledge and practices in order to improve work processes even further. The principles applied in Javor are universally applicable; however, the main limitation of this research is that it was done only in one company. Although strict procedure was designed and followed during the research, it would be beneficial to test the three phase approach proposed on another apparel manufacturer to see if the good results could be replicated in another environment. Furthermore there are no limits to applying the same approach to another industry. The results obtained from this study have important implications for practice since significant room for improvement lies within the company itself. We strongly believe that wage incentives can be used as a universal change facilitator, regardless of the change program and industry.

Therefore it would be of interest to see if the same level of improvements could be obtained through a combination of wage incentives and some other improvement program (e.g. Six Sigma, Theory of Constraints, Business Process Re-engineering, etc.).



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