

**EFFECT OF TPM (TOTAL PRODUCTIVE  
MANAGEMENT) IMPLEMENTATION ON  
PRODUCTION LINE PERFORMANCE  
IMPROVEMENT: A CASE OF BRALIRWA PLC.  
RUBAVU SITE 2019-2020**

**Banyenza B. David**

University of Kigali

**Gamariel Mbonimana**

University of Kigali

ISSN 2277-7733

Volume 12 Issue 2,

September 2023

**Abstract**

*The purpose of this research project is to assess the effect of Total productive management (TPM) implementation in manufacturing companies in Rwanda to improve the production lines performances; we will focus on BRALIRWA plc as our case study. Manufacturing companies in Rwanda and round the world pay huge amount of money for purchasing new equipment to improve their production output however nothing or little is done to achieve full output from their current installations, small losses in time or deviations from planned or calculated capability are taken as usual line performances. Nevertheless, currently because of improved capability levels and demand of quality product at lower prices, purchasing latest production line is not a solution, unless the current installations is fully used and optimized. TPM is a method that involve everybody from top management to all workers, it is a systematic approach to eliminate waste associated with production equipment and machinery, minimize machine downtime resulting from unexpected breakdowns, fully utilizing a machine's capabilities. The implementation of TPM can lead to significant manufacturing cost reductions, improvement in production efficiency and allow manufacturing organizations better placed to survive in increasingly competitive regional and global markets. The researcher used primary and secondary data; questionnaires were given to 14 employees of BRALIRWA Plc, working in logistics, maintenance and production departments. BCS data for the company were used to evaluate the lines performance and volume development. After analysing the data, the researcher found indeed a positive trend of the line performance (OPI) and volume from the period 2019 to 2020. implementing TPM at BRALIRWA Plc has supported in a steady improvement year by year of operational performance, with increased performance lead to increased volume thus increasing the company profitability, much more involvement of employees in the program as well as consistent use of reward and recognition system were recommended. On the other side, this research has proven that using TPM in production activities supports in a sustainable lines improvement, thus recommended to other manufacturing companies in Rwanda.*

**Keywords:** TPM, BRALIRWA, BRALIRWA PLC., RUBAVU

During the last decades, we saw an increased number of manufacturing companies; this has increased competition level in the market. hence a battle to increase the market share of their portfolio, Rwanda beer market is price sensitive; in the fight to boost companies

profit, increase the product price will be the last option therefore a lot of efforts is put on increasing productivity and reducing losses throughout production chain. Automation has played a good role in increasing productivity however, it fails if the production line is not maintained properly. There are seven types of waste (Muda) that were identified by Taiichi Ohno, the Chief Engineer at Toyota, as part of the Toyota Production System (TPS). Commonly referred to as 'The 8 Wastes' - Transportation, Inventory, Motion, Waiting, Overproduction, Over processing and Defects - an 8th element of waste known as "TIMWOOD" was introduced in the 1990s with the implementation of Toyota's Manufacturing System in Western nations. At shop floor level, material wastage and time loss can often be attributed to factors such as unskilled or unqualified personnel, processes and components not being available when required; additional quality wastage; machinery sitting idle; and workers waiting without purpose. This is true for many organizations (Eti et al., 2004). There are some unseen losses like when operating the machines against their specifications (e.g. low speed, speed losses), minor stoppages, startup losses, within the method and breakdown of the equipment. To avoid the discussed losses, a new idea of TPM has been considered by several industries across the world. The main concept is to achieve ZERO losses, zero breakdowns, zero accident, zero incident, zero defects etc. This can be achieved by implementing TPM methodology by the manufacturing company (Total productive management) (Venkatesh, 2015).

The outcome of this thesis has shown the improvement in the processes of the company and its objective to realize positive results. It also proves that TPM is not just some production tools rather than the implementation and maintenance of TPM needs to be a long run methodology to prove its huge improvement and enhancement, (Bamber et al, 1997). In the end, there will be generalization of the results and suggestion of implementation in other manufacturing companies in Rwanda.

**Research Questions:** What is total productive management?; How total productive management is generally implemented?; How is Total productive management implemented at BRALIRWA Plc, Rubavu Site?; What are the effects of TPM methodologies implementation on a production line performance?

### **Methodology**

In carrying out this study, primary data were collected through structured interview and self-administered questionnaire. In designing questionnaires addressed to the BRALIRWA staff in the specified departments, the researcher used Likert scale to measure the staff's appreciation level on working capital management and their appreciation on performance level. Using Likert Scale, the staff

indicated whether they actually strongly agreed (SA), agree (A), undecided (U), disagree (D), or strongly agree (SD). The items for the said scale are gathered for related research studies (Bhuiyan and Alam, 2004; Casadesu and Karapetrovic, 2005; Haversjo, 2000; Psomas (2010) where all those authors used Likert Scale to measure such variables mentioned above.

