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# PRODUCTION ORGANIZATION, WORK ORGANIZATION AND KNOWLEDGE MANAGEMENT: A BLUE COLLAR PERSPECTIVE IN AN AUTOMAKER ASSEMBLY LINE

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***Abstract**: This paper aims to assess the organizational triad which is Production, Work and Knowledge. The importance of these organizational triad factors were assessed from the blue collar workers perspective. The research was conducted in an assembly line of an important Automaker installed in Brazil since the 90's. It was consistently concluded that the main factors for creating knowledge sharing context are: well understanding the objectives of management and workers, a clear definition of roles and responsibilities of the personnel involved in productive activities, good communication among those involved in the production, opportunities for their professional training and improvement, and financial incentives. These factors allow managers to promote a favourable context for knowledge sharing.*

***Keywords:** Knowledge Management; Production Organization; Work Organization; Blue Collar Worker.*

## 1. INTRODUCTION

This paper aims to analyze the organizational triad: Production, Work and Knowledge, using the blue collar workers perspective. The research was conducted in an assembly line of an important Automaker installed in Brazil since the 90's.

Zilbovicius (1999) indicates that the automotive industry originated the main production system (Mass, Lean, semi autonomous groups, enriched groups), and influenced most sectors. Currently, the Brazilian automotive industry has noticed an evolution of the physical production and a number of formal workers (IBGE, 2011), which indicates an opportunity for sharing employees' knowledge.

'Blue collar' is a profession category related to labourers (Vu; Harding and Percival, 2008). It is a workplace designation that defines an employee who performs manual or technical labour, such as in a factory, in contrast to a white-collar worker, who does non-manual work.

Symbolic workers have, in general, some autonomy over their work, making decisions on how to appropriately perform it. Blue collars in turn do not have this formal autonomy; their actions and resources are usually predefined. Under such restrictions, they perform activities, internalizing knowledge from procedures and developing tacit knowledge. Operations performance, and, ultimately, the firm's performance depends on that knowledge, but there is sparse literature on blue collar workers, and how they develop and incorporate knowledge in their actions (Muniz Jr.; Nakano; Batista Jr., 2011).

Creating and adopting ways to support workers to learn together and share knowledge for improvement in the production processes are very challenging tasks. The challenges are directly related to the integration of the triad: Work, Knowledge and Production. Important research questions in this scenario are: What are the factors for a production system to align People, Processes and Knowledge? How to assess such factors?

The paper contribution is aligned with knowledge management opportunities identified in literature review, as it discusses factors that affect the tacit knowledge in groups within the organizations (Erden, Von Krogh and Nonaka, 2008) and guidelines on how the manager can encourage knowledge conversion processes within groups in the organization (Nonaka; von Krogh; and Voelpel, 2006; Muniz Jr.; Nakano and Batista Jr., 2011). The research also contributes to expand the scope of the manager over the reality of their work. This enhances the analysis of this reality and, therefore, contributes for their decision-making process.

The research applied the construct Knowledge-Based Integrated Production Management Model (see Muniz Jr., Batista Jr.; Loureiro, 2010; Muniz Jr., 2007 for model description and detailing) that integrates:

- Knowledge management (hereafter called the K-Dimension) is the set of systematic, formal and deliberate actions in order to capture, preserve, share and reuse tacit and explicit knowledge created and used by people during the routine and the improvement productive processes, generating measurable results for the organization and for the individuals (Muniz Jr., Trzesniak, Batista Jr., 2009).
- Work Organization (hereafter called the W-dimension) addresses issues relating to people;
- Production Organization (hereafter called the P-dimension) addresses the physical resources used in the production process that result in services and goods.

In order to meet the specific research objective, this paper is structured as following: section 2 presents the Knowledge-Based Integrated Production Management Model (K-PMM) and its K, P and W factors, section 3 presents the Research Method, section 4 presents the results and analysis of the exploratory case study, and section 6 draws the Conclusion.

