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MANAGING FOR INCREASING THE ADDED VALUE IN LABOR INTENSIVE AUTOMOTIVE INDUSTRY IN ROMANIA

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Abstract. *The paper discusses the results of a pilot qualitative survey focusing on various aspects of the managing for increasing the value added in the automotive industry in Romania. The researcher interviewed five top managers of large automotive companies active in Romania. The findings indicate that increasing the value-added is a major part of their managerial activities, that value added is embedded in their companies mission statement, that most important ways to increase the value-added at workshop level are: automation, value stream mapping, Gemba kaizen, keeping the important productions operations in the company, externalization of non-value-adding operation to suppliers and using clear and specific key performance indicators (KPI) to plan and control the performance at workshop level and in indirect departments. The researchers argue that automation and robotization is key to remain competitive in the global market for the future of the automotive and other actual labor-intensive industries in Romania.*
Key words*: value added, management, automotive industry, interview.*

1. INTRODUCTION

A major key performance indicator for the general managers and production managers in Romanian automotive companies, is to increase "direct labor productivity" which is the hourly, daily or monthly productivity per operator. Recently, it has become quite difficult to increase this key performance indicator even more through means of intensifying work, reducing unused time, training the direct work operator to work faster, for various reasons. The consequence is that direct labor productivity has stagnated compared to previous years. Among the reasons we have identified for this situation the most important are the worsening situation of the labor market in Romania leading to lack of people willing to be employed as workers.

The second major reason is that new workers demand high wages and are not willing to work at an always-increasing pace for their low salaries. The financial impact of the performance of the company is negative since total salaries and related labor costs/ unit increase faster than productivity. Such a situation is not sustainable since it leads finally to a decrease in the work efficiency and of the profitability of the company. This is a very specific situation for the Romanian labor market and a typical one for other European countries. Operation managers must find new ways of increasing productivity not based on a short-term target but on mid- and long-term benefits.

Value added is defined as" the difference between the value of the products or services that a manufacturing unit produces and the cost of the materials or supplies that it uses to produce them. Value added is calculated without deducting the depreciation of fixed assets, such as machinery or buildings" [1]). By defining precisely what value-added means to an automotive factory, it will be easier to describe how to boost it. One of the most promising solutions is to use the recent technological advances and to increase the automation level in Romanian automotive factories. In the authors' opinion, automation is an engine of productivity which could transform automotive manufacturing in Romania in the next 5-7 years.

The top management teams of Romanian automotive factories must act quickly and find new ways to increase value-added and direct labor productivity. This is highly urgent because new competitors are entering the industry mostly from countries with a cheaper workforce and higher labor productivity and value added.

2. LITERATURE REVIEW

For original equipment manufacturers (OEMs), which are the principal customers for automotive suppliers, value means: only good products, in the right time and at the best cost. Today, most of the Romanian automotive industry is producing very high amount of simple automotive components relying on a high number of operators. This production model is more and more difficult as automotive parts are getting more complex and the diversification is increasing too. Original Equipment Manufacturers (OEMs), like the VW Group or Renault, are expecting from their supplier to receive complete systems and not only single components which reduce the complexity of their supply chain. The pressure on costs is very high and the minimum request for productivity for mechanical hardware parts is three percent per year and much more for an electronic device or a software [2]

Buchholzer in [2] concluded that "to meet the assumptions of the OEMs and to remain competitive, Romanian automotive factories need to improve productivity and added value in the production and reduce at the same time the cost of labor. They need to reduce the cost of labor to increase the output of parts per operator but also to avoid having to hire or replace people on an empty labor market" [2, p.104]. The best way to increase added value and productivity in the Romanian automotive industry is to invest in automation and robotization.

Much research related to recent automation and robotization has analyzed only the situation in high-cost countries [3]. Their main conclusion is that companies from these countries will act towards implementing automation and robotization at a fast pace. Such actions are capital intensive and at the higher level of workers' wages, the return on investment is faster. Think-tanks and organizations like the World Economic Forum [4] are forecasting major productivity and value-added improvement by automation and robotization, and more recently by rapid advances in Artificial Intelligence technologies. In this situation, the researchers recommend redefining a new strategy focused on increasing value-added by means of automation and robotization for the next ten years to companies and government authorities. The OEMs and Tier 1 automotive suppliers represent 90% of the customers for the Romanian automotive factories. These customers are only paying for materials. Material resources are purchased at the best price and the best quality. There is no place for waste in the selling price by suppliers. Only engineering and production add value in new projects and automotive products. If there is a high, added value content and cost is low, and the theoretical margin is high. What is of no value for the customer? The customer does not pay for products and features of products that do not represent value for them and therefore, those processes do not add value to the final product or service. The most used method to optimize production processes is world-class manufacturing (WCM) [5]. Schoenberger introduced the term world-class manufacturing (WCM) in 1986 encompassing several techniques and technologies designed to enable a company to match its best competitors [6], [7].

