

## Promising Areas for Future Research on Reverse Logistics: an exploratory study

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Abstract	<p>During the early nineties, the Council of Logistics Management started publishing studies where Reverse Logistics was recognized as being relevant both for business and society (Stock, 1992). Other studies followed stressing the opportunities on reuse and recycling (Kopicki et al., 1993), discussing marketing aspects (Kostecki, 1998) and reported on the U.S. experience (Rogers and Tibben-Lembke, 1999). In Europe, an inter-university EU sponsored project called RevLog had served as one of the motors for European Research on Reverse Logistics. For the last 5 years, researchers associated with RevLog have co-authored more than 100 papers on the subject (see Dekker et al., 2003). Very recently, the RevLog group organized a meeting to identify "Promising Areas for Future Research on Reverse Logistics." In this paper we report the outcome of such meeting.</p>	
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	R 4	Transportation Systems
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# Promising Areas for Future Research on Reverse Logistics: an exploratory study

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## **Abstract**

During the early nineties, the Council of Logistics Management started publishing studies where Reverse Logistics was recognized as being relevant both for business and society (Stock, 1992). Other studies followed stressing the opportunities on reuse and recycling (Kopicki et al., 1993), discussing marketing aspects (Kostecki, 1998) and reported on the U.S. experience (Rogers and Tibben-Lembke, 1999). In Europe, an inter-university EU sponsored project called RevLog had served as one of the motors for European Research on Reverse Logistics. For the last 5 years, researchers associated with RevLog have co-authored more than 100 papers on the subject (see Dekker et al., 2003). Very recently, the RevLog group organized a meeting to identify “Promising Areas for Future Research on Reverse Logistics.” In this paper we report the outcome of such meeting.

**Keywords:** Reverse logistics, Future, Exploratory study, Nominal Group technique.

## **1 Introduction**

Companies have become involved with reverse logistics, either because they 1) have to, due to regulations; 2) want to, for the economic benefits; 3) “feel” moved to, as part of corporate citizenship (De Brito and Dekker, 2003). Reverse logistics has been posing new challenges, as it rolls up the more linear traditional supply chain. The one-to-many (customers) structure is extended with the collection many-to-one (e.g. a supplier) logistics network. Besides this, the uncertainty increases with respect to quantity, quality, timing and variety reverse flows (see De Koster et al., 2002).

The field is in the process of evolving but it is not yet clearly established (see Melissen and De Ron, 1999). With this study, we explore the development of reverse logistics research. The objective is to get insights in the areas for future research, helping researchers to position themselves and their research projects. The methodology followed is the Nominal Group Technique (NGT) with international researchers working on reverse logistics issues. In short, this technique

is a way to structure group discussions, where there is a first phase for participants to think about the question/problem individually and in silent (Delbecq et al., 1975). The ideas are later presented to the group and clarified. The last phase is for individual and anonymous voting (ranking and/or rating) of ideas. The analysis brings insights concerning future research on reverse logistics.

This paper is organized as follows. Next we describe the methodology, i.e. the Nominal Group Technique characteristics. After that, we report on the implementation of the study and we discuss the findings. Finally, last section puts together a summary and conclusions.

## 2 Methodology

NGT is a technique to structure communication among a group of individuals. Its applications cover problem solving, policy-making and proposal review among others. To summarize, after having a question/task, the discussion process proceeds the following steps (with some variations): Step 1- Silent generation of ideas; Step 2 - Round-robin record of ideas; Step 3 - Clarification of each idea and discussion; Step 4- Individual voting (ranking and/or rating). The process has been originally designed 1) to assure creativity (silent and individual generation of ideas); and 2) to balance participation among members (round-robin: everyone exposes their ideas; minority ideas are included as well).

