

## Product-Oriented Environmental Management Systems (POEMS) From theory to practice – experiences in Europe

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### EXTENDED ABSTRACT

The authors are engaged in a research project on Product-Oriented Environmental Management Systems based on the assumption that such systems have the potential to systematically integrate EcoDesign and life cycle thinking in companies' strategies and practices. In this context, a theoretical model for POEMS has been developed by Delft University of Technology (The POEMS<sup>TUD</sup> Model, figure 1), primarily oriented at companies that have product development as part of their core business, and tested with promising results. It was designed for compatibility with Environmental Management Systems standards (EMAS and ISO 14001) and includes:

- Activities that lead to the concrete definition of environmental objectives and performance criteria for the product, as well as tracking progress (the “plan”, “check” and “act” phases of the model);
- Operational activities for the improvement of products' eco-efficiency and innovation (the central sequence of the “do” phase of the scheme);
- Activities that ensure capability for EcoDesign, including resources, know-how, allocation of responsibilities, development of tools, etc. and
- Activities that ensure control and routinisation (in the sense of making it a systematic effort) of EcoDesign (both corresponding to the “do” box on the left of the scheme).

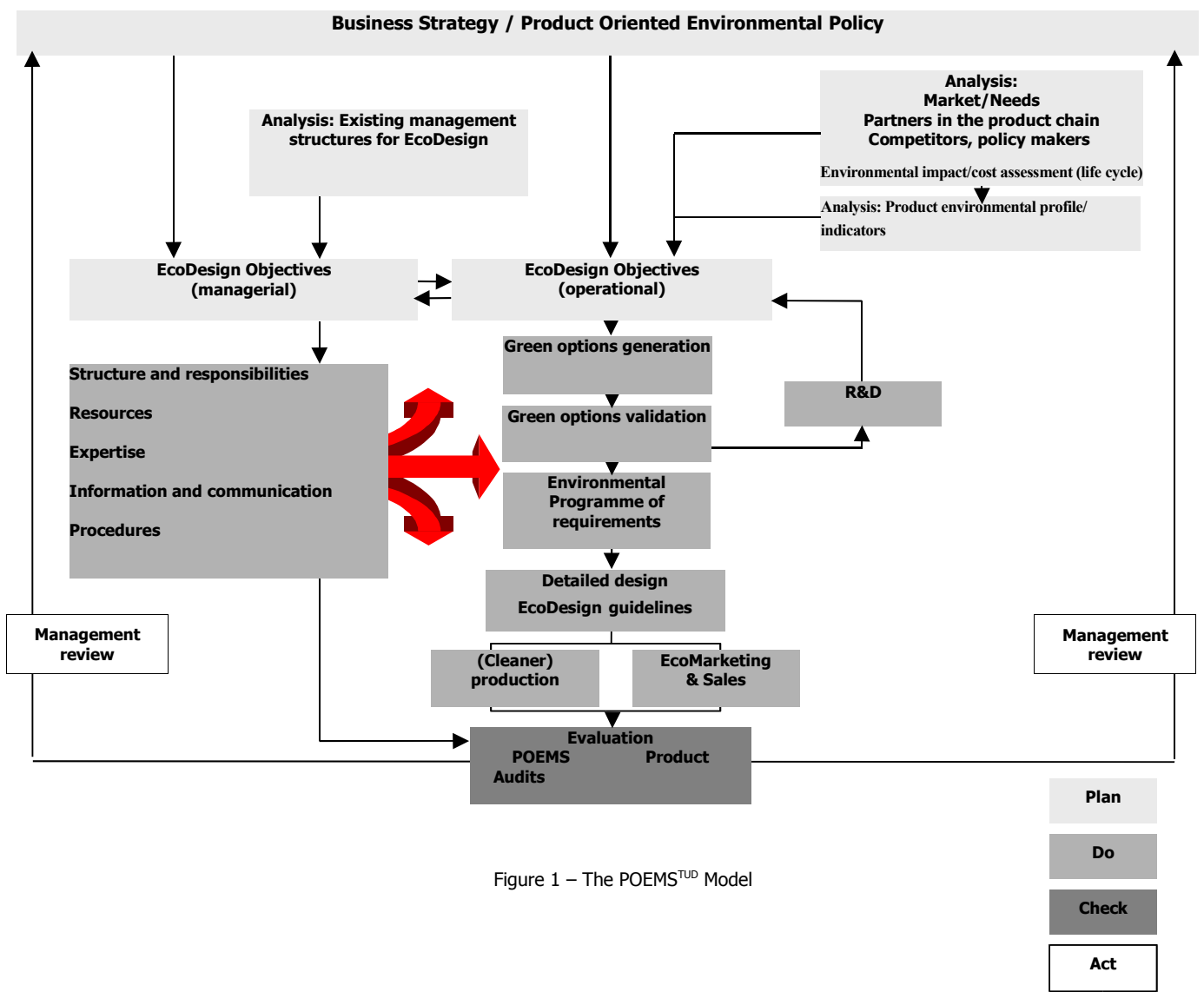


Figure 1 – The POEMS<sup>TUD</sup> Model

In addition to the earlier application of the POEMS model to the automotive and electronics industries (action research), the experience of companies from various economic sectors that joined the Dutch PMZ Programme ('Stimulating Product Oriented Environmental Management' Incentive Programme) gave valuable insights on the most important elements of a POEMS approach as well