A characteristic of WCM (WCM) is" No stock". That is because stocks are binding capital, and therefore represent a source of increasing the producers' costs, while not representing value for customers. The second characteristic of WCM is "No inventories", because inventories are also blocking capital and they are coming from a deficient production flow and production planning. Another characteristic of WCM is "No quality control", meaning that a stable automotive production process does not need extra quality control.

"No internal transport/ handling/ picking/ moving" is another characteristic of WCM meaning that these operations do not increase the value content and in general too much and unorganized movements during production are waste. Another characteristic of WCM is "No rework", which means not to handle the same part two times. Most of the time rework is also not a standard process, which means rework is more work intensive and time consuming. "No scraps" is another characteristic of WCM. Because scrap production is not only increasing costs but also is time intensive since the rework needs to be executed. Avoiding or reducing the scraps rate will allow automotive factories to use the same time to produce a good part, so

increasing the worker productivity and reducing costs. A highly important characteristic of WCM is summarized in the motto is “No people waiting or not balanced”, that means that the production flow must be lean and balanced, and thus eliminating the waste of human worktime leading to the elimination of the labor costs related to waiting. The practice of WCM companies is recommending having “One piece flow” and identical operation time for each workstation to increase the efficiency of the production process. A very important characteristic of WCM is summarized in the motto “No people not adding value”. It is recommended to minimize as much as possible indirect work executed by employees, work that is not adding value to the final product.

Another important characteristic of WCM is “No extra investment”. This means that any piece of expensive equipment should always run and do the technical tasks for which it is designed. The key performance benchmark for OECD countries is Overall Equipment Effectiveness, which should be higher than 90%, no downtime and only preventive maintenance where necessary. Related to the previous WCM characteristic, “No unused machines” (anywhere) consists of planning the use of the machine capacity at 110% to be close to 100%, as shown in the practice. This is done by undertaking maintenance activities as planned as minimum duration of repair and maintenance. In the case of machine breakup, the reduction of unused time is done by reacting very fast and execute the repair in minimum time needed.

There are several other practices recommended such as: a) “No extra space (anywhere)”: extra space is allowing longer movements, consumes more time and work for moving products and parts; b) “No unproductive time”, meaning to minimize time which is not creating value to the product; c) “Not all indirect people”, that is achieved by reducing the number of indirect employees only to those who provide the right service at the best cost; d) “No low activity” meaning that anywhere in production, there must be full activity for each employee; e) “No absenteeism” meaning that the more a production is lean and each operator is adding high value, the more you feel the effect of absenteeism; f) “No meeting”, that means reducing the duration of each meeting and also keeping their number very low; g) “No repairs” and if repairs are necessary, only preventive maintenance. All these non-value-added activities for the customer represent currently big areas of improvement for the Romanian automotive factories. This mindset to track waste in production is what the Japanese call „MUDA” [8]. Some companies which achieve it are continuing the improvement process to attempt to become WCM companies, meaning that they reach the threshold of 1 adding value activity of 25 activities. In this stage getting improvement becomes even more difficult since many of the non- value-adding activities are already eliminated. That is why there are about 1000 manufacturing companies which are world class.

There are several best practices to achieve such a result. The first is to maximize personnel efficiency. Continuous activity without planned and unplanned production interruption is one of the success factors to increase the number of activities, which are adding value to the production process. The second is to reduce the non-quality costs related to scrap. When you have scrap, you need to produce twice to sell one good product. Scrap is slowing down operation and there is no added value in a scrap part. The third is to reduce inventories and asset management: this is bringing less investment in non-essential production activities. The notion of safety stock is also going in the opposite direction of maximizing added value in the manufacturing activities. If your production is well balanced and lean, you do not need any kind of safety stock.

The value is generated in the transforming operation, at the workplace (any type of workplace). To maximize the added value in a Romanian automotive plant, design, and office, we must define the proper production concept.

For all the activities in an automotive factory, including in production, design and at the office, the rhythm at the workplace is crucial. Rhythm in an automotive factory means having a constant speed in all the activities.