To achieve the previous, special attention has to be given to the following (Delbecq et al., 1975): A) the welcoming statement (stressing the importance of the task); B) the question/task (level of abstraction and depth vs. breadth); C) the group size (with between 5 and 9 participants). The NGT is designed to structure group meetings, and therefore, it will achieve structured material. Nonetheless, this is still raw material and very likely not rich in detail, since participants are stimulated to synthesize their ideas. Thus, the NGT is more appropriate for exploratory studies, as this one.

## 3 Implementation

The study took place during the annual workshop of the European working group on Reverse Logistics, called RevLog (see RevLog, online), in the end of the summer in 2002. Fifteen participants were involved in this study, 13 belonging RevLog. The two guests, out of the RevLog group, were a senior and a more junior researcher. All the participants of this study, either RevLog members or not, were familiar with the work of the group RevLog (see Dekker et al., 2003). The participants were non-junior and more junior researchers, who use to publish in internationally renowned scientific journals. The senior researchers of the RevLog group did not participate. This was thought to be more adequate. RevLog senior researchers are experts in Reverse Logistics, who would dominate the results, even by only causing unintentional inhibition in the more junior researchers. Besides this, they have plenty self-confidence in their specialization areas (within Reverse Logistics). In this exploratory phase, we rather give all the freedom to innovative ways of thinking.

Three groups of 5 people each were put together. In each group, a moderator was nominated. In making the groups we aimed to have a diversity of research backgrounds in each group.

During the workshop, each group met at the same time, but in separate rooms. The moderators welcomed the participants stating that the meeting would serve to gain insights on the future of reverse logistics research. The discussion followed the generally four steps of the NGT. The moderators did also participate in all the steps; they count as participants as well.

The moderators met before the workshop to discuss the formulation of the question. The questions were brought down to the following two:

- What are promising areas for future research on reverse logistics?
- What are promising research areas to include in a follow-up RevLog project?

The moderators auto-tested the question. The test showed that the second question would lead to highly individually-centered research subjects while the first would give more room for other research subjects than the ones each respondent is individually involved with. Since this was important to the objective of discussing promising areas for future research on reverse logistics, and some were invited participants (not members of RevLog) the first question was chosen.

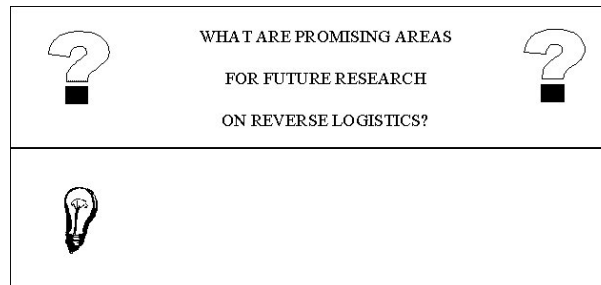


Figure 1: Representation of the sheet of paper given to the participants.

Figure 1 represents the sheet of paper given to the participants. Participants were instructed to list any idea on promising ideas for future research on reverse logistics, on a sheet of paper. They were instructed to synthesize their ideas in a few words (one short statement). The participants were given 5 minutes to generate ideas individually and in silence, which was respected.

After that, the ideas were recorded in a round-robin fashion. This means going around the table asking for one idea from one member, recording it on a flip-chart, and then another idea from the next participant, and so on. Arguments for/against, motives for the ideas, should not be given at this point in time. It is also up to the participant that gives the idea, the wording of his/her own idea.

After the round robin, there was a clarification of the ideas listed in the flip chart. Everyone should understand what is meant by it. Arguments in favour/against can be expressed (not necessarily by who has suggested it). In the voting phase, every participant received 5 cards. Participants were asked to write in each card one of the five most important items. Participants

were asked to spread the cards on the table and to rank the promising areas, using the numbers 1 (most promising) to 5 (least promising of the five).

