ORGANIZATIONAL CULTURE TRANSFORMATION MODEL IN A MANUFACTURING PLANT: Impact analysis of a four year journey towards High Performing Organization

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ABSTRACT:

The current market environment, characterized by its volatility, uncertainty, complexity and ambiguity (VUCA), means a paradigm shift for any organization. Consequently being innovative via new perspectives such as the management of the Organizational Culture becomes a key factor as a potentially strong competitive advantage. In this framework, the main objective of this research is to analyse the impact of an Organizational Culture Transformation Model for an automotive sector's manufacturing plant, with over 750 employees and 105,000 m^2 in size, to facilitate its journey towards a High Performing Organization as way of survival. After four years of rigorous and systematic implementation of the model, the impact has been measured through the improvement obtained in the main business Key Performance Indicators and the Organizational Culture survey. In all of them, improvement exceeds expectations. Thus, Net Structural Cost Savings have been 1.4% versus 1% expected, Plant Overall Equipment Efficiency 69.8% vs 68%, for the Safety and Quality Index, Line Driven Management has been implemented as expected, and finally the Organizational Culture Survey (% of questions answered 4 or 5) has reached 58.1% vs 55%, demonstrating that the model positively impacts the organizational culture, enabling the viability of the plant.

Keywords: Organizational Culture, High Performance Organization, Manufacturing Performance Improvement, Key Performance Indicators

1. - INTRODUCTION

The world is subject to continuous changes, many posing great threats to companies, so each company needs to create and develop strategies aimed at obtaining competitive advantages that allow them to achieve, maintain and improve the position within its socio-economic sphere [1]. In the ongoing battle to be competitive, evident in the current market, companies all over the world are being impacted by several external changes [2], thus, embarking on the path to High Performance Organization (HPO) becomes a matter of survival [3].

Both theoretical and empirical work in this area, are consistent concluding that there is a strong relationship between HPO and its subsequent performance from efficient Key Performing Indicators (KPI) standpoint, through the Organizational Culture (OC) [4], [5]. Thus, the management of OC plays an important and decisive role and has become an important topic and object of study for many researchers nowadays, in particular business enterprises as it is correlated with the organizational performance outcomes [6], [7].

Even the concept of OC is ambiguous, the definition given by Edgar Schein, "a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems" [8] is the most popular and accepted one.

Based on OC pragmatic point of view, OC can be, should be and has been managed, however it requires effort and courage as it is complex and despite requiring quick, effective action to be taken, it is a mid to long term activity as it is necessary to influence the behaviour and attitudes of the members of these organizations, through appropriate models [9]. Although there is a wide range of

models to change OC, the lack of empirical studies analysing their viability represents the importance of the field of study. In addition, an established process to manage the OC would represent an important added value to the scientific community [10].

From measurement point of view, both qualitative and quantitative methods of measuring OC have been well established among such OC studies. Both being complementary approaches, qualitative methods had been most widespread in the early OC studies, providing an understanding of how organizational members interpret their experiences and how these interpretations influence their behaviour. However, it is difficult to study OC over time or compare culture across organizations by using this approach [11].

Conversely, once measurability of OC was shown, quantitative methods allow these drawbacks to be overcome, using questionnaires designed to measure OC, making it possible to perform large-scale surveys and longitudinal studies. Consequently, quantitative instruments have grown rapidly since the mid-1980s, and nowadays there is a wide variety of quantitative instruments available to professionals both for research and evaluation and subsequent intervention in an organization through its OC [12]. As an example of the variety of instruments, there are authors who have identified up to seventy-one instruments [13]. Besides, there is no universally accepted one [14], although all of them have share the fact of being survey based instruments, making it possible to diagnose OC and classify it in some of the specified domains, scales or dimensions.

In this frame of reference, this research seeks to analyse the impact of the prototype of an Organizational Culture Transformation Model (OCTM) prepared for an automotive sector manufacturing plant, with over 750 employees and 105,000 m^2 in size, to facilitate its journey toward HPO, improving so the organizational performance as way of survival [15]. In order to achieve this main objective, during the process it has been required, on the one hand to develop a step by step implementation system to deploy the OCTM and on the other to deliver a customized OC survey to measure it.

