

# Procurement of operating-room textiles in German hospitals as part of Industrial Ecology

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## ABSTRACT

This paper analyses possible hurdles for the missing integration of environmental criteria in the procurement of operating room (O.R.)-textiles in German public hospitals. In order to reach this the authors aim at elaborating a best practice example for the procurement of O.R.-textiles. Therefore, the authors do their research from the perspective of a procurer in a hospital directly evaluating possible hurdles that might hinder a sustainability-oriented procurement of O.R.-textiles. This paper contributes to the research on hurdles in environmental procurement and adds a primary analysis to the existing literature. The combination of hygienic, technical, economic, environmental and subjective criteria like comfort are considered as important criteria for the procurement of O.R.-textiles. All these criteria are combined in a decision-making framework and the availability as well as the interpretation of relevant data is assessed as existing in practise today. Identified possible hurdles for decision-makers are on the steps of criteria definition, data gathering and data interpretation. Finally, the legal framework might be a hurdle for a holistic approach in the procurement of O.R.-textiles. A short description of all these hurdles is given with a focus on practical examples.

## Research Question

The integration of environmental criteria in procurement is an important aspect for the realization of industrial ecology in all steps of the value chain.[1] Procurement has the potential to influence the production process, the use phase and the end-of life of goods and services, by determining environmental aspects over the whole life cycle of a product together with economic aspects within the scope of the procuring organization. That is why the potential of procurement is already considered by the European Commission, who promote green procurement widely.[2] Nevertheless the possibilities of green procurement have not been integrated into decision making yet.

The special importance of public procurement is further underlined by its economic impact.[3] In 2002 more than 1.500 billion Euros were spent in the EU for public procurement. In Germany more than 10% of the GDP stem from public procurement. The case described in this article focuses on O.R.-textiles procured by German hospitals that spent more than 21.5 billion Euros in 2004 for procurement. The procurement of O.R.-textiles, where no more detailed information is available, is included in this number. However, in 2003 almost 8 million operations were performed in German hospitals [4], all of them applying O.R.-textiles and causing O.R.-textile related energy, material and financial flow.

In general O.R.-textiles can be grouped into gowns and drapes and single-use and reusable textiles. Single-use O.R.-textiles are in common non-woven directly disposed off after use, whereas reusable O.R.-textiles are woven fabrics that are reprocessed after every use cycle. Gowns are worn by the operating-room personnel, whereas drapes cover the patient during the operation. The main purpose of the textiles is the prevention of surgical site infections of patients as well as the protection of the O.R.-personnel.

When procuring O.R.-textiles, a decision-maker has to consider a wide range of information with examples as:

type of needed O.R.-textiles, infrastructure of the hospital and type of linen management. Before procuring O.R.-textiles the fundamental question whether single-use or reusable textiles will be used in the O.R. has to be raised. Both types of O.R.-textiles can be mainly distinguished by the applied textile management as single-use textiles are disposed after their use and reusable textiles are reprocessed after their use. In addition there are many possibilities to design the linen management for both types. Figure 1 gives a general overview over different types of linen management that might be applied by a hospital. Grey fields indicate a process done in a hospital, dotted fields show processes that might be part of the linen management by a hospital and finally white fields indicate processes outsourced to textile service providers.

		Reusable O.R.-textiles				Single-use O.R.-textiles
		Owned by hospital	Commission	Rental	Full Service	Delivery
Acquisition	Procurement					
	Investment in textiles					
Use	Disposition					
	Stock Keeping					
	Internal Logistics					
	O.R. use					
	Investment into machinery					
	Reprocessing					
	Sterilization					
	Repair					
End-of-life	Disposal					
Related activities	Cost control					
	Cost allocation					

Table 1: Types of linen management (In adaptation to: Rothfuß, T. (2004); Lipphaus, A. (1998))

Hygienic and technical properties being k.o.-criteria given by the standardization organizations, hitherto the predominant selection criterion for O.R.-textiles was the purchasing price. This does not lead to a comprehensive decision for two reasons: Firstly, follow-up costs are not considered. When full cost accounting became vital after the introduction of the “diagnosis related groups” the economic analysis had to be extended to the whole life cycle. Secondly, non-monetary criteria were not integrated in the selection process. Due to the development of the legal framework conditions, like the KrW-/AbfG (Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal) and the BImSchG (Federal Immission Control Act), environmental aspects have to be looked at. Nevertheless, environmental aspects are not yet an equivalent decision criterion in the procurement process of O.R.-textiles.