## 2. K-PMM – THE KNOWLEDGE-BASED INTEGRATED PRODUCTION MANAGEMENT MODEL

Muniz Jr., Batista Jr. and Loureiro (2010) indicate that traditional production management models have two dimensions, a human or social dimension represented by the work organization called as the W-dimension and, a technical dimension represented by the production organization which is the P-dimension.

The P and W-dimensions essentially capture the explicit structure and the behaviour of the production management system. Such a system has also a tacit structure that is progressively converted into explicit, as it is better understood. Tacit knowledge exists, it is important, and it needs to be formally included in a model of production management system, especially to model shop floor environment relationships.

Many authors have defended that only the explicit knowledge can be managed, captured and kept updated (von Krogh; Ichijo and Nonaka, 2000). However, the same authors indicate that better results can be achieved with the existence of a favourable context, stimulated by actions that are focused on tacit knowledge sharing and people integration, facilitating the new knowledge acquisition. This favourable context is hereafter called as *Ba* (von Krogh; Ichijo and Nonaka, 2000). When the organisation formalises and makes such actions explicit, there is a higher potential for obtaining the *Ba*.

Table 1 presents the acronyms assigned to each factor used in Table 2. Table 2 relates papers and factors mentioned in them in order to improve the favourable context (Ba). The fact that K, P and W factors are mentioned in those papers suggests that a production management model for promoting the Ba for shop floor workers should have the three K, P and W integrated dimensions.

Table 1: Acronyms assigned to factors and dimensions used in the Table 2

| **Knowledge Management K-dimension** | | **Production Organization P-dimension** | | **Work Organization W-dimension** | |
|---|---|---|---|---|---|
| **Factor** | **Code** | **Factor** | **Code** | **Factor** | **Code** |
| Socialization (Tacit → Tacit) | SOC | Problem Solving Method (PSM) | PSM | Objective | OBJ |
| Externalization (Tacit → Explicit) | EXT | Standard Operating Procedure | SOP | Structure | STR |
| Internalization (Explicit → Tacit) | INT | 5S | 5S | Communication | COM |
| Combination (Explicit → Explicit) | CBN | *Poka Yoke* | PY | Training | TRN |
| | | Quick Change Over | QCO | Incentives | INC |
| | | | | Personal Characteristics* | PCH |

Table 2: Papers and factors identified in them. (Muniz Jr., Batista Jr.; Loureiro, 2010)

| | K - Dimension | | | | | W – Dimension | | | | | P - Dimension | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code / References | SOC | EXT | INT | CBN | OBJ | STR | COM | TRN | INC | PCH | PSM | SOP | 5S | QCO | PY |
| van der Zwaan, 1975 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | ■ | ■ | | | |
| Sandberg, 1995 (Org) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | | |
| Emiliani, 1998 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | | |
| Peltokorpi; Nonaka; Kodama, 2007 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | | | | |
| Nonaka, 1994 | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | | | ■ | ■ | | | |
| Garvin, 1993 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | | | |
| Bartezzaghi, 1999 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | ■ | ■ | | | |
| Bisalyaputra, 2004 | ■ | ■ | ■ | | | | ■ | ■ | ■ | | ■ | ■ | | | |
| Nonaka; von Krogh; Voelpel, 2006 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| Easterby-Smith, 1997 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | ■ | | | |
| Spender e Scherer, 2007 | ■ | ■ | ■ | ■ | | | ■ | | ■ | | | | | | |
| Biazzo e Panizollo, 2000 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | |
| Emery, 1959 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | | | |
| Smith, 2001 | ■ | ■ | | | ■ | | ■ | | ■ | | | | | | |
| Wiig, 1994 | ■ | ■ | | | ■ | ■ | ■ | ■ | | | | | | | |
| Woorlen e Doolen, 2006 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | | |
| Kulkarni; Ravindran; Freeze, 2007 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | |
| Ohno, 1988 | ■ | ■ | | ■ | ■ | | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ |
| Shingo, 1989 | ■ | ■ | | ■ | ■ | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Spear and Bowen, 1999 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |

Figure 1 illustrates the traditional production management models adding a third dimension to them, and reinforcing that these three dimensions must be integrated.