2. - RESEARCH METHODOLOGY

The research has been carried out in an automotive sector manufacturing plant deeply rooted in its environment, having been founded in 1933. It should be noted that in the last thirty-three years it has formed of a multinational company, leader in its sector. During the great recession of 2008-2014, period in which sales plummeted creating an unsustainable situation, the plant had no other choice but reinvent itself to ensure its viability. To this end, the plant decided to evolve towards an HPO, betting on a customized Organizational Culture Transformation Model (OCTM), that would purposely enable transformation of its OC, as this has a huge impact on the effectiveness of organizations [16].

The decision to create an own model customized to the needs of the plant instead of using an existing one, was the search for maximum adaptability. Resulting model consists of three supplemented layers (Design Elements, Performing Elements and Working Tools), around the core concept (HPO), representative of the resulting OC. Outside inward, through a rigorous implementation of the twelve Working Tools, the model manages to adapt the nine Performing Elements, enabling thus to deploy the three Design Elements, empowering the journey of the organization towards HPO (See supplementary material).

During the whole journey towards HPO, KPIs will be tracked in order to assure that the model is impacting the organization in such a way that those KPI improve as expected and initially defined. Thus, to achieve HPO status, main KPI had to evolve based on 4 milestones, the last of these representing HPO status.

As a summary, Figure 1 represents implementation process of the whole OC transformation journey towards HPO.

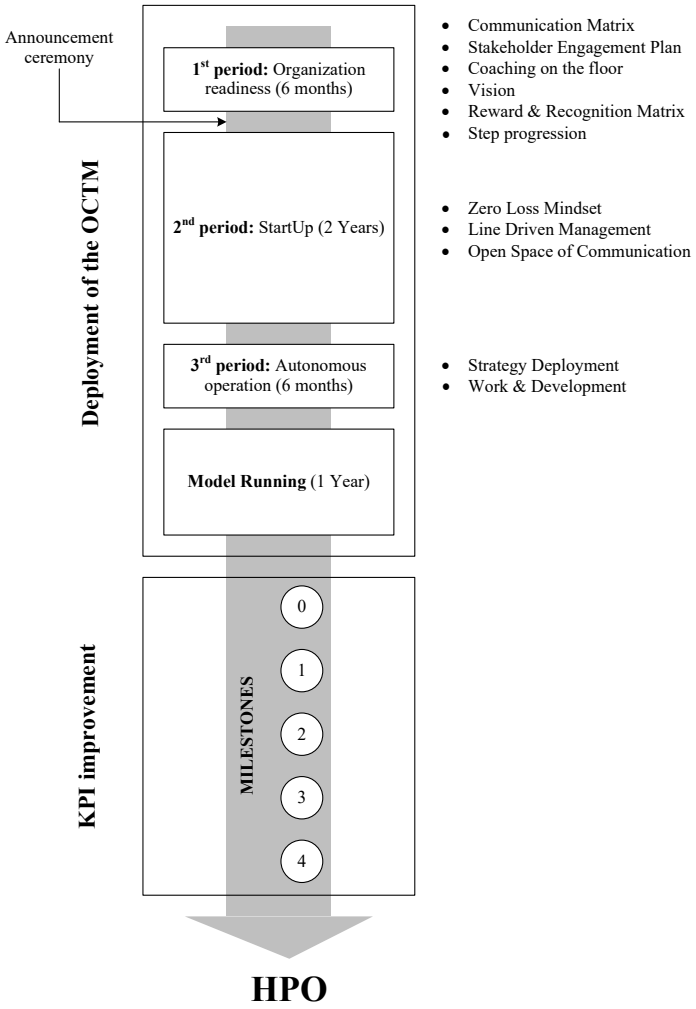

Fig. 1. HPO transformation journey

The deployment schedule for the model lasted four years, from 2017 to 2020. This timeframe had been necessary, on the one hand, to deploy the model and on the other, to have it up and running long enough to assure its maturity, monitored through the main KPI.