Secondary data, which was mostly collected from the company's different but relevant reports, were used to measure the company's lines performances comparing the past results and the present.

**Findings:** The findings of the study and highlights the results of the findings as set out in the research methodology are presented as follow:

View on first and second research objective: General TPM implementation and specific TPM implementation at BRALIRWA PLC, Rubavu site

Two questions was derived from the first and second objective of the research study about how is Total productive management generally implemented and specifically implemented at BRALIRWA Plc, Rubavu site. The questions delivered to the respondents were aimed at investigating their response towards the stated research objective.

**What is TPM?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Total Productive Management	14	100.0	100.0	100.0

Source: Primary data (2021)

From table 4.2, Indicates that all the respondents 100% were able to define well what is TPM, this shows that TPM is known in the organization and Bralirwa has worked to ensure awareness of the program among his staffs.

TPM Training

**Have you attended at least one TPM related training?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	9	64.3	64.3	64.3
Agree	4	28.6	28.6	92.9
Neither agree nor disagree	1	7.1	7.1	100.0
Total	14	100.0	100.0	

Source: Primary data (2021)

From table 4.3, 92.9% of respondent agreed that, they have attended at least one TPM related training, This shows that there is frequent TPM related training organized by Bralirwa plc, to ensure their staffs understand and they have a good insight of the program as a tool of a way of working for the company. Employee training and development programs are essential to the success of businesses worldwide. Not only

had it offered opportunities for staff to improve their skills, but also for the company, Bralirwa plc. In this case to enhance employee productivity and improve company culture. Training can also reduce employee turnover – A 2020 Work Institute study has demonstrated the significance of employee learning and development to a business's financial performance. The report unveiled that voluntary worker turnover incurs U.S. organizations more than \$630 billion every year. It is clear that personnel who are regularly given chances to learn, progress and grow are more likely to remain working with an organization. Bob Nelson, author of 1,001 Ways to Engage Employees, observed that learning and growth are some of the primary variables in staff engagement.

TPM methodologies knowledge

**Do you have a good knowledge of TPM methodologies?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	5	35.7	35.7	35.7
	Agree	8	57.1	57.1	92.9
	Disagree	1	7.1	7.1	100.0
	Total	14	100.0	100.0	

Source: Primary data (2021)

From Table 4.4, 35.7% of respondents strongly agree to have a good knowledge of TPM methodologies, 57.1% agreed, Thus 92.9% of respondents are favorable to this question.

The above indicates that on top of the TPM trainings and development programs, the latter have been also effective. In fact, Bralirwa defines their learning strategy in terms of 70-20-10 philosophy, with 70% representing on the job training, 20% representing next to Nely training (coaching) and 10% representing formal classroom training. This has supported to increase the overall knowledge and skills of Bralirwa Employees in regards of TPM. They have formal trainings and evaluation, then follow on the job trainings, which comes in terms of leading or participating in a TPM improvement team, a coach and a trainer is assigned to the improvement team.

Where is TPM implemented?

**Where is TPM implemented?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Production, Logistics and Maintenance	9	64.3	100.0	100.0
Missing	System	5	35.7		
	Total	14	100.0		

Source: Primary data (2021)

From table 4.5, shows in which department TPM is implemented, TPM is implemented in Supply chain departments namely Production, logistics and maintenance. In the production department you have Brewing

department, in charge of brewing, beer production (fermentation and beer filtration); there is also packaging department in charge of putting the beer into primary, secondary and tertiary packaging materials; There is support functions departments as well as Safety, Quality and TPM departments. Each department follows a set of related KPIs to support driving the results.

**Table 4.6 TPM a strategic pillar in Supply chain department**  
**Is TPM a strategic pillar in Supply Chain department?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	6	42.9	42.9	42.9
Agree	7	50.0	50.0	92.9
Strongly disagree	1	7.1	7.1	100.0
Total	14	100.0	100.0	

Source: Primary data (2021)

Strategic pillars are simply your strategic battlefields that your business needs to win in, no matter what else happens. Strategic pillars truly represent the essential dimensions around the company’s long-term success. These are the most strategic battlefields that you need to win on, they may also be defined at a set of high-level objectives that defines the areas of activities and initiatives that directs the organization achieve its long-term goals. 92.9% of respondents agree that TPM is a strategic pillar for Bralirwa, TPM has been defined as Bralirwa supply chain way of working, the TPM ways of working has been embedded in the day-to-day operations.

