COMPARISON OF THE APPLICATION OF PRODUCTION MANAGEMENT TOOLS AND TOPSIS-AHP METHODS: BEARING MAINTENANCE PROCESS

José Carlos Souza Oliveira

Paulista University "Júlio de Mesquita Filho" – UNESP-Guaratinguetá/São Paulo - Brazil

ABSTRACT

There is no doubt that in the industrial environment decisions become more and more complex tasks for managers. Decision analysis methodologies also make up the arsenal of techniques and tools that can be used for better answers, combined with other classic quality and problem solving tools. Decision makers should not make them instinctive, based on feelings and hunches, but using analytical and quantitative tools. In this context, methods such as Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) and Analytic Hierarchy Process (AHP) become useful tools for decision making. This article presents a case study of a large bearing maintenance process used in the steel, mining and sugar-energy industries, where from the application of production management tools; which at a certain level; are purely exploratory and poorly structured approaches to decision making; and of Decision Making Aid Methods (MCDM) allow to obtain similar responses in the prioritization of actions to eliminate or mitigate the effects, from the treatment of possible causes.

OBJECTIVES

The objective of this article is to demonstrate that the application of Decision Making Aid Methods (MCDM) and production management tools; in a large bearing maintenance problem, allow to obtain similar answers in the prioritization of actions to eliminate or mitigate the effects, from the treatment of possible causes, where the element of comparison is defined by the hierarchy of actions, obtained in the application of each method.

The simultaneous application of the MCDM TOPSIS and AHP methods in the research problem aims to refine and validate the response to the problem through the MCDM method, generating a more reliable response given the adherence of the problem to the production management tools

RESEARCH PROJECT/METHODOLOGY

Figure 1: Methodology used
Source: Author

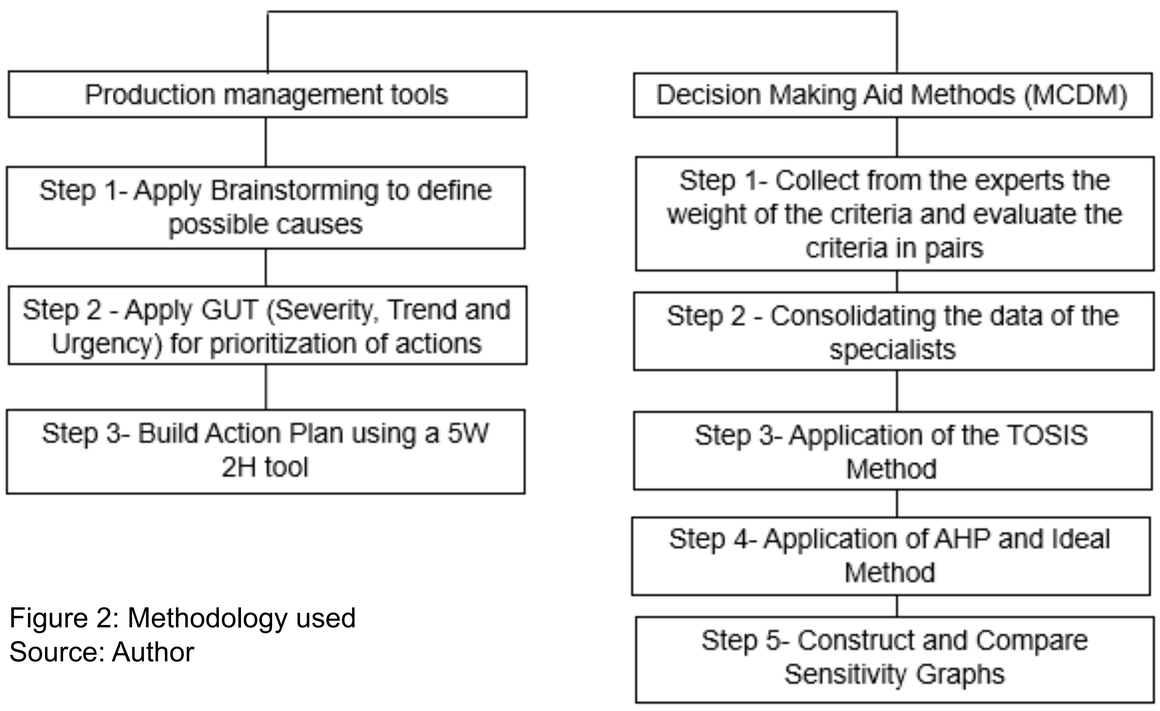


Figure 2: Methodology used
Source: Author

DATA ANALYSIS/MODEL

Box 1: Calculations of the application of the Ideal AHP method

AHP Measurement (pairwise comparisons) - Global Priority of Suppliers				
Supplier	Time	Costs	Productivity	Gobal
	40%	20%	40%	
Automatic spreadsheets	100%	26%	64%	71%
Maintenance plan	44%	100%	100%	77%
Measurement setup	44%	26%	100%	63%
New layout	9%	7%	33%	18%
Review in flow	18%	7%	33%	22%