So the present article investigates the question:

*Why have O.R.-textiles up to now primarily been selected according to their purchase price?*

### Research Design

In environmental procurement processes the influence of hurdles is proven.[1] Following the structure of the hurdles analysis developed at TU Dresden there are five major hurdle groups that may not support the integration of environmental aspects on the four steps of the procurement process: aim of the organization or the individual, regulation (internal or external), knowledge, information and incentives/sanctions.

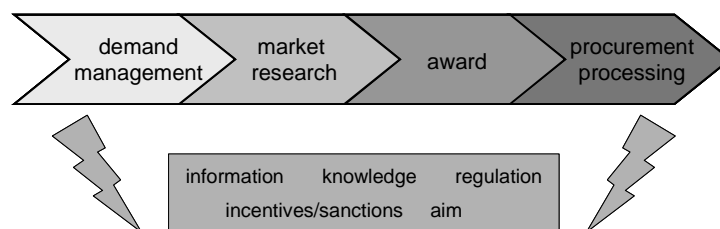


Figure 1: Structure of a procurement process and existing hurdles

Figure 1 summarizes the four steps in a procurement process and combines them with the identified groups of

hurdles existing for the process. For further details on procurement processes see [5].

So far research on the hurdles was focused on secondary analyses, evaluating the perception of procurers. In this paper the authors extended the research to primary analysis, i.e. the researchers took the perspective of a procurer in a hospital. The object of investigation is provided by a project funded by the German “Ministry for education and research” with the objective to design a decision aid for the sustainable-oriented procurement of O.R.-textiles based on their whole life-cycle. In order to reach this objective the authors aim at elaborating a best practice example for the procurement of O.R.-textiles. Therefore, the authors do their research from the perspective of a procurer in a hospital directly evaluating possible hurdles that might hinder a sustainability-oriented procurement of O.R.-textiles.

The prerequisites assumed in this paper are on the one hand the existence of an aim to integrate environmental aspects on the organizational as well as the personal level, and that there are no restrictions by missing incentives or possible sanctions, e.g. restricted time. Hence, excluding the two hurdles of missing aim and no incentives three main hurdles identified for the procurement are at the focus of research: no knowledge (development of decision criteria and data interpretation), no information (data availability) and no supportive regulation (legal constraints in tenders).

### **Research Results**

The following sections describe possible hurdles of knowledge, information and regulation for a holistic approach in procurement.

#### **1. Knowledge and regulation hurdle: development of decision criteria and assessment framework**

Procurers of O.R.-textiles often characterize their decision by three criteria: price, price and price! However, there are other important aspects to regard when procuring O.R.-textiles.

As the main criterion the hygienic, i.e. prevention of surgical site infections of O.R.-textiles should be considered as it functions as a k.o.-criterion. Since 2006 there is a European standard regulating the technical and hygienic properties O.R.-textiles have to possess.[5] This standard is a great improvement as before those properties could not be evaluated by procurers. Right now the coherence to this standard is a requirement to obtain a CE-mark. The standard distinguishes between two performance-types of O.R.-textiles. The procurer has to decide individually which type to procure, as there is no standard concerning the application of O.R.-textiles in surgical operations. Beside the hygienic criterion fulfilled by the technical properties of O.R.-textiles other criteria determined by technical properties can be applied as decision criteria, namely the comfort or quality of O.R.-textiles. As these are subjective issues, they are often assessed in tests in the O.R. with non-generalizable outcomes.

Assuming all O.R.-textiles offered on the market fulfill the hygienic criteria determined by the EN DIN 13975, economic aspects are chosen to evaluate different textiles. Very often only the purchase price is considered as no detailed information on the economic consequences caused by different offers are available inhouse as detailed costing systems are often missing. The consideration of economic aspects is a sine-qua-non for the further survival of hospitals.

Legal obligations as the “Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal” in addition to the consideration of economic criteria are obviously not influential enough to integrate the concept of industrial ecology into procurement of hospitals.

In a sample of 22 tenders for O.R.-textiles drawn from the Tenders Electronic Daily (TED) database for the period May 2006 till January 2007, only one tender included the criterion environment. Therefore the existence of an objective to include environmental aspects when deciding on procurement decisions is needed. For this analysis as stated above such an objective is assumed to be in place.

To summarize decision makers procuring O.R.-textiles need a profound knowledge on a large variety of criteria. Assuming this knowledge is existing the decision maker might set up an assessment framework as presented in

figure 2 in order to assess different O.R.-textiles and services provided by the distributors.