At this point, there was a small discussion, with the purpose of analyzing unbalance in ranking patterns. The objective is not to lead to a change of opinions but it is clarification. If participants change their mind is up to them. An opportunity was given to re-discuss some of the items that are perceived as receiving “too many” or “too few” votes. Finally, the participants were given each a piece of paper prepared in advance with a 0-10 rating scale from not important to very important. Participants were asked to rate 5 items from the flip chart. This means that they did not have to stick to their previous 5 ranked items.

## 4 Findings and discussion

During the first discussion phase, after recording the ideas on the flip chart, the participants used diverse arguments against/in favour of each item (some arguments were personal). Table 1 lists just a few.

Table 1: Arguments used during the first discussion about the ideas on the flip chart.

“This area is growing” - “This area publishes” “That issue is really important for practice” “I personally would not do such research” / ”I want to do something I like” “I wouldn’t want to work with psychologists” “We should have competence to do it” - “That area is outside our scope” “We can include one item a bit out of our competence, but not more than one.” “I do not see why the military needs special focus” - ”Too broad” - “Too detailed” “Many problems in this area have not been solved or even stated until now” “Important issue, even more important in the future” “Already much research has been done in this area”
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Every group generated between 12 to 25 ideas for promising areas for future research on reverse logistics. Some of the ideas were not among the ranked ones. The very specific subjects were not ranked in contrast with items stated in a general/broad manner. Tables 2 to 4 list the ideas that were ranked at least once. A well ranked item by Group 1 is “Strategic + International Issues (mapping, decision paths);” Group 2 ranked well two subjects ”Coordination of supply and return networks” and “Cost accounting of Reverse Logistics.” Group 3 ranked well ”Integration of ICT.”

We do observe that when two or three participants considered an item as of rank 1 or 2, later more participants rate this item. To this may have contributed, on the one hand, valid arguments during the second round of discussion, and, on the other hand, an inherent search for consensus. In contrast, we also observe that some items are single-rated with a 9 or a 8. This seems to indicate that some participants do not give up from the subjects that are most dear to them. After this, unbalanced vote patterns were discussed. For instance for 2 participants of Group 1, “Multi Criteria Decision Making (DSS+Eco-Eco)” was the most promising research area while

Table 2: Ideas ranked by Group 1.

Description	Ranking
Information Flows (Multi-actor, Incentives, Stability, ...)	2,3,5
Multi Criteria Decision Making (DSS + Eco-Eco)	1,1
Trust Theory (Privacy, Security, Incentives)	2, 5
Co-ordination	2, 5
Life Cycle Analysis + Environmental Indices	2,3,5
Controlling Issues(E.g accounting)	4
Marketing Issues (Influence Return Rate - Demand for R.)	3,4,4
Bench marketing	4
Strategic + International Issues (mapping, decision paths)	1,1,1,2,3
Organizational Theory (Power issues)	5
Typologies + Terminology	3,4

Table 3: Ideas ranked by Group 1.

Description	Ranking
Coordination of supply and return networks	1,1,1
Cost accounting of Reverse Logistics	2,3,3
Integration of R.L. in standardized software (e.g. ERP)	2,5
Performance measures of Reverse Logistics	2,3
Integration of Reverse Logistics and e-business	4,5
Reverse Logistics measurement link with strategy	1
Application of or techniques on environmental issues	2
Scheduling rework jobs	1
How to market remanufactured products?	4
Developments of methodologies on R.L. partnerships	4
Impact governmental policy and legislation	3
Application of Reverse Logistics in the military	3, 5
Integration of Reverse Logistics with CRM	5
How can we involve retailers in Reverse Logistics	5
The cannibalizing-demand effect for selling remanufactured products	4
Integration of production and remanufacturing lot sizing decisions	4
Can ICT improve forecasting of returns?	2

Table 4: Ideas ranked by Group 3.

