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The background of the title slide is a light green color with a pattern of white, stylized geometric shapes. These shapes include vertical lines, curved lines, and angular, star-like patterns that resemble a stylized map or a network of connections.

Green issues in the supply chain management training

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Academic Work

Objectives

- The purpose of the present article is to provide a model for training assessment of Green Supply Chain Management (SCM).
- This model incorporates elements from SCM Theory and Multi-criteria Decision Making (MCDM).



Context

- The research presented in this article was conducted in a chemical plant located in the State of Sao Paulo State.
- The studied plant has around 1,000 employees, and it is part of the top 10 companies in the chemical and petrochemical sectors.



Context

- The company has been an active member of the United Nations Global Compact since 2000's.
- A “strategic policy initiative for businesses that are committed to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labor, environment and anti-corruption” (United Nation Global Compact, 2013).



Context

- A training program was implemented one year ago to prepare to Certified in Production and Inventory Management (CPIM) with five modules of 32 hours each.
- More than 100 employees have participated in the training program.



Problem

- The company does not have a structured model to assess individual and organizational benefits offered by training.

Frequently asked questions regarding the SCM training gains are:

(i) “Does the training program deliver individual benefits based on GSCM?”, and

(ii) “Does the training program deliver organizational benefits based on GSCM?”



Theory background

1. Supply Chain Management

Many SCM concepts are found in literature that remain valid and convergent:

- The activities and processes coordination within organizations; information, product and service flow from customer to supplier; the transformation of activities and goods flow; the integration of core processes from end user through suppliers (Cooper et al., 1997; Ballou et al., 2000; Lambert and Cooper, 2000).



Theory background

2. Green Supply Chain Management (GSCM)

- GSCM is an expansion of the SCM focusing Green Issues as environmental sustainability practices' disposal of waste, and best use of resources (Zhu et al., 2012).
- Sustainability refers to “the efforts a company makes related to conducting the business in an environmentally sustainable manner, and it involves social responsibility” (Supply Chain Management Terms and Glossary, 2013).



Theory background

3. Supply Chain Operations Reference (SCOR) Model

The scope of the five distinct processes of SCOR

- Plan – demand/supply planning and management
- Source – sourcing stocked, make-to-order, and engineer-to-order product.
- Make – make-to-stock, make-to-order, and engineer-to-order production execution
- Deliver – order, warehouse, transportation, and installation management, for stocked, make-to-order, and engineer-to-order Product



Theory background

4. Training assessment

Association for Operations Management (APICS) suggests that SCM training could be evaluated using two sets of benefits Individual benefits and Organizational benefits.

Individual benefits include:

- Increase your functional knowledge of production and inventory management
- Improve efficiency of your organization's supply chain
- Streamline operations through accurate forecasting
- Maximize return on investment on systems and technologies



Theory background

4. Training assessment (cont.)

Expected organizational benefits from SCM training are:

- Proven knowledge and organizational skills to strategically streamline operations
- Tools to effectively manage global supply chain activities where suppliers, plants, distributors and customers are located around the world
- Ability to interact with existing resources and your ERP system to increase the efficiency of the workplace



Theory background

4. Training assessment (cont.)

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Theory background

5. Analytic Hierarchy Process

- Training in SCM can be assessed using qualitative criteria to various SCM processes. The AHP method application uses hierarchy models (Saaty, 2010a).
- The AHP application often is taken in two phases of the decision process: the problem structuring and the elicitation of priorities through pairwise comparisons (Ishizaka and Nemery, 2013).



Multi-criteria training assessment for GSCM

- This proposal is based on SCOR Model's four top-level processes (Plan, Source, Make and Deliver).
- Twelve benefits were identified considering Green Issues in its components: “being on a long-term perspective”, “best uses of resources”, and “avoiding rework and waste management” for instance.