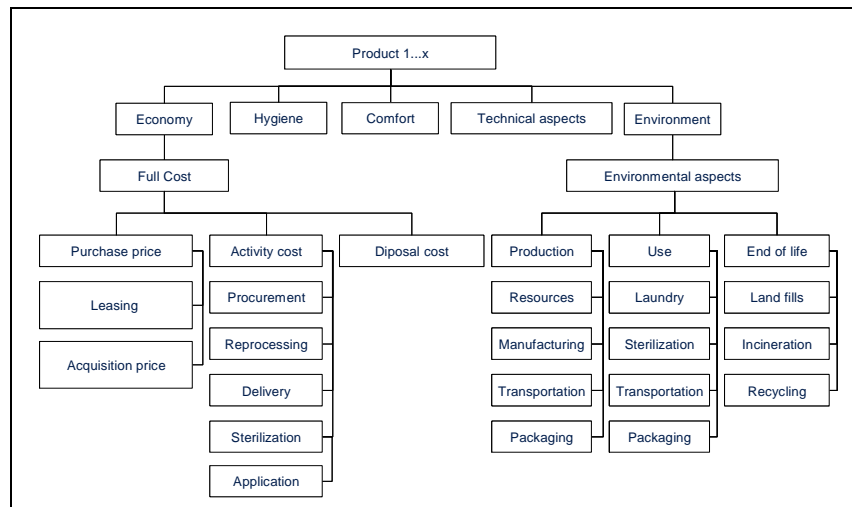


Figure 2: Assessment framework for O.R.-textiles

Based on the experience of several case studies in hospitals no detailed knowledge on all criteria described could be identified for procuring personnel. Hence, the identification of a broad criteria scheme seems to be a hurdle for a holistic procurement decision.

In order to evaluate all criteria for the decision-making process appropriate instruments have to be selected. In the related project life-cycle assessment for the evaluation of the environmental criteria, life-cycle costing and activity-based costing for the evaluation of economic criteria and technical analysis as well as user surveys to assess hygienic and technical criteria were chosen. Ideally, the selection of data follows the assessment method. Before the data concerning the different decision-criteria can be identified and gathered, the method for evaluation and interpretation has to be selected.

## 2. Information hurdle: data availability

When the assessment framework and the assessment methods are defined the identification of data is necessary. For this process the range of internal and publicly available information is evaluated.

Concerning economic information the acquisition price is available from offers of possible suppliers of O.R.-textiles. When comparing this information the service-level provided by the single supplier in regard to table 1 has to be considered. To achieve a process-oriented comparison of different offers, the availability of data concerning internal processes of the hospital are vital. The availability highly depends on the design and performance of the cost accounting system applied within an organisation.

As O.R.-textiles are a minor cost factor in hospitals the level of information available is assumed to be low. A decision-maker might therefore turn towards publicly available information concerning the economics of O.R.-textiles. The information in journals on this topic is scarce. Most publications identified by the authors were published by companies selling O.R.-textiles or by consulting companies that have to be contacted in order to obtain a detailed report. The general accessibility of such information is at least questionable and the number of publications still small. The authors could identify only nine publications analyzing the economic consequences of the use of O.R.-textiles in some depth.

Concerning the technical and hygienic criteria the decision-maker can rely on the standard DIN EN 13975, defining the properties an O.R.-textile has to fulfil. Nevertheless, the decision whether “standard” or “high”-performance O.R.-textiles should be used, has to be taken by the procurer.

The evaluation of subjective criteria as comfort is not as easy, as this criteria is mentioned in the DIN EN 13975 but not specified with measures. Therefore a practical test is often applied in which O.R.-textiles are rated by the

O.R.-personnel. The results of such test are subjective and are therefore not always unanimous. Those tests are seldom published. Therefore many hospitals run their individual tests.

The availability of environmental data for O.R.-textiles is also restricted. Inhouse there are normally only data concerning the amount of waste produced available, not allowing a holistic environmental assessment. The amount of publicly available information is equal to economic data limited. For the literature research process special knowledge is needed as most data is not reported in journals. Most environmental data are included in special reports by research institutions or industry associations and as a consequence normally not directly available. The authors could identify seven highly relevant publications with regard to environmental aspects.

Concerning the literature review the question of language has to be addressed too, because many publications are only available in English causing further impediments to a procurer. Overall, the availability of data concerning the identified criteria seems to be limited, therefore restricting the information accessible to a procurer. This causes a further hurdle for a holistic procurement decision.