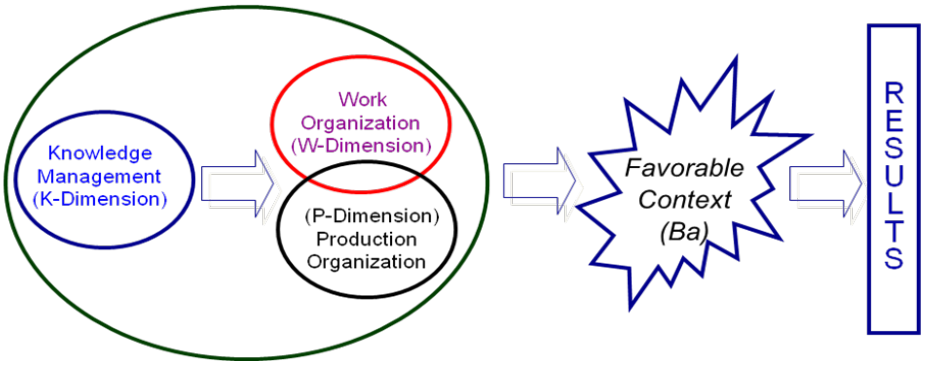
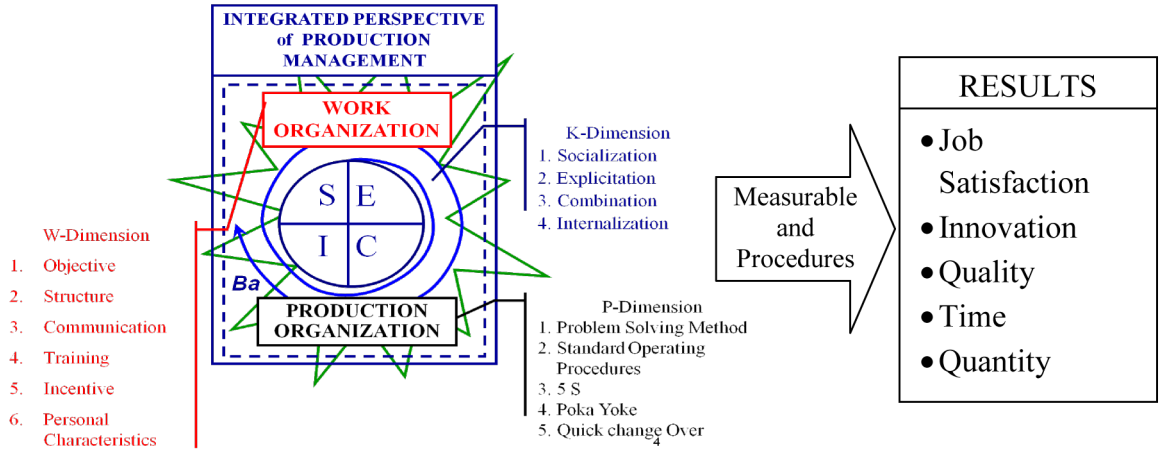



Figure 1 – Dimensions for promoting the *Ba* (Muniz Jr., Batista Jr.; Loureiro, 2010)

The Knowledge-Based Integrated Production Management Model (Muniz Jr.; Batista Jr.; Loureiro, 2010) is a theoretical model, which is depicted in Figure 2. The K-PMM promotes the integration of P, K and W dimensions because it is formally concerned with the tacit and explicit knowledge conversion modes, incorporating them to the procedures and assessing, by measures, their use in the shop floor knowledge identification and sharing activities.

Figure 2: Knowledge-based integrated production management model (K-PMM) with dimensions and factors (Muniz Jr., Batista Jr.; Loureiro, 2010)




The star involving Production Organization and Work Organization represents the set of defined, controlled and integrated factors for carrying out production management in a way that creates the *Ba*. As in the Taylorist and Socio-technical models, the dashed line represents the permeability of the production operations shop floor environment to external factors, such as, market, strategic and technological aspects reflected in the production processes.