Within the four-year period, the deployment phase could be divided in three different periods (see Figure 1) based on the implementation tasks carried out. Different tasks are related with the twelve Working Tools found in the outer layer of the "OCTM towards an HPO".

The activities carried out in each period are summarized below, period by period:

1st period: Organization readiness

The first period is focused on making the company's Senior Management aware of the journey that they have to bring about as leaders of the organization through the preparation of different transformation journey facilitator tools. It took six months and the main tasks to carry out, linked with the Working Tools of the OCTM, were six; Communication Matrix, Stakeholder Engagement Plan, Coaching on the floor, Vision, Reward & Recognition Matrix and Milestone Progression.

Among the deliverables of this period, it is worth highlighting the definition of the main KPI and their expected improvement milestone by milestone, carried out based on the business needs of the company in order to be competitive along with recommendations from consultants taking into account the values of the sector's best-in-class companies. Those main KPI are the following:

- **Net Structural Cost Savings:** Percentage of structural cost reduced versus the exiting cost before implementing the model (Base Line).
- **Plant OEE:** Average percentage of manufacturing time that machines of the plant are truly productive.
- **Safety Index:** Percentage of reduction in the Safety Index, based on safety (injury) cases, versus the existing index before implementing the model (Base Line).
- **Quality Index (Loss Ratio):** Percentage of reduction in the Quality Index, based on the rejected material in the form of rework or scrap, versus the existing index before implementing the model (Base Line)

On top of those four KPI, which are considered as the ones which will provide needed reliability to the plant, in other to ensure sustainability over time, Senior Management team also defined the OC Survey value as an extra key indicator to monitor.

- **OC Survey:** Percentage of questions answered as 4 (Agree) or 5 (Strongly Agree) in the OC Survey, prepared specifically for the OCTM.

Table 1 summarizes the evolution of each indicator, milestone by milestone until reaching HPO status.

	KPI	Beginning of Deployment Phase (Base Line "BL")	Milestone 0	Milestone 1	Milestone 2	Milestone 3	Milestone 4 (HPO)
Reliability Key Performing Indicators	**Net Structural Cost Savings**	100% (BL)	1% vs BL	2% vs BL	4% vs BL	6% vs BL	8% vs BL
	Plant OEE% Overall Equipment Effectiveness	65% (actual result)	68%	78%	80%	85%	88%
	Safety Index	100% (BL)	Line driven S and Q deployed	75% vs BL	50% vs BL	25% vs BL	20% vs BL
	Quality (Loss Ratio)	100% (BL)		90% of BL	70% of BL	40% of BL	50% of BL
Sustainability Indicator	**OC Survey** (% of answers 4 or 5)	48,0% (actual result)	> 55%	> 65%	> 70%	> 75%	> 80%

Table 1. Expected KPI achievement for each milestone.

As shown in Table 1, the improvement is measured in percentage of recovery in all cases except for the Safety and Quality Index in Milestone 0, for which the objective is, to have Safety and Quality management driven by Cells and not by Safety and Quality functions at the end of the deployment phase.

To move from the readiness period to the next one, aiming to motivate, stimulate and inspire all the organization, a major announcement ceremony was arranged to publicize and communicate the great change they were about to undertake and to underscore the leadership team's absolute commitment to it.

2nd period: Start up

The second period is focused on initiating the deployment of the model. The plant is ready and aware after the first period of preparation. This second period is characterized by the effort, both in time and in workload, required to form the basis of the entire infrastructure. It took two years to complete and there are three Working Tools developed in this Start-Up period: Zero Loss Mindset, Line Driven Management and Open Space of communication.

As it is a line driven management based model, with the shop floor being where everything happens, people working on the production line are accountable of all of its business results. Thus, the production line which is divided in six different departments, had been divided into fifteen autonomous cells, each one of them being fully accountable for its performance and responsible for the journey towards HPO. To this end, the structure of the plant had to be totally rearranged, consequently, all shift supervisors, originally focused on supervising and controlling work during the shift with hardly any sense of ownership with the business results, where converted into daily cell leaders, assuming accountability.