Description	Ranking
Integration of ICT	1, 2, 3, 5, 5
Quantitative modelling under uncertainty	1, 2, 2
Coordination of the parties involved	1, 3, 3
Return acquisition	2, 4, 4
Product design	2, 4
Interface between production planning and scheduling	1, 5
Waste management policies	1, 3, 4
Life cycle optimisation	3, 4
Information gathering	5
Pricing issues	5

Table 5: Rating - Group 1

Description	Rating					Sum
Strategic + International Issues (mapping, decision paths)	10	9	9	9	9	46
Information Flows (Multi-actor, Incentives, Stability, ...)	9	8	8	7	6	38
Multi Criteria Decision Making (DSS+Eco-Eco)	10	9	8	6		33
Life Cycle Analysis + Environmental Indices	9	9				18
Co-ordination	8	8				16
Trust Theory (Privacy, Security, Incentives)	8	7				15
Marketing Issues (Influence Return Rate-Demand for R.)	7	5				12
Typologies + Terminology	9					9
Bench marketing	8					8
Psychology (Customer Perception)	0					0

Table 6: Rating - Group 2

Description	Rating					Sum
Coordination of supply and return networks	5	8	8	9	10	40
Cost accounting of Reverse Logistics	6	7	7	8	8	36
Integration of Reverse Logistics in standardized software (e.g. ERP)	5	6	7			18
Performance measures of Reverse Logistics	6	7				13
Integration of Reverse Logistics and e-business	6	6				12
Reverse Logistics measurement link with strategy	9					9
Application of or techniques on environmental issues	9					9
Scheduling rework jobs	9					9
How to market remanufactured products?	8					8
Developments of methodologies on Reverse Logistics partnerships	7					7
Impact governmental policy and legislation	6					6
Application of Reverse Logistics in the military	3					3

Table 7: Rating - Group 3

Description	Rating					Sum
Integration of ICT	10	9	9	9	8	45
Quantitative modelling under uncertainty	9	9	8	8		34
Coordination of the parties involved	10	9	8	7		34
Return acquisition	8	8	7	6		29
Product design	9	7	6			22
Interface between production planning and scheduling	7	5				12
Waste management policies	10					10
Life cycle optimization	8					8
Information gathering	8					8



for all the other three members was not even among the most five promising research areas. Finally, participants rated the ideas of the group, presented in Tables 5 to 7. One can notice that in some cases there was a shift: participants that had not ranked certain items, did rate them.

We perceive that many items do not have to do with logistics alone. Words like integration, coordination, acquisition, marketing, and accounting are among the ideas of the participants, for promising areas for future research on Reverse Logistics. This announces that researchers in the field are conscious of the multidisciplinary character of reverse logistics. Besides this, participants anticipate the development of the field in the direction of Integrated Reverse Logistics (in words like co-ordination, strategic) or even Extended Reverse Logistics (recall e.g. acquisition and marketing).

## 5 Conclusions

This paper has reported an exploratory study about promising areas for future research on reverse logistics. This is not to say that the ideas generated by the participants of the study constitute the promising areas for future research on reverse logistics. Be aware of the exploratory character of the study, meant to thwart the way for future studies. Yet, from the enquiry, we observe that participants anticipate the development of the field in the direction of Integrated Reverse Logistics or even Extended Reverse Logistics (similarly to the Extended Product concept). This would demand co-ordination with other research fields (such as marketing) and therefore alliances with researchers with other core expertise than reverse logistics. This is a vital aspect to keep in mind while writing research proposals, or deciding on research strategies.

We have also documented the process, in such a way that this exploratory study can feed follow-up studies about the future course of reverse logistics research. From some of the arguments used against adjacent areas (like “I personally would not do such research”), one notices that the ideas are biased by personal preferences. Therefore, follow-up studies should 1) take into account the participant’s view on reverse logistics (e.g. his perspective on the value of early contributions for reverse logistics); 2) ask for both promising research areas, within, but also without, one’s competencies. This is like to require other setting and technique than the Nominal Group Technique (NGT) as employed here, which is more suitable for straightforward tasks/questions.

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