Knowledge conversion process acknowledges the importance of a tacit knowledge and focuses on the various processes of conversion of such knowledge into explicit and other tacit knowledge and vice-versa (Table 3).

Table 3 – Knowledge conversion process – SECI (Nonaka, 1994)

| From \ To | Tacit | Explicit |
|---|---|---|
| Tacit | **S**ocialization | **E**xternalization |
| Explicit | **I**nternalization | **C**ombination |

The inclusion of the SECI conversion process and the knowledge spiral (Nonaka, 1994), in Figure 2, formalises the integration of knowledge management with the traditional production management models highlighting the need for measures and procedures related to results or to the factors presented in Section 4, establishing a dynamic relationship of cause and effect between the factors and the obtained results.

The K-dimension, as presented in Figure 2, promotes the integration between the P and W-dimensions, because it is formally concerned with the tacit and explicit knowledge conversion modes, incorporating them to the procedures and assessing, by measures, their use in the shop floor knowledge identification and sharing activities. Therefore, K-PMM recognizes the spontaneous and collective knowledge generation process and the workforce flexibility for the operation of shop floor machinery, and for a better communication among the people involved.

Relevant P-factors are the use of the following tools that promote the use of worker knowledge and involvement. The tools contribute for the control and improvement of the daily activities of production workers which are: Problem Solving Methods (Garvin, 1993); Standard Operating Procedure (Ohno, 1988); 5S (Ohno, 1988); Poka Yoke (Ohno, 1988) and Quick Changeover (Shingo, 1989).

Using the P-factors enhance operators learning by systematically seeking improvement in the production environment. Lean manufacturing and mass production were considered when selecting such factors. In order to promote the *Ba* integrated in the production work routine, the use of P-factors require, not only socialization, externalization and internalization of knowledge (K-factors), but also the implementation and use of the W-factors.

Relevant W-factors are objectives (Smith, 2001), structure, communication (Worley and Doolen, 2006), training (Nonaka, 1994; Darrah, 1995), incentives (Smith, 2001).

The W-factors to promote the *Ba* support the interaction between the operators and the organization, by sharing measurable objectives, by work and communication structure, and by training and incentives. For the selection of these factors, two work organization models were considered: the semi-autonomous models and the enriched model.

The W-factors, adopted in the K-PMM, contribute to organizing people in order to get the best of operators' knowledge and to obtain better results. They are adequate to the production environment. It is intended, with the use of these factors, to enhance people's involvement in order to systematically get their organization objectives by the creation, retrieval, share and use of knowledge. The factors consider the needs of the group members when executing their routine and improvement activities, outlining: "who can help to do what?", material and time resources availability, communication among group members and between the group and the other people in the organization, required training by the various activities, and by the operation of the production machinery and incentives.

Muniz Jr., Batista Jr.; Loureiro (2010) conclude that the theoretical model K-PMM and its factors may influence the *Ba* creation because they:

- support the socially built knowledge;
- stimulate the cooperation and teamwork;
- emphasize the importance of transferring and transforming knowledge from personal to organizational and from tacit to explicit;
- stimulate interactive work on problems (try and error) as a learning process;
- suggest that a production management model for promoting the Ba for shop floor workers should have the three K, P and W integrated dimensions as proposed in the K-PMM and its factors.

## 3. WORKERS KNOWLEDGE AND KNOWLEDGE MANAGEMENT

Muniz Jr., Nakano and Batista Jr. (2011) indicate that the KM literature can be roughly divided on two perspectives: (a) knowledge as amenable of being stored, combined, and disseminated, and (b) while the other stresses the role of social relations and individual and collective action. To the latter, knowledge is embedded in relationships and cannot be separated from action.

White collars workers have, in general, some autonomy over their work, making decisions on how to perform it. Blue collars in turn do not have that formal autonomy; their action and resources are usually predefined.