Each cell is led by three people (cell leader, maintenance leader, process leader), being accountable for all the business results of their cell. The selection of each position was made based on the leadership skills of the previous supervisors and their ability to work together as a team.

During this second period and because the model is based on loss elimination by 100% of the people within the organization, a rigorous implementation of the lean manufacturing's continuous improvement mindset was necessary in form of Total Productive Maintenance (TPM) capabilities. Thus, at the end of this second period, the full production line was ready to work autonomously, opening the way to the third and last period: Autonomous Operation.

3rd period: Autonomous operation

The last period of the deployment phase, called "Autonomous operation", is the period when the tools deployed during the previous two periods, merge and start to impact OC. It took six months to deploy this period, with two Working Tools deployed, namely Strategy Deployment and Work & Development Plan.

It is in this period when Vision was deployed throughout the plant's departments and cells, creating a link between the global vision and individual contributions. Thus, each level of the organization created a plan concerning losses to eliminate, defining each individual contribution to the Vision and, moreover, the capability injections needed from functional departments in order to achieve all the loss elimination plans were prepared. From an operator's point of view, their contribution as loss elimination targets and individual capability injection, were reflected in an individual Work & Development plan.

At the end of the third period, the model could be considered deployed. However, OC transformation is long-term journey, in consequence, in order to regularly assess how the journey is evolving and to react accordingly, if needed, ongoing diagnosis would be required. As explained previously, there is a wide range of quantitative instruments to evaluate OC. Despite this, to achieve greater adaptability, a customized instrument was prepared for the model. The proposed survey is based on 23 questions, which are scored from "1: Strongly disagree" to "5: Strongly agree" (See supplementary material).

The validity of the survey was proved through an internal consistency analysis based on the Cronbach's Alpha [17] which represents the level of covariation between survey items of the answer of the year 2017. For this period, the Cronbach's Alpha was 0.93, which, as exceeds 0.9, corresponds with an excellent internal consistency level, thus validating the survey [18].

During this deployment phase, the survey was completed once per year after cell activation and strategy deployment, providing plant leadership with a clear vision of the model's impact on OC. As a main actor of the transformational journey, the survey was completed by machine operators who, in total, represent a collective of 476 people. Each one of them answering 23 questions based on their feelings about the journey.

3. - RESULTS AND DISCUSSION

Once the deployment phase had been completed, the model was left to run autonomously for a year and a survey carried out yearly (see Figure 1), providing the necessary data to check the impact of the model.

As previously explained, the OCTM was defined with the aim of influencing OC in such a way that business results would improve insofar as to assure the viability of the organization. Thus, the impact of the model has been quantitatively calculated measuring the gap between:

- The improvement achieved in the main KPI before (end of 2017) and after (end of 2020) the implementation of the model.
- Expected impact for each KPI, defined in the Table 1.

Besides, an in-depth analysis of OC Survey results has been carried out. To this end, raw data of OC survey have been dissected in order to obtain different added results, which will enable additional conclusions and lessons about the implementation of the OCTM to be obtained.

Below, and as a summary prior to the conclusions and subsequent discussion, is a data board (see Figure 2).

	KPI	2017 KPI	2020 KPI	2017 vs 2020	Expected impact at the end of deployment phase	Meets Expectation?
Reliability Key Performing Indicators	Net Structural Cost Savings	100% (BL)	98.6%	1.4%	1% vs BL	YES
	Plant OEE % Overall Equipment Effectiveness	65% (2017 result)	69.8%	69.8%	68%	YES
	Safety Index	100% (BL)	Line driven S implemented	Line driven S implemented	Line driven S and Q implemented	YES
	Quality (Loss Ratio)	100% (BL)	Line driven Q implemented	Line driven Q implemented		YES
Sustainability KPI	OC Survey (% of answers 4 or 5)	48% (2017 result)	58.1%	58.1%	>55%	YES

Fig. 2. Results data board

- **Net Structural Cost Savings:** Conversion cost point of view and after isolating all positive and negative impacts not related with the study, net structural cost savings were 1.4%. At the end of the deployment phase, expected improvement was 1%, so expectation for this KPI was achieved.
- **Plant OEE%:** Plant Overall Equipment Efficiency at the beginning of the journey was 65% and at the end of the deployment phase, improved up to 69.8%. As the expected OEE for this period was 68%, it could be concluded that for OEE the impact was achieved.
- **Safety (S) and Quality (Q) Index:** As these are long term improvement KPI, Senior management decided on a Line Driven S&Q as expected impact for the deployment phase.