as on the main determinants to the outcomes of such a system. The objective of the PMZ programme – an initiative of the Dutch Ministry of Housing, Spatial Planning and Environment (VROM) – was precisely to encourage and introduce a process of continuous product improvement and permanent product environmental innovation, through the development of product-oriented environmental management systems.

In the first part of the presentation, we shall present the results of an evaluation ex post of the experience of 10 companies that joined the first phase of the PMZ Programme (1996-1998) and are relevant for the POEMS framework in our research project, i.e., with a focus on product development. In this context, the working definition of POEMS is:

an environmental management system with a special focus on the continuous improvement of products' eco-efficiency (ecological and economic) along the life cycle, through the systematic integration of EcoDesign in the company's strategies and practices

Success with POEMS depends not only on the POEMS model that was implemented (as a way of operationalisation of the concept) but also on a number of internal and external factors. An explanatory model for success was developed and used to evaluate the PMZ Programme through a questionnaire answered by companies' representatives (figure 2). By success we mean concrete results in terms of improved/innovative products and also the creation of organisational conditions for continual improvement and learning.

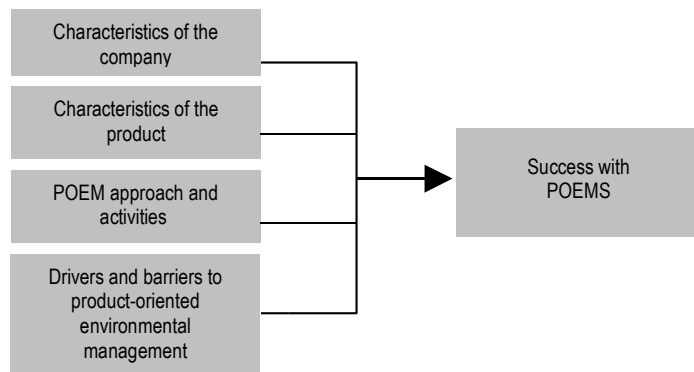


Figure 2 – Explanatory model of success with POEMS

The presentation will include a description of the variables studied and the results of the statistical analysis currently being concluded, which will give insights on the influencing factors for an effective implementation of POEMS, on the one hand, and feedback on the POEMS<sup>TUD</sup> Model from a practical application point of view, on the other.