There are several principles of lean management to be respected when designing and

managing increased value-added manufacturing [9]; [10]. First, keep investment at minimum, meaning investing only in what is helping to achieve higher added value in the process. Second, keep people at minimum needed level, meaning to only use the minimum human labor necessary to increase the productivity per worker. Third, have minimum set-up time to avoid wasting time when you start a shift or change a model in a production line. A basic rule is to avoid changing production models on the same production line too often. Fourth principle is to use minimum material resources by better controlling them, do less handling, bring in production only the material you need to produce a certain number of parts based on the customer orders for the next hour, so keeping stocks in the production lien very low (1 hour stock). This is important since all activities linked to the handling of material resources are generating no added value, and therefore there is no benefit to them, only costs. The fifth principle is to use the minimum space: the smaller the workplace is the more you can reduce movements which are not essential to the production process. The limitation of movements is a good way to avoid waste (MUDA). The sixth principle of organizing the workplace is to have minimum movements, both at the workplace itself and second, the movements towards and from the workplace need to be shortened [11], [12]. One very important principle is to apply in the production flow low-cost automation. This principle consists of using some simple and cheap automation solutions which could help workers to increase their work productivity fast and in a cost-efficient manner. Another very important principle, related to the overall production process and supporting activities, is to provide only minimum support (anywhere). This means that the workers who are not participating directly in the adding value process, also called indirect labor or indirect workers, must be kept as low numbers as possible. From the management of the work place point of view, the principle of minimum decisions at each place needs to be enforced and applied by production managers. It means delegating the responsibility for making decisions at the level of each production operator, without any request for support from the direct managers. It means that most of the decisions must be taken directly on the production line. This principle is one of the bases of total productive manufacturing/maintenance (TPM) [13]. Consequently, our opinion is that o maximize value in the Romanian automotive industry, it is essential to minimize non adding-value operations, non-productive time, and movement time for the direct operators in the production line.

3. RESEARCH METHODOLOGY

The researchers employed a qualitative methodology, using as a research instrument the interview. The interview had 14 questions, selected based on the literature review and aimed to get detailed information from first-hand top managers of OEM in Romania. This was pilot research aimed to get important facts related to the researched topics from knowledgeable individuals, holding top management positions.

The sample consisted of 5 respondents, top managers in large automotives companies active in Romania, 2 are general manager, 1 in country manager, 1 is production manager and 1 is the chief financial officer. Respondents demanded that their names and their companies' details remain anonymous. Therefore, each respondent and company are kept anonymous and given names such as respondent A, respondent B, respondent C, respondent D and respondent E.

4. FINDINGS AND DISCUSSIONS

The first question was "What are the most important ways to increase the value – added in your company at work-shop level?" Workshop level is the level where the value-added is created by direct workers. Respondents offered very interesting, detailed answers such as, respondent D "5S, value stream mapping, Gemba, automatization, industry 4.0", respondent A" the most common way is to increase the automation level. It is also very important to have all important production step in-house and to externalize non-adding value operations to sub-suppliers", respondent C stated, "take out the simple and stupid work and replace it through cobots if possible".

Respondent E stated that "direct operator and indirect productive workers must understand what is adding value to their daily tasks… They need a leader to follow the changes, clear visual management to facilitate the value creation process and Key Performance Indicators (KPIs) to evaluate the results of the work at the work-shop level". Respondent B reported a different approach based on the process of mapping the value stream process, "We always start with a value stream mapping. Value stream mapping helps us to recognize bottlenecks and ineffectiveness in the entire workstream process of a company". Respondent B also suggested you can externalize a part of the operations and reduce the number of operators by buying sub-component with already a higher amount of manual work already performed to do only a minimum operation in-house, only final assembly operations".

Most of them stated that the most important ways to increase the value-added at workshop level are automation, value stream mapping, Gemba kaizen, keeping the important productions operations in the company, externalization of non-value-adding operation to suppliers and using clear and specific key performance indicators (KPI) to plan and control the performance at workshop level. Important aspects referred to the need to keep involved and informed workshop workers about value-added, the need for change and the role of the leader in managing the process.

The second questions referred to "Which are the key performance indicators your company is using to plan and monitor the value-added at workshop level? Respondent A stated four major KPIs such as "PHP = Pieces per Hour per Person. This is a good productivity indicator. OEE = Overall Equipment Effectiveness, MTBF = Mean Time Between Failure, MTTR = Mean Time to Repair are important KPIs in a more and more automatized and robotized workshop environment". The same type of answer was provided by respondent C "Efficiency = Pieces by hour/attendance OEE (Overall Equipment Effectiveness), PCE= Production cost efficiency (operators + support Team like logistic, shift, supervisor, quality…) and Process Quality= Parts delivered/ Scraping costs". Respondent E answer was about the use of Financial KPIs "Most are financial KPIs as a good since organized production processes and workers should provide better financial results for the overall company. For example, the Working Capital is a very good indicator of how effective a production workshop is." Another financial KPI was mentioned by respondent E "The sales per Direct and Indirect productive headcount is also a good indicator to see how much value an operator and indirect productive worker are generating on a daily/ weekly/ monthly basis." Respondent B stated "The most important one is the sales per employee. Each employee needs to generate a certain amount of revenue and this ratio should increase from year to year through productivity gain". Respondent D summarized its answer stating, "Productivity and efficiency".