Under such restrictions, they perform activities, internalize knowledge from procedures and develop tacit knowledge. A standard operation procedure contains information, but the enclosed knowledge in it has no value until it is actually put into practice, and it is enacted by workers. Operations performance and, ultimately, the firm's performance depends on that knowledge, but the knowledge management basis to blue collar workers is still a research issue, i.e. how they develop and incorporate knowledge in their actions.

While white collars may have some action over their work environment, and thus act to foster knowledge creation and sharing, blue collars do have much less formal autonomy. Their work context is defined by human management practices and operation management techniques on shop floor. Thus, they ultimately define knowledge creation and sharing. Eastern operations management techniques were the first to allow some autonomy and discretion to blue collars, demanding them to participate, analyse and contribute in problem solving. For instance, housekeeping (5S) and participative problem solving (Kaizen) groups are based on workers initiative and participation, and even the use of standard operation procedures in such a context ends up facilitating internalization (Nonaka and Takeuchi, 1995).

Hence, participative work practices, HRM and managerial practices are expected to enhance and support knowledge creation and dissemination on the shop floor. In order to understand their influence and intensity, a study was conducted at an Automaker assembly line.

## 4. RESEARCH METHOD

This research used the Case Study method (Yin, 2008). It is defined as an empirical research method that investigates a contemporary phenomenon within its real context, which allows a better understanding of the phenomenon. In this exploratory study, this understanding is obtained by literature research and through capturing the perspectives of operators, line leaders and supervisors of the Automaker assembly line.

The researched automaker is one of the five major brands in Brazil (ANFAVEA, 2011). Actually, the company has about 3000 employees; it is implementing the Lean Thinking to reduce costs. It has improved the blue collar workers engagement in production issues.

The researched assembly line has 252 people. Its selection was based on the surveyed sample which has the same educational background. A random sample of 49 people (operators, team leaders and supervisors) was selected to answer the research instrument in order to achieve a confidence level of 95% and 10% sampling error.

All factors were measured using the 4-points Likert-type scale (very important to unimportant). The results were obtained from a questionnaire with 22 closed questions addressed to specific points. The questions surveyed are indicated in the Results and Analyses. The pilot test and the results discussion are performed with the interviewees.

The results of the questionnaire were discussed with the surveyed people. The theoretical construct was a priori defined from literature review. The Knowledge-Based Integrated Production Management Model (K-PMM) was used as construct because it had been developed originally for the automotive context (Muniz Jr.; Batista Jr.; Loureiro, 2010b).

## 5. RESULTS AND ANALYSES

Results related to Production Organization, Work Organization and Knowledge Organization factor analyses are presented following.

### 5.1 Factors Related to Production Organization

Production Organization comprises five major factors, which are Problem-Solving Methods, Standard Operating Procedure, 5S, Poka Yoke, and Quick

Changeover. The questions related for each factor and the results are presented in Table 4.

Table 4 – Factors related to Production Organization

| N. | Question | Factor | VeryImpor | | Impor | | LessImpor | | Unimpor | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | The importance of a problem solving method for the production line's usual problems | Problem Solving Method | 31 | 63,3% | 17 | 34,7% | 1 | 2,0% | 0 | 0,0% |
| 6 | The importance of written procedures for everyday work routines | Standard Oper. Procedure | 22 | 44,9% | 27 | 55,1% | 0 | 0,0% | 0 | 0,0% |
| 11 | The importance of a clean and organized workplace | 5S | 43 | 87,8% | 6 | 12,2% | 0 | 0,0% | 0 | 0,0% |
| 17 | The importance of using mistake-proofing systems | Poka Yoke | 45 | 91,8% | 4 | 8,2% | 0 | 0,0% | 0 | 0,0% |
| 24 | The importance of setting up the assembly line quickly and safely | Quick Changeover | 20 | 40,8% | 24 | 49,0% | 3 | 6,1% | 2 | 4,1% |

The cited tools take place in a daily work routine of the studied assembly line, and its practice are boosted by supervisors and team leaders. Besides acknowledging the importance of these factors, this survey also reflects the commitment of the workers on keeping them aware of the relevance of doing the right thing since its very beginning and the quality assurance of final product.