In this abstract, the specific question of which POEMS activities were performed by the inquired companies will be addressed. Such activities were confronted with elements of the model developed by TU Delft, which were organised as follows:

- Activities at strategic level:
  1. Definition of an **environmental strategy** oriented to improve the product's eco-efficiency along the life cycle
  2. Integration of the **environmental strategy in the overall business strategy**
  3. Evaluation of the **market's expectations** concerning the environmental performance of the products
  4. Seeking for **innovative ways** of addressing the need the products fulfil, in order to reduce the material and energy intensity in the life cycle (e.g., substitution of a product by a service)
  5. Achieving/applying for **eco-labels**
- Activities at managerial level (those that are included in the managerial cycle of the POEMS<sup>TUD</sup> model but are not of strategic nature):
  6. **Analysis of existing managerial structures** to support the products' improvements
  7. Definition of **managerial objectives** to improve the POEM system
  8. Definition of a **multidisciplinary team**, including the environmental function, product development and other relevant functions for POEM
  9. Definition of an **organisational structure and responsibilities** for POEM
  10. **Allocation of financial resources** for environmental product development and management

11. **"Green purchasing"**: definition of environmental criteria for purchasing of the components and materials required for the products
  12. **Internal communication** on the products' environmental profile
  13. **External communication** on the products' environmental profile
  14. Setting up an **information system** on the products' on environmental aspects of the products
  15. **Training** on EcoDesign, life-cycle assessment, life-cycle management
  16. Definition of **procedures** to include environmental considerations in products' development and management
  17. Development of **tools for POEM** (e.g., databases, eco-benchmarking, life cycle analysis/assessment, communication, etc.)
  18. **Evaluation of the POEM system** (audits)
  19. **Management review** of the POEM system, addressing the possible need for changes in policy, objectives and other elements of POEM
- Activities at operational level (those that are directly related with improving the eco-efficiency of the products along the life cycle):
    20. Evaluation of products' **environmental impacts in the life cycle** (life cycle analysis/assessment)
    21. **Consultation of partners** in the product chain in order to identify and implement environmental improvements in the products
    22. **Eco-benchmarking** of the products
    23. Evaluation of implications of **existing/expected requirements** for the products' environmental performance: legal requirements, agreements, codes of practice, etc.
    24. Definition of **environmental performance indicators** (EPIS) for the products
    25. Definition of **operational objectives** to improve the products' eco-efficiency in the life cycle
    26. **Generation of "green" options** to improve the products at the early stage of the product development process
    27. Environmental, economic and technical **validation of the "green" options**
    28. **R&D** to improve the environmental performance of the products, along the life cycle
    29. Inclusion of **environmental requirements** in the products' **programme of requirements**
    30. Definition of **EcoDesign guidelines** for product development
    31. Consideration of **EcoDesign** implications in manufacturing, aiming at **cleaner production**
    32. **Eco-marketing** of the products
    33. **Advice of clients/consumers** in order to prevent and minimise impacts in the use phase of the products
    34. **Monitoring of the products' environmental performance** and comparison with the defined objectives

Respondents were asked to state whether or not each activity has been performed in their company and, in the affirmative case, if it was undertaken:

- Before the POEM subsidized project
- During the subsidized project and discontinued
- During the subsidized project and continued, as part of the POEM system
- After the subsidized project, as part of the system

Table 1 shows the results of this evaluation. On what concerns the overall numbers of activities performed (or not) and continued (or discontinued), it is clear that the PMZ subsidizing Programme introduced a significant number of POEM activities in the ten companies (codes "3" and "4" in the cells of the table). Out of the 340 total amount of activities (multiplication of 34 different activities by ten companies), 141 were performed during the project (41%).

It is also clear that prior to the subsidized projects, very little has been done: only 6% of the inquired activities were declared as performed beforehand.

Approximately 31% of the total amount of activities were started after the project and are performed in a continuous way. It is reasonable to assume that the experience achieved during the subsidized project may have been an "eye-opener" to actions to be taken later in time, and therefore the performance of such activities was presumably influenced by the project.