  In order to improve S and Q results, the first step has to be to move the ownership of both parameters into the line from the functions. At the end of the deployment phase, cells, including machine operators, are tracking S and Q results and are self-

analysing problems in order to find root causes and implement robust countermeasures. Thus, Line Driven S&Q could considered deployed, meeting expectation for this KPI.

To achieve the expected results in those KPIs, means the assurance of the reliability of the plant in the short and middle terms. However and to make those result consistent in the long term, it is needed to assure also thee sustainability of the system. The way model measures the sustainability is through the OV Survey, whose results has been the following ones:

- **OC Survey:** At the beginning of the journey, questions answered 4 (agree) or 5 (strongly agree) were 48% of the total. After the deployment of the model, it increased up to 58.1%. Expected impact was to have at least 55% of the answers answered with 4 or 5, so this KPI also meets the expectation.

With regard to in-depth analysis of the OC Survey's raw data, the first item to highlight is participation in the Survey, because non responses in this kind of survey are considered as evidence of hidden problems in OC [19]. The participation increased 14.7%, rising up to 80.9% at the end of 2020, showing a clear improvement.

In addition to participation, Figure 3 compares the percentage of responses 4 and 5 for each question in 2017 versus 2020 showing the positive of negative evolution of each one.

% of responses 4 (Agree) or 5 (Strongly Agree)

Question	2017	2017 vs 2020	2020
1	38.1%	*8.8%*	46.9%
2	53.3%	*8.7%*	62.0%
3	33.8%	*16.5%*	50.3%
4	52.4%	*2.4%*	54.7%
5	73.7%	*1.5%*	75.1%
6	28.8%	*24.6%*	53.4%
7	22.4%	*14.5%*	36.9%
8	39.0%	*23.2%*	62.3%
9	57.0%	*5.3%*	62.3%
10	38.1%	*8.8%*	46.9%
11	69.8%	*8.1%*	77.9%
12	52.1%	*25.0%*	77.1%
13	36.5%	*20.2%*	56.7%
14	44.1%	*8.9%*	53.1%
15	65.2%	*4.9%*	70.1%
16	57.0%	*7.6%*	64.5%
17	52.9%	*4.4%*	57.3%
18	38.4%	*12.4%*	50.8%
19	51.7%	*8.0%*	59.8%
20	49.2%	*11.7%*	60.9%
21	49.5%	*3.8%*	53.4%
22	57.8%	*-0.8%*	57.0%
23	44.4%	*5.8%*	50.3%
Average	**48.0%**	***10.2%***	**58.2%**

Fig. 3. Impact question by question of OC Survey

A simple glance shows that on average all the questions have improved 10.2%. There is only one question with no positive trend, number 22 "My team and organization work closely and effectively with customers, suppliers and other outside relevant organizations", with a slight backward slide of -0.8%. The question has a clear outward approach as it refers to customers, suppliers and other relevant organizations, the type of relationship out of the scope of the core business of a manufacturing plant, which is no other than pure

manufacturing process. For all this and since the score to this question (57%) is in line with the average (58.2%) the result is considered acceptable and to be checked in future surveys.

Following with the comparation, figure 4 represents the same score but by cell, making possible to dissect the results for a better interpretation.