> *"These methods create procedures which help us carry out the daily work routines, since they encourage and oblige us to be vigilant and how to solve problems when they arise" [Assembly line operator]*

> *"These are everyday tools and it is, mainly, through them we ensure the production quality with fewer opportunities to make mistakes." [Team leader]*

> *"The proper operation of a production line is guaranteed by several people. Once people can fail, these tools help us eliminate most of these failures or, at least, locate quickly then." [Production supervisor]*

Poka Yoke was considered as very important and important by 91.8%, and by 8.2 % of the respondents, respectively. These percentages terms are due to the whole working class awareness and participation in developing mistake-proof systems, which minimizes the mistakes in everyday work.

Quick-Changeover was considered by 10.2% of interviewees, as the least important factor. This can be explained by the assembly lines being set to a wide range of products, which means that the quick-change is not necessary. But it is remarkable that about 90% of the workers believe that this factor is relevant.

Problem-Solving Methods, 5S and Standard Operating Procedure were considered as very important by the workers. This is because they are related to everyday work, so the workers are aware of their importance.

### 5.2 Factors Related to Work Organization:

Work Organization includes six factors, which are objectives (internal/external), structure (roles and responsibilities/resources), communication (internal/external), training, incentives (remunerations/compensation, rewards and benefits), and personal characteristics. The results related to Work Organization can be seen in Table 5.

Table 5 – Factors related to Work Organization

| Nº | Questions | Factor | VeryImpor | | Impor | | LessImpor | | Unimpor | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | The importance of people's commitment to reaching a goal | Internal Objective | 43 | 87,8% | 6 | 12,2% | 0 | 0,0% | 0 | 0,0% |
| 4 | The importance of knowing production objectives and quality requirements | External Objective | 45 | 91,8% | 4 | 8,2% | 0 | 0,0% | 0 | 0,0% |
| 5 | The importance of workers knowing the attributions of the line assembly supervisor | Structure - Role and Respons. | 25 | 51,0% | 20 | 40,8% | 0 | 0,0% | 4 | 8,2% |
| 7 | The importance of workers knowing the attributions of the team leaders | Structure - Role and Respons. | 30 | 61,2% | 17 | 34,7% | 0 | 0,0% | 2 | 4,1% |
| 9 | The importance of knowing the attributions of a versatile operator | Structure - Role and Respons. | 29 | 59,2% | 18 | 36,7% | 0 | 0,0% | 2 | 4,1% |
| 10 | The importance of an operator knowing its attributions | Structure - Role and Respons. | 36 | 73,5% | 13 | 26,5% | 0 | 0,0% | 0 | 0,0% |
| 12 | The importance of workers knowing the attributions of a supplier | Structure - Role and Respons. | 24 | 49,0% | 23 | 46,9% | 0 | 0,0% | 2 | 4,1% |
| 13 | The importance of devices being on top running conditions | Structure - Resource | 47 | 95,9% | 2 | 4,1% | 0 | 0,0% | 0 | 0,0% |
| 15 | The importance of a time to share experiences about problem-solving methods | Structure - Time | 32 | 65,3% | 17 | 34,7% | 0 | 0,0% | 0 | 0,0% |
| 16 | The importance of communication among workers within the assembly line | Communication - Internal - Relationship | 42 | 85,7% | 7 | 14,3% | 0 | 0,0% | 0 | 0,0% |
| 18 | The importance of communication among workers within and out of the assembly line | Communication - External - Support from other Areas | 19 | 38,8% | 23 | 46,9% | 0 | 0,0% | 7 | 14,3% |
| 20 | The importance of communication among workers of the assembly line and other sectors of the company | Communication - External - Support from other Areas | 32 | 65,3% | 15 | 30,6% | 0 | 0,0% | 2 | 4,1% |
| 21 | The importance of communication among workers of the assembly line and the maintenance staff during problem solving | Communication - Decision Taking | 30 | 61,2% | 15 | 30,6% | 0 | 0,0% | 4 | 8,2% |
| 22 | The importance of a training program | Trainning | 39 | 79,6% | 10 | 20,4% | 0 | 0,0% | 0 | 0,0% |
| 23 | The importance of rewards for enhancement suggestions | Incentive - Rewards | 33 | 67,3% | 16 | 32,7% | 0 | 0,0% | 0 | 0,0% |
| 25 | The importance of a program for acknowledgement of good ideas and best practices with no bonuses involved | Incentive - Acknowledgement - No bonus | 26 | 53,1% | 14 | 28,6% | 3 | 6,1% | 6 | 12,2% |
| 26 | The importance of the personality traits of the worker, that is, being a dynamic person, a person with initiative, etc. | Personality | 43 | 87,8% | 6 | 12,2% | 0 | 0,0% | 0 | 0,0% |
| 27 | The importance of the relationship among people of a work team | Communication - Internal - Relationship | 41 | 83,7% | 8 | 16,3% | 0 | 0,0% | 0 | 0,0% |