The number of activities that were discontinued is somehow intriguing: 122 out of 340, i.e., 36%. If the pattern of responses per company is analysed, we can see that companies 3 and 4 didn't continue any of the activities initiated during the project (with one exception in the case of company 4). As for the other companies, except in the case of company 2 (which performs nearly all inquired activities), there is a mix of continued and discontinued activities.

Another interesting figure is the amount of activities that started with the project and continued (code "4"), as it is very low: 19 out of 340 or 5.6%.

A more detailed analysis shows that those activities with higher uptake (equal or more than 50% of the cases) in the subsidized project were:

- At strategic level:
  - Definition of a life-cycle oriented environmental strategy
  - Seeking for innovative ways to fulfil the need the product is addressing
- At managerial level:
  - Definition of a multidisciplinary team
  - Definition of an organisational structure for POEM

Table 1  
Overview of POEM activities performed by the ten companies

Companies	Strategic level				Managerial level												Operational level																			
	Def. environmental strategy	Integr. env. and business strategy	Evaluation market expectations	Seeking for innovative ways	Achieving/applying for eco-labels	Analysis existing manag. structures	Definition of managerial objectives	Definition of multidisciplinary team	Definition of an org. structure	Allocation of financial resources	"Green" purchasing	Internal communication	External communication	Setting up an information system	Training on EcoDesign, LCA, LCM	Definition of procedures	Development of tools for POEM	Evaluation of POEM system (audits)	Management review of POEM system	Evaluation env. impacts (life cycle)	Consultation partners in the chain	Eco-benchmarking	Legal and other requirements	Definition of EPis	Definition of operational objectives	"Green" options generation	"Green" options validation	R&D to improve env. performance	Env. in programme of requirements	Definition of ecodesign guidelines	EcoDesign and cleaner production	Eco-marketing	Advice of clients/consumers	Monitoring of products' env. perform.		
1	4	5	4	4	4	3	3	3	3	3	5	1	4	4	5	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	3	
2	5	2	5	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3	3	1	1	3	1	1	1	1	3	1	1	1	1	1	1	3	1	3	3	3	3	1	2	1	3	1	1	3	1	1	1	1	1	1	1	
4	3	3	3	3	1	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	3	2	2	3	3	3	5	3	3	3	3	3	3	
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10	3	3	5	3	1	3	3	3	3	3	1	5	3	3	5	3	5	3	5	3	3	3	3	5	3	3	3	3	3	1	1	3	1	3	3	

Missing value

1 Not performed

2 Before the PMZ subsidized project

3 During/as a consequence of the PMZ subsidized project and didn't continue afterwards

4 During PMZ project and in PMZ system

5 After the project, as part of PMZ system

- Allocation of financial resources for POEM
- Definition of procedures
- Development of tools for POEM
- At operational level:
  - Evaluation of impacts in the life cycle (life cycle analysis/assessment)

As for those activities that were declared as part of the on-going POEM system, the higher uptake refers to:

- At strategic level:
  - Integration of the environmental strategy in the overall business strategy
- At managerial level:
  - Internal communication
  - External communication
  - Management review of the POEM system
- At operational level:
  - Definition of environmental performance indicators for the product
  - "Green" options generation
  - R&D to improve the environmental performance of the products
  - Inclusion of environmental requirements in the environmental programme of requirements
  - Advice of clients/consumers to minimize impacts in the use phase

These results seem to indicate that there was an evolution in the POEM activities in the companies under study. Companies started by setting up an organizational framework and performing the baseline study (LCA type of evaluation) and evolved to operational activities leading to potentially improved products. Whether or not this path influences the perceived success and the reasons why companies tended to follow this approach are matters for further study and will be part of the discussion.

The second section of the presentation concerns a review of POEMS experiences in several European countries, either in the framework of subsidized projects or as single firm's initiatives. Drivers and obstacles for adoption and diffusion and the specific contents needed for an effective and efficient adoption of the POEMS concept in companies in Europe and elsewhere will be discussed, also in view of the EU Integrated Product Policy.