The researchers conclude that all the five companies are making extensive use of very precise KPIs to plan and control the process of value-added creation at workshop level, and that KPIs are related to the effectiveness, efficiency and productivity at individual, team and company level, both in financial and technical terms. A promising route for further exploration is to identify the specific KPIs related to the increased level of automation and robotization of the production process, with less people involved in the production process.

Next questions focused on the role of indirect departments in the increasing of value added. Third question is "What are the most important ways to increase the value – added in your company for the indirect departments?" Respondent A stated that "one of the most common ways to increase value-added in indirect departments is to reduce the indirect workforce to a minimum". Respondent B stated a percentage of a maximum of 10-20% of people working in indirect department compared with direct department in labor intensive companies", while in highly automated companies "you will find more and more a 50/50% ratio as you need much less non-qualified direct operators or direct operators". Respondents C and D stated "reducing the overhead in reviewing the need for the customer or to automate processes" and "using Business Intelligence systems" in the activity of indirect departments of the company.

Respondent E suggested three ways such as "To reduce the number of people working in indirect departments; to increase the level of sales (more sales for the same amount of people working in indirect department improve the KPI ratio) and to load the indirect department at 100% to be sure they are not slowing down the direct workers". He also suggested a limit of "less than 10% indirect headcount at workshop".

All the five respondents consider that reducing the number of indirect employees working in indirect departments is the most important way to increase value-added in indirect departments. They also agree that there should be a limit of the percentage of indirect employees in the total number of employees depending on the dominance of labor-intensive processes or automated and robotized processes in the company. Some also pointed out the automation and use of intelligent business systems in indirect department activities as a solution for the reduction of the number of indirect employees.

The fourth question is "Which are the key performance indicators your company is using to plan and monitor the value-added for the indirect departments?" Respondent A stated they use two KPIs "Sales per indirect workforce and Total indirect workforce per total direct workforce. "Respondent B stated also two KPIs "Sales per indirect workforce and max 3.5% Indirect labor cost per total sales". Respondent C reported one KPI "Actual indirect costs compared to sales". Respondent D stated one KPI "Actual indirect costs compared to sales", while respondent E stated two KPIs "Sales/indirect headcount, ratio between Direct headcount/Total headcount > 90% = less than 10% indirect headcount at workshop". The answers indicate that there is a wide agreement about using the same two KPIs, sales per indirect workforce and total indirect workforce per total direct workforce, with the aim to keep indirect labor costs to a maximum limit of 3.5%.

The fifth question is "What is the mission of your company? How is it related to increasing the value added in your company?" Respondent A stated "The mission of the company is to create sustainable value for all stakeholders by focusing on productivity, quality, and systems. The mission of the company is to train and develop a qualified workforce and empower them." Respondent B stated "We want to generate a maximum of wealth with low risk and less own capital utilization. We want to secure the Future of the stakeholders and all employees. We want to be and innovative company which is benchmark in the segment." Respondent C stated a very specific mission of the company from which we selected the part that refers to value creation "We care about creating unique experiences for our customers. We care about everyone working at our company as well as our worldwide suppliers…" Respondent E stated as part of his company mission "…Only by having a high value-added content in our products we can afford the costs for R&D to sustain our main strategic goal…" Respondent D stated that the mission of the company has "…no direct relation to value-added, is just a general mission to improve our future", including their stakeholders.

The researchers conclude that the fact that the mission statements include the value added reflects the high importance each of these companies give to the need to increase value-added of their products and services in the increasing competitive business environment.

The next question is for respondents to estimate "Approximately, what percentage of your time is dedicated to activities directly linked to increasing the value added in your company?" The aim of this questions is to find out the extent to which the general managers/ top managers of automotive companies in Romania are investing their time, knowledge, experience and energy into increasing the value added. Respondent A stated "I would say 90% of my work out of the routine Meetings and Report. My role is clear to increase the added value in operation management and to avoid MUDA" meaning the waste of the company resources. The answer of respondent B is very detailed and expresses the frustration of the requirement to participate in fixed meetings set by his superiors. He stated "In a perfect world, this is my sole purpose. Unfortunately, as General Manager (GM) you also have a lot of reporting and jour fixe meeting to consider". Respondent B added which are the actions he is taking to overcome this situation stating "We are trying to automate as much as possible daily routine, reporting and

problem solving. We invest in new software tools with artificial intelligence like SAP HANA or UIpath".