Multi-criteria training assessment for GSCM

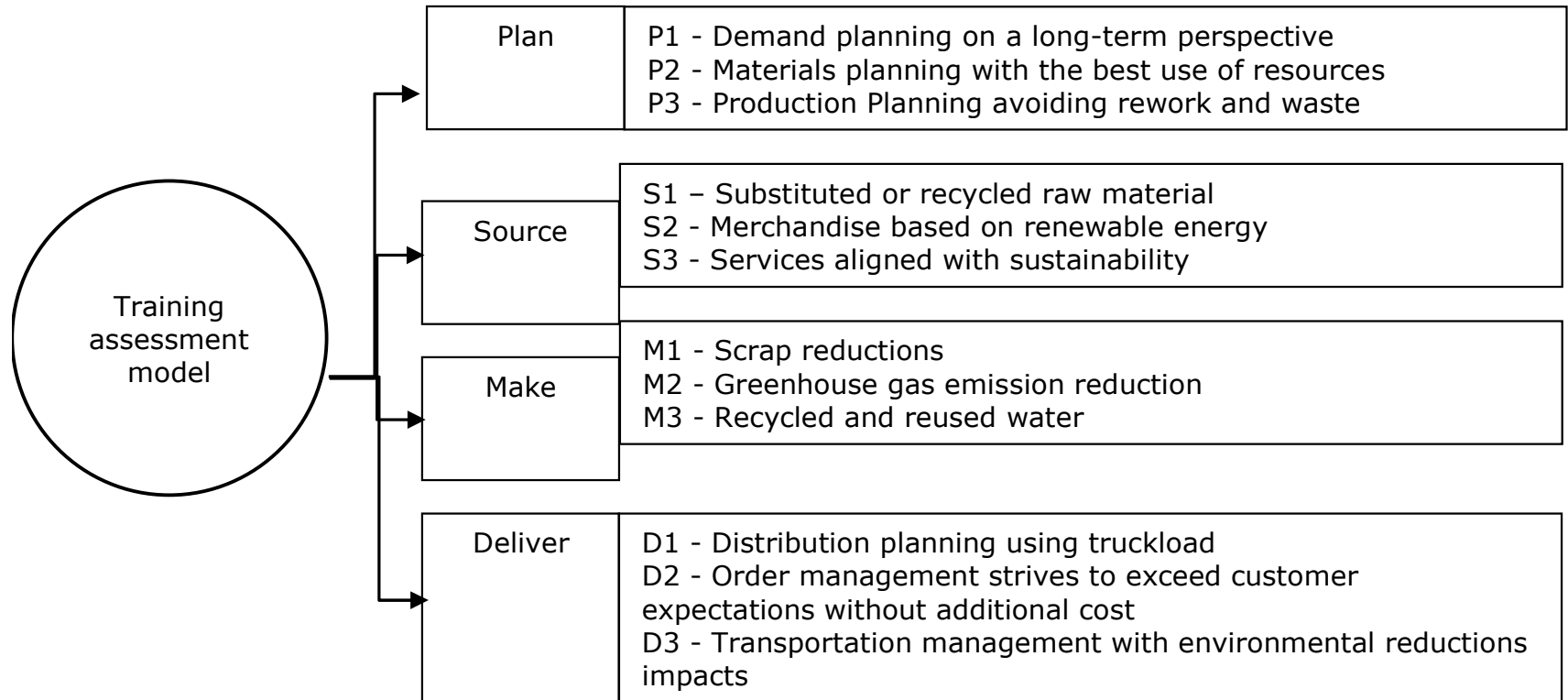


Fig. 1. Training assessment model



Multi-criteria training assessment for GSCM

- The complete hierarchical structure. Individual and Organizational benefits are in the bottom level, as the alternatives. Criteria will be pairwise compared