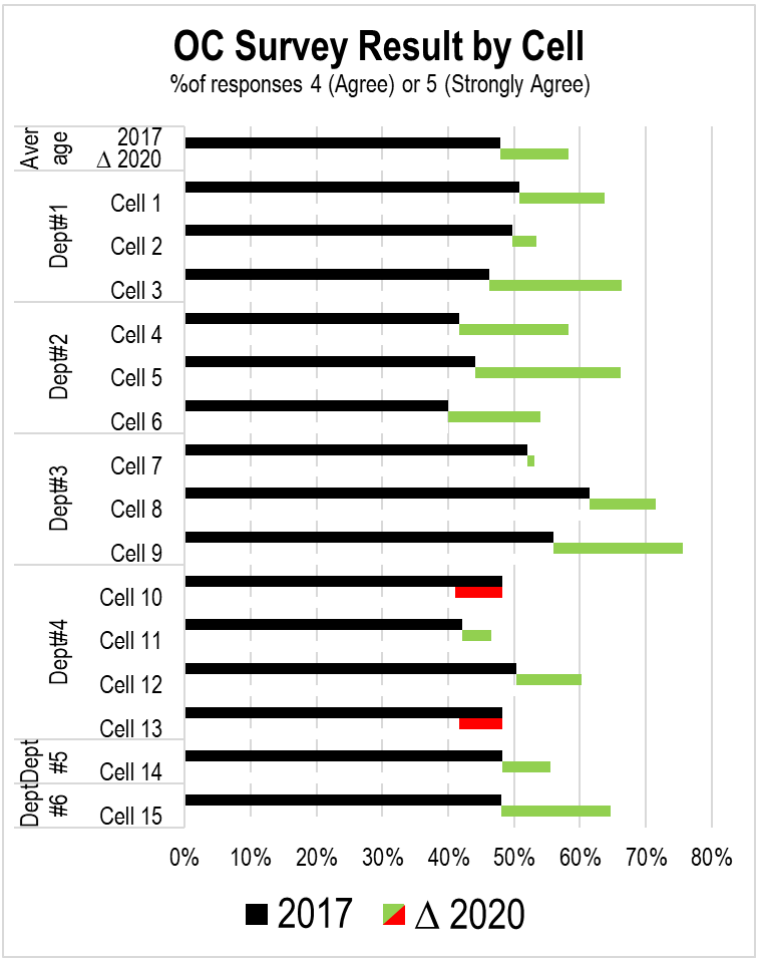

Fig. 4. Impact by cell (2017 vs 2020)

As shown in Figure 4, cell 10 and 13 are the only ones with a backward slide in the OC Survey results. Specifically, cell 10 has had a regression of 7.2% and cell 13, 6.6%. Furthermore, cell 11 (46.5%) is the third worse score. The three cells (10, 11 and 13) belong to Department #4 so it becomes necessary to study the results by department in other to understand possible structural causes behind those results.

Table 2, represents several descriptive data consolidated by department, required for the analysis:

		OC Survey results			Complexity*		OEE%		
		2017	**2020**	**2017 vs 2020**	**# of operator**	**# of machines/cell**	**2017**	**2020**	**2017 vs 2020**
PRODUCTION LINE	Department #1	49.0%	61.0%	+12.0%	69	3	60.4%	68.8%	+8.4%
	Department #2	42.0%	69.9%	+17.9%	84	3	56.3%	61.3%	+5.0%
	Department #3	56.5%	66.4%	+9.9%	90	3	55.1%	66.4%	+11.3%
	Department #4	47.1%	47.9%	+0.8%	144	5	50.4%	51.5%	+1.1%
	Department #5	48.2%	55.5%	+7.3%	40	3	76.3%	83.6%	+7.3%
	Department #6	48.0%	64.7%	+16.7%	49	3	85.1%	90.1%	+5.0%
	Total Average	**48.0%**	**58.2%**	**+10.2%**	**476**	**--**	**64.0%**	**70.1%**	**+6.1%**

**Complexity point of view," # of operator" and "# of machines/cell", have both maintained flat. OEE% improvement had been invested in more final product, increasing so the productivity of the plant.*

Table 2. Descriptive data consolidated by department.

As seen in the table 2, Department#4 represents a focus point as it is the only one which it's result (47.9%) is below the total average value (58.2%) and with hardly any improvement comparing 2017 versus 2020 (+0.7%). Three are the points that differentiate this department from the rest.