### 3. Knowledge hurdle: data interpretation

The economic data available is characterized by a lack of a detailed description concerning the methods applied for interpretation as well as for data used or assumptions applied. Because of this the results are not generalizable and most often might only function as benchmarks.

The environmental data on O.R.-textiles is mostly available in form of life-cycle-assessment studies including the steps of goal and scope definition, inventory analysis, impact assessment and interpretation as given by the ISO standard 14040 [XX]. The level of detail for different publications but also the different steps varies widely. Sometimes, in an academic style, all assumptions and decisions are transparent and references given, allowing a complete understanding of the studies. In other cases references are not given and no details available. As reason for this obligations to maintain secrecy are mentioned at the best. Because of this the interpretation of data is cumbersome. For example when comparing the results of different studies there is sometimes a large difference between the results as illustrated in figure 3, where the results of two Life Cycle Assessments with regard to the impact categories global warming and acidification are shown. The cause for the gap between both studies might not be easily understood by a procurer.

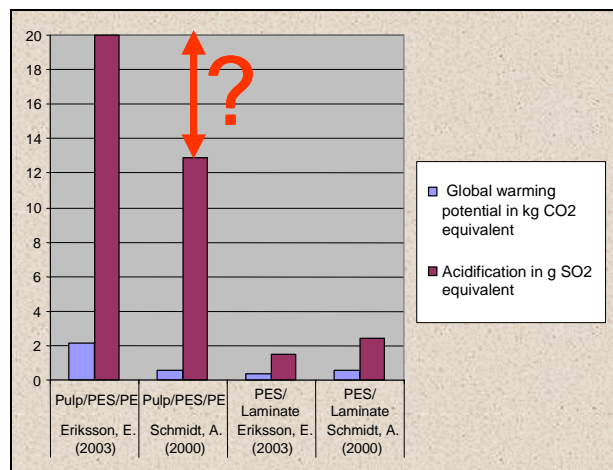


Figure 3: Results of LCAs

In summary the following aspects could be identified that might be problematic for the interpretation of data on environmental aspects and impacts of O.R.-textiles presented in LCA studies:

- different product systems studied, e.g. laminate-gown vs. micro-fibre gown
- different system boundaries, e.g. including transportation or not
- different functional units, e.g. whole gown vs. grams
- different data sources and data quality, e.g. measuring, estimating, calculating
- different forms of impact assessment, e.g. choice of eutrophication as impact category

The way data are presented in publications and the knowledge needed to interpret might cause a further hurdle for a holistic procurement decision.

#### **4. Knowledge hurdle: legal framework for tenders**

When the problems of decision criteria and assessment framework, data availability and data interpretation are overcome and the decision-maker has a profound understanding about the criteria for a holistic procurement decision, his knowledge still has to be applied and integrated into the tendering process. This process is vital as all former steps cumulate in the writing of a tender and the interpretation of incoming offers related to the criteria defined in the tender.

At this stage the legal framework, all public German hospitals are subject to, might prove to be a further hurdle. The application of environmental criteria in public tenders is still determined by the possibilities the legal framework offers. The integration of environmental points is regulated and not easily done for, it requires special know-how. In general there are points, where to include environmental aspects in tenders, which are [7]:

- definition of the contract subject,
- drawing up of technical specifications,
- selection of tenderers (suitability criteria),
- evaluation of tenders / Contract award (award criteria),
- conditions for the performance of contracts.

However, the realisation of these possibilities, the legal framework offers, is still limited because of a high level of uncertainty concerning their application. So far, there is no decision aid supporting the integration of environmental aspects in tenders for O.R.-textiles causing another hurdle for a holistic procurement decision.

#### **Conclusion**

The paper analyses the hurdles of knowledge, information and regulation in procurement decisions of O.R.-textiles. The primary research method, picturing the process from the perspective of a procurer, describes the possible problems that might occur. First and foremost the complex process for the identification of a holistic criteria set and assessment framework is shown. Additionally, the limited data availability for a large range of criteria is identified. Moreover the problems in data interpretation are highlighted. Finally, the possibilities to include environmental aspects in tenders, which have to conform to the legal framework, are difficult to identify and realize. To summarize, based on this research the elaboration of a decision-aid for a sustainable-oriented procurement of O.R.-textiles is deeply needed. The decision aid has to deliver solutions to the identified hurdles.

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