**Table 4.7 TPM age in the company**  
**What is the age of TPM in the company?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Above 8years	11	78.6	84.6	84.6
Between 5-8 years	1	7.1	7.7	92.3
Between 3-5 years	1	7.1	7.7	100.0
Total	13	92.9	100.0	
Missing System	1	7.1		
Total	14	100.0		

Source: Primary data (2021)

**Table 4.8 TPM embedded throughout the years**  
**TPM ways of working are being embedded throughout the years.**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	6	42.9	42.9	42.9
Agree	7	50.0	50.0	92.9
Neither agree nor disagree	1	7.1	7.1	100.0
Total	14	100.0	100.0	

Source: Primary data (2021)

From Table 4.7 and 4.8, indicates that TPM has been in Bralirwa for more than 8 years, throughout the years, TPM methodologies have found time to really sink in the supply chain department and in the ways of working of its departments. As every change management program, it always start by dependent mindset to independent then later on interdependent as last stage.

It starts with dependency; I will use this methodology because I am requested to do so, and if I am not using it will face consequences; to the level of I understand the effect of using TPM and I am fully convinced to use the methodologies (independency). The last maturity stage will be of influencing the others to also use the TPM ways of working (Interdependency).

**Table 4.9 All employees involved in TPM implementation**

**Are all employees involved in the TPM implementation?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	3	21.4	21.4	21.4
Agree	9	64.3	64.3	85.7
Neither agree nor disagree	2	14.3	14.3	100.0
Total	14	100.0	100.0	

Source: Primary data (2021)

From Table 4.9; it indicates that 85.7% agree that all employees are involved in the TPM implementation. From its definition, the first T stands to Total; which means involving everyone and everything. Involving everyone from shop floor people to senior managers; with that, we have an improvement that goes from bottom- up not only up down. this helps a lot; in the sense that if you want to improve the performance of a line, you will start with improving the individual machines performance and people who knows and masters their machines are called the machines operators, hence you need to talk to them and based on their inputs improve the performance and culture. Most respondents lies in the agree side... 64.3%, and only 21.4% strongly agree, here Bralirwa has an opportunity to move much more of their staff in the strongly agree area.

**Table 4.10 Use of TPM as ways of working**

**Do you often use TPM in your work?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	7	50.0	50.0	50.0
Agree	7	50.0	50.0	100.0
Total	14	100.0	100.0	

Source: Primary data (2021)

From Table 4.10, 50% of respondents strongly agree that they use TPM as ways of working in their day-to-day job, 50% others agree; it is good that all employees agree that they use TPM in their day-to-day job, which

means that TPM has been a culture and a way of working. On the other hand, in order to gain full advantage of TPM methodologies, there is an opportunity to maximize the usage of TPM and move the 50% agree population to strongly agree.

4.2.2 View on third research objective: Effect of TPM methodologies implementation on improving production lines performance at BRALIRWA PLC, Rubavu site

A question was derived from the third objective of the research study about what are the effects of TPM methodologies implementation on production lines at BRALIRWA Plc, Rubavu site. The questions delivered to the respondents were aimed at investigating their response towards the stated research objective.

**Table 4.11 OPI (OEE) measurement of line performances**  
**Do you think OPI (OEE) is a good measurement for your line performances?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	8	57.1	57.1	57.1
	Agree	6	42.9	42.9	100.0
Total		14	100.0	100.0	

Source: Primary data (2021)

From Table 4.11, indicates that all the respondents agree that OPI (OEE) is a good measurement for their line performances, OEE measures the difference between ideal production and current production. When a production line operates 24 hours each day, delivers perfect quality and works at top speed, we get an idea of the ideal line production. Bralirwa is measuring the line performance by calculating the OPI, we cannot improve something we are not tracking, and we cannot track if we are not measuring. From this calculation a driving results system is in place that helps to deploy the losses on OPI which comes in terms of speed loss and Minor stop, Breakdown loss(failure in equipment), External stop (lack of water, power, steam, air, Co2 etc.), Planned down time loss, Reject and Rework. From these components, a deep dive is being done in order to deploy up to the failure mode, which is an attackable loss. Then improvement team is being launched using dedicated improvement route.

**Table 4.12: OPIs before TPM implementation**

**What were your OPIs before TPM implementation?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Between 65%-75%	3	21.4	21.4	21.4
	Between 55%-64%	3	21.4	21.4	42.9
	Between 44%-54%	8	57.1	57.1	100.0
Total		14	100.0	100.0	

Source: Primary data (2021)

**Table 4.13: OPIs after TPM implementation**  
**What are your OPI (lines performance) after TPM implementation?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Above 75%	2	14.3	14.3	14.3
	Between 65%-75%	12	85.7	85.7	100.0
	Total	14	100.0	100.0	

Source: Primary data (2021)

**Table 4.14: TPM implementation supporting lines performance improvement**  
**Do you think TPM implementation has supported improved line performances?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	8	57.1	57.1	57.1
	Agree	6	42.9	42.9	100.0
	Total	14	100.0	100.0	

Source: Primary data (2021)

**Table 4.15: TPM supporting increased in volume**  
**Do you think TPM implementation has supported increased in volume?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	8	57.1	61.5	61.5
	Agree	4	28.6	30.8	92.3
	Disagree	1	7.1	7.7	100.0
	Total	13	92.9	100.0	
Missing	System	1	7.1		
Total		14	100.0		

Source: Primary data (2021)

From table 4.12, 4.13 & 4.14, It clearly shows that most of respondents agree that there is an improvement on the lines performance after TPM implementation compared to before TPM implementation in the company, This shows that the respondents have a strong belief in TPM, and that implementing TPM has supported the lines performance improvement.