To begin with, Department#4 is the one with the biggest quantity of operators (144), representing 30% of the total. Secondly, it is the unique department with a semi-automatic process, where 50% depends on the operator and another 50% on the machine, while in the rest of the departments this percentage does not exceed 15% on manual job in any of the cases. Finally Department#4 is the one with higher quantity of machines per cell getting to have five and with the most advance technology, which means more resources and time to bring them to base condition. In fact, from improvement efficiency point of view, measured by the Overall Equipment Effectiveness (OEE%), Department#4 is the one with the least OEE% and improvement obtained from 2017 to 2020.

Large collective of operators to develop alongside lot of technical machines to improve, relentlessly require longer time to see the effectiveness.

4. – CONCLUSIONS AND FUTURE LINES OF RESEARCH

In the current increasingly competitive, dynamic and aggressive market context, the main objective of this research has been to analyse the impact of the OCTM as an enabler to improve the Organizational performance as way of survival.

The findings of the research show a significant improvement in all the indicators, both reliability and sustainability point of view. Thus, achievements in the main business KPI, "Net Structural Cost Savings", "Plant Overall Equipment Efficiency" and "Safety and Quality Index", make the plant reliable assuring in consequence its viability in the short term. However, this fact does not, per se, ensure that the plant is viable over time. To know if the model also has an impact in the long term, it is necessary to analyse the results of the OC survey, which, has also improved in line with expectations.

In summary, through this research, it can be stated that the OC can be managed to create a desired culture through appropriate models, so behaviours and attitudes of the members of the organizations will evolve, improving both business and operational efficiency and achieving more competitive performance, reflected in an improvement of the main KPI. However, as the model is based on people development and continuous improvement, the research also shows, the conditionality of the model with respect to collective of people and the quantity and expertise of the machines. The more employees and complex machines, the more time it takes to get results.

Furthermore, the findings have implications for business practices, as they may prove useful to organizations that wish to improve business performance indicators, managing their OC through an empirically validates model.

From here in and as future line of research could be proposed to continue monitoring the impact of the model along the journey towards HPO, milestone by milestone, in order to see if the model continues providing expected improvements.