Respondent C answered very briefly, stating "60-70%", which indicates that the specific situation of his company requires him to dedicate 30-40% of his time and energy to other responsibilities he has as general manager of the company. Respondent D stated "50%, the remaining is day to day business", his role being the Chief financial officer of the company. Finally, respondent E stated "85%, the rest is daily work".

So, all the respondents invest most of their time and energy in activities directly linked to increasing the value added in their company, between 50% to 90%. The seventh question inquired about the situation in the respondents' companies about "Approximatively, what percentage of the value-added is due to applying automation as productivity enhancer? And robotization?" Respondent A answered "I would estimate 40 to 60% for each new implemented project. We are still having line balancing and layout activities to increase the added value by having a lean process… this represent 50% to me, the rest of the added value is already coming from robots". The same opinion belongs to respondent B "Today I would estimate it to more than half of the entire value stream creation in the shopfloor". Respondent E stated the same opinion "More than half, the rest comes from Total Productive Manufacturing, 6 Sigma and Line Balancing activities". Respondent C stated, "I can´t specify depends at the project and the given circumstances" and respondent D shared the same opinion "Not possible to say as all is an ongoing process. In general productivity increase should compensate labor cost increases".

In conclusion, the process of automation and robotization is well underway in all the 5 companies, with three of them clearly evaluating that is already contributing to about 40 to 60% of the value added in their products.

Finally, managers were invited to express their key thoughts and recommendations. Respondent A stated "In Romania, it makes no sense to continue chasing cheap labor. Every labor-intensive factory must find a way to increase added value to get new project awarded". Respondent E also pointed that "Automation and robotization is key for the future of the automotive and other actual labor-intensive industries in Romania. We need an improvement fast to overcome the missing qualified and unqualified workers on the Romanian labor market".

5. FINAL CONCLUSIONS

The results of the qualitative research indicate several important aspects related to managing automotive companies in Romania to increasing the value-added to their products. In these companies, reducing the number of indirect employees working in indirect departments is the most important way to increase value-added in indirect departments. They also agree that there should be a limit of the percentage of indirect employees in the total number of employees depending on the dominance of labor-intensive processes or automated and robotized processes in the company. Related to the KPI used for monitoring indirect department, we found a wide agreement about using the same two KPIs, sales per indirect workforce and total indirect workforce per total direct workforce, with the aim to keep indirect labor costs to a maximum limit of 3.5%. The fact that the mission statements include the value added reflects the high importance each of these companies gives to the need to increase the value-added of their products and services in the increasingly competitive business environment. All the respondents invest most of their time and energy in activities directly linked to increasing the value added in their company, between 50% to 90%.

In conclusion, the process of automation and robotization is well underway in all the 5 automotive companies in Romania, with three of them clearly evaluating that is already contributing to about 40 to 60% of the value added in their products. This trend is likely to continue due to global competition pressure and lack of skilled labor in the Romanian economy. Our results provide a foundation for the recommendation to companies and Romanian government authorities to apply and facilitate

the implementation of a new strategy focused on increasing value-added by means of automation and robotization for the next 5-7 years (horizon 2030).

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Managementul orientat către creșterea valorii adăugate în industria automotive cu forță de muncă intensivă din România

Lucrarea discută rezultatele unei anchete calitative pilot referitoare la aspect diverse ale procesului de management având ca obiectiv creșterea valorii adăugate în industria de automobile din România. Autorii au intervievat cinci manageri de vârf din companiile automotive de mari dimensiuni din România. Rezultatele indică faptul că creșterea valorii adăugate reprezintă a parte importantă a activităților manageriale ale respondenților, că valoarea adăugată este incorporată în declarația de misiune a companiei, că cele mai importante modalități pentru creșterea valorii adăugate la nivelul atelierului de producție sunt: automatizarea, cartarea fluxului valorii utilizarea Gemba kaizen, menținerea operațiilor de producție importante în cadrul companiei, externalizarea operațiilor care nu adaugă valoare către furnizori și colaboratori și utilizarea unor Indicatori Cheie de Performanță (KPIs) clari și specifici pentru a planifica și controla performanța la nivelul atelierului de producție și la nivelul departamentelor indirecte. Cercetătorii argumentează că automatizarea și robotizarea reprezintă factorii cheie pentru a rămâne competitivi în piața globală pentru viitorul industriei automotive și alte industrii cu forță de muncă intensivă din România.

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