Also from Table 4.15, 92.9% agree that TPM implementation has supported on the volume increase, the volume is the sales volume and by increase the volume we are improving the company profitability.

**Table 4.16: Reward and Recognition**

**Do you believe the Reward and Recognition system supports the TPM adoption by the employee?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	5	35.7	38.5	38.5
	Agree	5	35.7	38.5	76.9
	Neither agree nor disagree	2	14.3	15.4	92.3
	Disagree	1	7.1	7.7	100.0
	Total	13	92.9	100.0	
Missing	System	1	7.1		
Total		14	100.0		

Source: Primary data (2021)



From Table 4.17, it indicates that 71.4% agree that reward and recognition system supported the TPM adoption by the employees. With TPM implementation employees will have difficulty to buy in and will consider TPM as an extra work, Bralirwa PLC has implemented a Reward and Recognition initiative designed to incentivize employees to incorporate TPM in their daily routine. Through this system, which can involve both intrinsic and extrinsic rewards, employees are recognized and appreciated for their efforts in a timely and equitable manner.

**Table 4.17: Next Steps with TPM**  
**Do you think that discipline of execution, Knowledge of TPM concept and theories, Top management involvement, strong TPM pillar involvement and Closing the loop can be used to gain further advantages of TPM implementations?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	5	35.7	38.5	38.5
	Agree	7	50.0	53.8	92.3
	Neither agree nor disagree	1	7.1	7.7	100.0
	Total	13	92.9	100.0	
Missing	System	1	7.1		
Total		14	100.0		

Source: Primary data (2021)

From Table 4.17, 85.7% think that discipline of execution of actions, a good knowledge and skills of TPM concept and theories; Top management involvement, strong TPM Pillar involvement and closing the loop can be used to gain further advantages of TPM implementation. As every change management program after quick wins you will need to keep the momentum, do not let it go and try to sustain the improvement.

A PDCA (Plan, Do, Check, Act) approach is used intensively to ensure closing of the loop on all the initiatives, ending all the discussions with concrete actions; and we followup their disciplined on time in full execution.

### Conclusion

This research inquired whether the effect of TPM (Total productive management) implementation on production line performance improvement with reference to BRALIRWA Ltd. Not only it does add to the extensive literature, but also contributed in terms of evaluating TPM implementation in industries to improve their production lines performances.

Based on a sample of 14 employees and review of BCS (Business comparison system) and other reports, all specific objectives were achieved as indicated in the previous sub section. The TPM methodologies and lines performance analysis were studied fully and the findings indicated that BRALIRWA have implemented all the methodologies and they are fully supported under their specific activities that are tackled both tactically and strategically

## References

- Ademir, S., Piechnicki A., Vanderley H. and Sola, F.T. (2015), "Decisionmaking towards achieving world-class total productive maintenance", *International Journal of Operations & Production Management*, Vol. 35 Iss 12 pp. 1594 - 1621.
- Ahuja, I.P.S. and Khamba, J.S. (2008), "Strategies and success factors for overcoming challenges in TPM implementation in Indian manufacturing industry", *Journal of Quality in Maintenance Engineering*, Vol. 14 No. 2, pp. 123-147.
- Alan, H. and Remko, H. (2008). *Logistics Management and Strategy (Competing through the supply chain)* 3rd edition. Prentice Hall, Financial Times.
- Alan, J. (2014), *Rigour in Research: Theory in The Research Approach*, YSJ Business School, York St John University, York, UK, Vol. 26 No.3.
- Alsyouf, I. (2009), "Maintenance practices in Swedish industries: survey results", *Int. J. Production Economics*, Vol. 121 No. 1, pp. 212-223.
- Arca, J.G. and Prado, J.C. (2008), "Personnel participation as a key factor for success in maintenance program implementation: a case study", *International Journal of Productivity and Performance Management*, Vol. 57 No. 3, pp. 247-258.
- Aspinwall, E. and Elgharib, M. (2013), "TPM implementation in large and medium size organisations", *Journal of Manufacturing Technology Management*, Vol. 24 No. 5, pp. 68871