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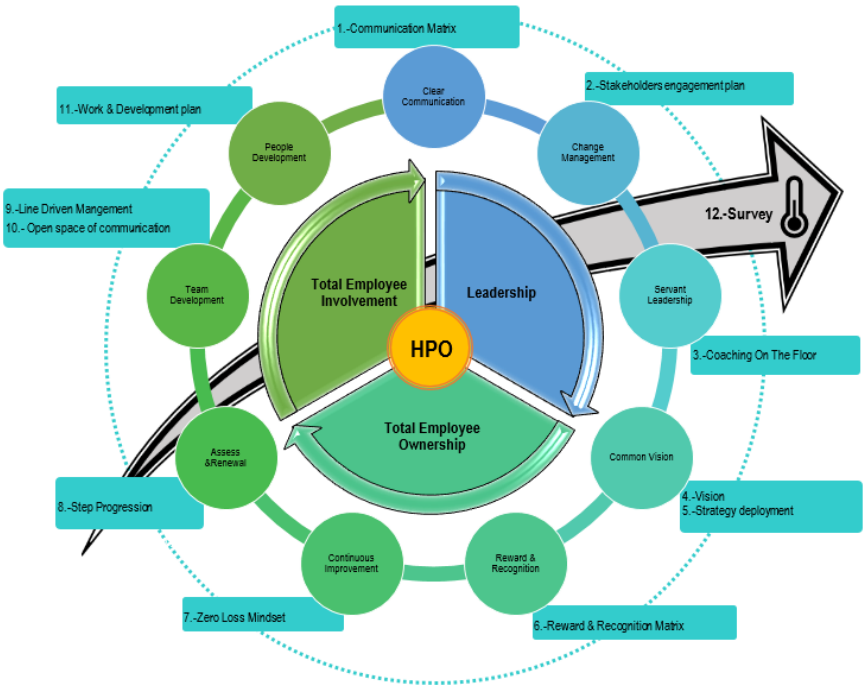
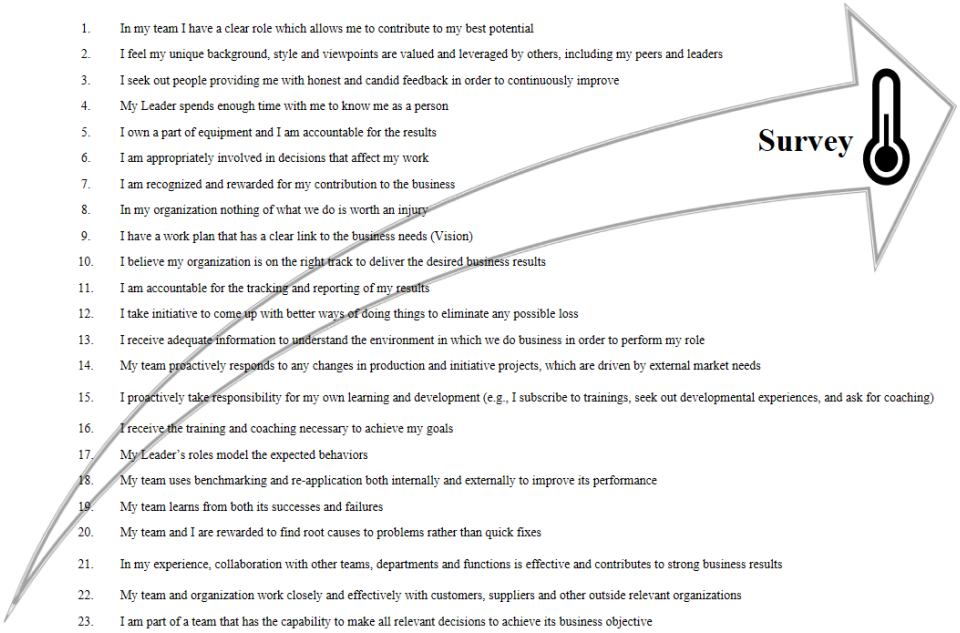
SUPPLEMENTARY MATERIAL



OCTM towards HPO [1]



1. In my team I have a clear role which allows me to contribute to my best potential
2. I feel my unique background, style and viewpoints are valued and leveraged by others, including my peers and leaders
3. I seek out people providing me with honest and candid feedback in order to continuously improve
4. My Leader spends enough time with me to know me as a person
5. I own a part of equipment and I am accountable for the results
6. I am appropriately involved in decisions that affect my work
7. I am recognized and rewarded for my contribution to the business
8. In my organization nothing of what we do is worth an injury
9. I have a work plan that has a clear link to the business needs (Vision)
10. I believe my organization is on the right track to deliver the desired business results
11. I am accountable for the tracking and reporting of my results
12. I take initiative to come up with better ways of doing things to eliminate any possible loss
13. I receive adequate information to understand the environment in which we do business in order to perform my role
14. My team proactively responds to any changes in production and initiative projects, which are driven by external market needs
15. I proactively take responsibility for my own learning and development (e.g., I subscribe to trainings, seek out developmental experiences, and ask for coaching)
16. I receive the training and coaching necessary to achieve my goals
17. My Leader's roles model the expected behaviors
18. My team uses benchmarking and re-application both internally and externally to improve its performance
19. My team learns from both its successes and failures
20. My team and I are rewarded to find root causes to problems rather than quick fixes
21. In my experience, collaboration with other teams, departments and functions is effective and contributes to strong business results
22. My team and organization work closely and effectively with customers, suppliers and other outside relevant organizations
23. I am part of a team that has the capability to make all relevant decisions to achieve its business objective

OC Survey [1]

[1] A. Ipinazar, E. Zarrabeitia, R. M. Rio Belver, and I. Martinez de Alegría, "Organizational culture transformation model: Towards a high performance organization," *J. Ind. Eng. Manag.*, vol. 14, no. 1, p. 25, Jan. 2021.