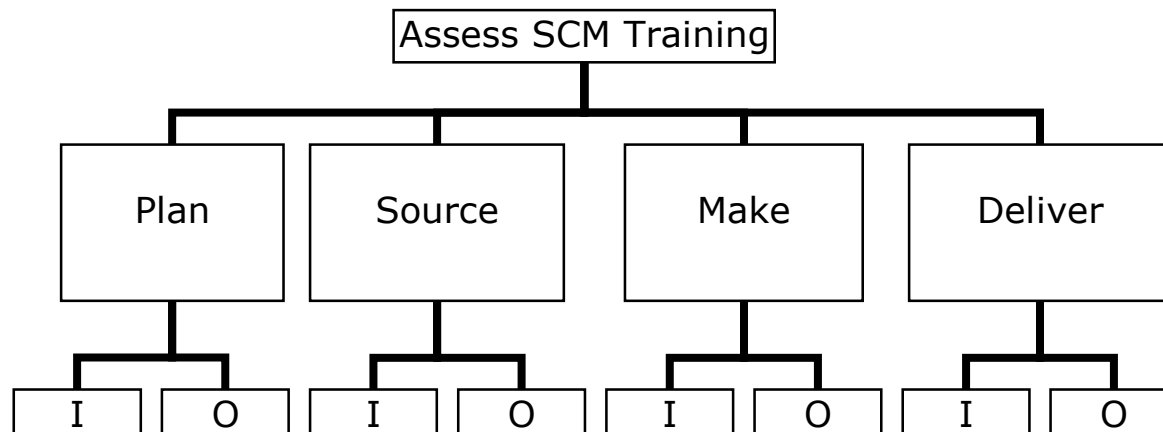


Fig. 2. Training assessment hierarchy



Multi-criteria training assessment for GSCM

- Following the expert experience, the pairwise judgments for the Plan, Source, Make and Deliver criteria were achieved.
- The Make criterion is the most significant priority result, 45%, followed by Plan with 21%, Deliver with 18%, and Source with 16%

Process	Plan	Source	Make	Deliver	Priority
Plan	1	1	1/3	2	21%
Source	1	1	1/2	1/2	16%
Make	3	2	1	3	45%
Deliver	1/2	2	1/3	1	18%

Table. 1. Processes priorities



Multi-criteria training assessment for GSCM

- Overall priorities were calculated, highlighting sub-criteria M1 - scrap reductions of 20%, followed by M2 - with 14%, and M3 -with 12%

	Process	Overall Priority
Plan	P1 - Demand Planning on a long-term perspective	6%
	P2 - Materials Planning with the best use of resources	5%
	P3 - Production Planning avoiding rework and waste	10%
Source	S1 - Substitute or recycled raw material	5%
	S2 - Merchandise based on renewable energy	5%
	S3 - Services aligned with sustainability	6%
Make	M1 - Scrap reductions	20%
	M2 - Greenhouse gas emission reduction	14%
	M3 - Recycled and reused water	11%
Deliver	D1 - Distribution planning using truckload	6%
	D2 - Order management strives to exceed customer expectations without additional cost	5%
	D3 - Transportation management with environmental impact reduction	7%



Table. 2. Overall priorities of processes

Multi-criteria training assessment for GSCM

- There is also possibility of using ratings or absolute measure in AHP application, i.e. each alternative is compared with many other alternatives, while ratings compare each alternative with an ideal one.

	Intensities	Level
	Excellent	1
	Very good	0.83
	Good to very good	0.67
	Good	0.50
	Poor to good	0.25
	Poor	0

Table. 3. Training rating scale



Multi-criteria training assessment for GSCM

- The quantitative performance based on rating for each benefits

Benefits	P1	P2	P3
Individual benefits	0.83	0.5	1
Organisational benefits	1	0.67	0.83
Benefits	S1	S2	S3
Individual benefits	0.5	0.83	0.5
Organisational benefits	0.83	0.83	0.83
Benefits	M1	M2	M3
Individual benefits	0.83	0.83	0.67
Organisational benefits	1	1	0.67
Benefits	D1	D2	D3
Individual benefits	0.83	0.83	0.83
Organisational benefits	0.67	1	1

Table. 4. Quantitative performance

Multi-criteria training assessment for GSCM

- Aggregating the overall priority (Table 2) and the quantitative performance (Table 4), it was obtained 88% for organizational benefits, followed by 78% for individual benefits delivered by the training program based on GSCM.
- These results were presented to the managers of the company under study. They validated it as consistent and applicable in practice. There was no formal method used for validation.



Conclusion

- A model was proposed to assess the effectiveness of a training program based on what had been delivered by training. The SCOR Model top-level process and sustainability elements were considered in its development.
- The AHP was applied in the modelling, and pairwise judgments were considered as criteria for ratings the alternatives.
- The Make Criterion was considered as the highest overall priority. The main result of the analysis reveals that SCM training contributes with individual and organizational benefits.



Conclusion

- Therefore, the managers of the company should not be worried because there is a proven return on the investment on SCM training, measured in terms of benefits which are based on SCOR and Green Issues.
- In a real application, the importance of adopting a consistent assessment model through the incorporation of components and elements of sustainability is revealed.
- However, the model was applied in a company and therefore all employees of the company under study that attended the training program should be considered for this research to be carried on.



Conclusion

- Evaluation a long term based on tangible aspects of training efficacy, efficiency should be considered as next steps, and new approach based on Benefits, Opportunities, Costs and Risks is suggested as future research.



THANK YOU!

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