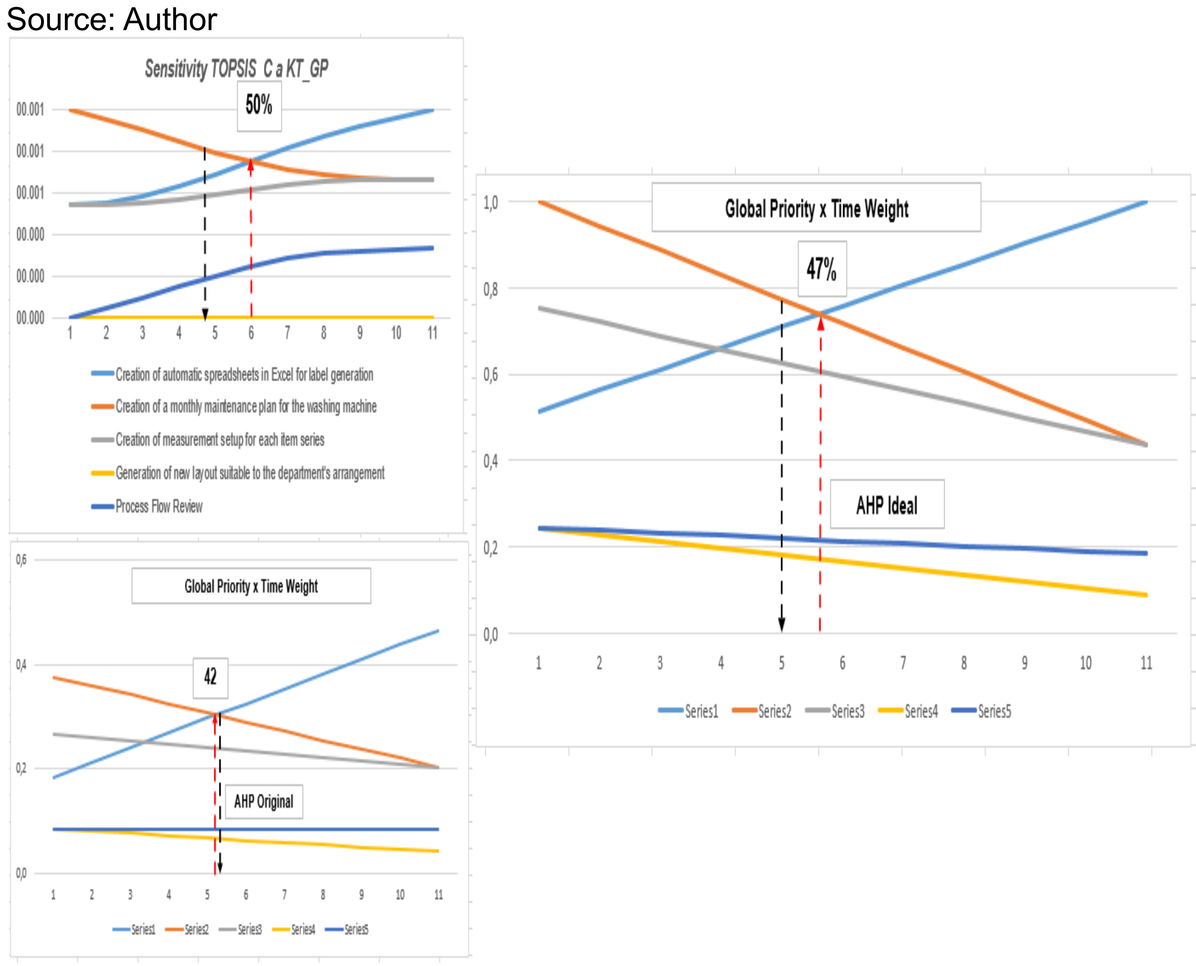
Sensitivity Analysis											
Supplier	Time Weight										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Automatic spreadsheets	0,51514664	0,56363198	0,61211732	0,66060265	0,70908799	0,75757332	0,80605866	0,85454399	0,90302933	0,95151466	1,00000000
Maintenance plan	0,99900000	0,94276484	0,88652968	0,83029453	0,77405937	0,71782421	0,66158905	0,60535389	0,54911873	0,49288358	0,43664842
Measurement setup	0,75198023	0,72044705	0,68891387	0,65738069	0,62584751	0,59431432	0,56278114	0,53124796	0,49971478	0,46818160	0,43664842
New layout	0,24420000	0,22882286	0,21344573	0,19806859	0,18269146	0,16731432	0,15193719	0,13656005	0,12118292	0,10580578	0,09042865
Review in flow	0,24420000	0,23819279	0,23218558	0,22617837	0,22017117	0,21416396	0,20815675	0,20214954	0,19614233	0,19013512	0,18412792

Source: Author

Box 2: Comparative results of two MCDM TOPSIS E AHP methods

Supplier	TOPSIS	AHP	
		Original	Ideal
Creation of automatic spreadsheets in Excel for label generation	0,671	28,4%	71%
Creation of a monthly maintenance plan for the washing machine	0,812	34,7%	77%
Creation of measurement setup for each item series	0,588	22,6%	63%
Generation of new layout suitable to the department's arrangement	0,000	6,3%	18%
Process Flow Review	0,188	7,9%	22%

Source: Author



Graph 1: Sensitivity Analysis for TOPSIS and AHP methods Original and Ideal
Source: Author

CONCLUSIONS

The application was successful in an important industrial area, with the possibility to be taken to the evaluation of other processes in complex areas. Relevant the use of consolidated data among specialists, as to the weight of the criteria and comparison in pairs between the criteria. Mitigated empirical bias so present in multi-criteria analysis, with similar prioritization of actions in the tools used.

REFERENCES

A. Lombardi, 2020. Multicriteria analysis of sustainability programs in the textile industry. Master's Dissertation - Paulista State University, School of Engineering of Guaratinguetá; 64f

M. Brunelli, 2015. Introduction to the Analytic Hierarchy Process, SpringerBriefs in Operations Research, Aalto University - Finland.

Pasqualini; Lopes; Siedenberg, 2010. Production Management. Ed. Unijuí, 2010. – 100 p. – (Collection distance education. Textbook series), Ijuí - Rio Grande do Sul.

SLACK, N. et al. Production management. Atlas Ed. São Paulo, 2008.

Contatct

José Carlos Souza Oliveira – carlos.souza@ifsp.edu.br