Objectives (internal/external) were considered as very important and important by 12.2% and by 91.8% of the respondents, respectively.

Structure, Communication and Training were all classified as important factors. The employees attach particular importance to issues, like knowledge of functions that interact with them, knowledge acquisition by communication among employees and improvement of confidence by training programs. This result does not depend on whether the surveyed company applies such factors or not, but it shows that workers are interested in them.

Incentives comprise two questions, one of them related to remuneration, rewards and benefits, and the other related to unpaid incentives. The former was considered as important or very important. However, the later was considered as unimportant or "unimportant" by 18.4% of the respondents.

Dynamism and initiative were considered as very important Personal Characteristics by 87.8% of the workers.

### 5.3 Factors Related to Knowledge Organization

Knowledge Organization comprises four factors: Socialization, Externalization, Internalization and Knowledge Combination. The results related to this set of factors can be seen in Table 6.

Table 6 – Factors related to Knowledge Organization

| Nº | Questions | Factor | VeryImpor | | Impor | | LessImpor | | Unimpor | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | The importance of experience interchange among workmates | Socialization of Knowledge | 35 | 71,4% | 14 | 28,6% | 0 | 0,0% | 0 | 0,0% |
| 8 | The importance of reviewing work instructions just after a problem analysis | Externalization of Knowledge | 36 | 73,5% | 13 | 26,5% | 0 | 0,0% | 0 | 0,0% |
| 14 | The importance of reading working standards | Internalization of Knowledge | 40 | 81,6% | 9 | 18,4% | 0 | 0,0% | 0 | 0,0% |
| 19 | The importance of summarizing and illustrating standard operating procedures | Combination of Knowledge | 36 | 73,5% | 13 | 26,5% | 0 | 0,0% | 0 | 0,0% |

Internalization was considered as the most relevant issue. Recently, the workers have been involved by the company in developing and revising working procedures. This is an attempt which aims to encourage reading and comprehension of the standard operating procedure.

Externalization and Combination were considered as very important and important by 73.5% and by 26.5 % of the respondents, respectively. Socialization was considered important by 71.4% of the employees.

## 6. CONCLUSION

The triad Production Organization, the Work Organization and the Knowledge Organization were confirmed as important by data analysis. The factors were considered as important by at least 80% of the surveyed people. Ongoing research conducted by the authors in the automakers, electronics and glass industries support this finding.

The research indicates that the surveyed assembly line can be guided by the factors to create integrated actions to promote a favourable context to sharing tacit knowledge among workers.

The research has practical implications, since it guides managers' actions. It was suggested that good communication and objectives sharing are important practices. Results were discussed with managers, who agreed with these conclusions.

A further approach would be the use of the Factor Analysis Technique to confirm the latent variables applied in the present research. The case study suggests a potential for developing new assessment tools to identify which factor should be further developed to get the most favourable context to knowledge sharing.

As future work, it is also proposed the analysis of the K-PMM application in other sectors, such as the electrical-electronic and chemical ones, and also in areas with more specialized workforce, not completely automated, such as in maintenance and tooling groups.

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