MAKING AN IMPERSONAL METHOD PERSONAL - EXPERIENCES FROM A TELEPHONE INITIATED MAIL SURVEY AMONG TRANSPORT BUYERS

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Abstract

A major concern when carrying out a survey is the problem of avoiding bias and getting a high response rate. The aim of this paper is to reveal the outcomes of using a telephone initiated survey method and how this will affect the validity, reliability and especially the response rate. The analysis is based on our personal experiences of using this method when we carried out an extensive mail survey among persons responsible for the purchasing of goods transports in manufacturing and wholesale companies in Sweden.

The mail survey covered the transport pattern of the core service i.e. the actual transport today, but also attitudes towards logistic services (such as delivery time, price etc), choice of forwarder, and environmental issues regarding transports. The survey targeted companies having outbound goods transports exceeding 150 km. The results presented show the benefits and short-comings of the method. They also show how a telephone initiated survey method affects the response rate in a positive way and increases the understanding of the survey results. By establishing a personal contact with the respondents, an informal link was established which generated a greater commitment to answering the survey.

Keywords: Goods transport; Survey; Methodology; Transport purchasing; Reliability; Response rate; Freight transportation
Topic area: D5 Data Collection Methods

1. Introduction

A useful and common method of data collection is the self-administrated mail questionnaire. On one hand it does not require e.g. interviewers, which can keep the survey cost down. On the other hand this method have least contact with the respondents, and therefore it frequently has the lowest rate of response (Scheaffer et al. 1990). A few examples from surveys in transportation research (with corresponding response rates) will be mentioned here. Bardi et al (1989) mailed out a survey to 1 000 transportation executives on CLM´s membership list, that mapped determinants of modal choice (response rate:29%). Harper & Evers (1993) mailed 695 executives in logistics of manufacturing firms with more than 50 employees, about shippers perceptions of modes (response rate: 22%). A study of the role of transportation in supply chains was made by Morash & Clinton (1997) and was sent out to 9 634 firms in USA, Japan, Korea and Australia (response rate: 20%). Hopkins et al (1993) mailed a survey to 950 shippers and carriers about service quality gaps (response rate: 16%), and SIKA (2000) did a Swedish survey on a similar issue sent out to 85 persons (response rate: 38%). It can be concluded that the response rates rarely have reached more than 30% in surveys carried out in transportation research, usually about 20-25%. The possibility of obtaining complex data, which can be used for multivariate analysis etc when analysing different aspects, is another

advantage with a mail questionnaire. This paper deals with the use of a self-administrative mail questionnaire as a basis, but in addition is extended to involve a telephone initiated contact before sending out the mail survey.

During a survey, there are initially important considerations as to establish the types of scales used, choice of statistical measures and methods, and also identifying the effect of errors and uncertainty (in particular measurement error, non response error, and frame errors). In this paper we will deal with the last consideration, namely identifying the effect of errors and uncertainty, but the focus will be on how the survey was conducted in terms of identifying and contacting the respondents. When results of a survey are presented, most academic papers do not go into detail of the process. It is clear though, that the process of carrying out a survey and the choices made will greatly affect the outcome as well as the validity.

2. Purpose

The purpose of this paper is to reveal the outcomes of using a telephone initiated mail survey method and how this will affect the validity, reliability and especially the response rate. A survey was conducted during year 2003 and concerned outbound goods transports in Swedish manufacturing and wholesale companies, where much effort was put into covering all large goods flows in Sweden. The paper is based on the personal experiences by the authors and the problems confronted during the survey. However, the results of the survey will not be presented in this paper, as the purpose is to focus on the methodological considerations of this telephone initiated survey.

Our main problem to confront in this paper is**:** *how to increase the response rate on a mail survey and at the same time increase the validity.* Our hypothesis is that by putting more effort into identifying the right respondents and to initiate a personal contact by telephone, the response rate will increase as well as the validity of the results.

In order to increase the validity, it is necessary to examine various components in the process of conducting a mail survey. The main problems concerning sampling and data collection we recognised were: (1) *to identify the elements and the target population*, (2) *to solve frame- and sampling problems* (3) *to identify the respondents and to get them to send back the questionnaire*. These steps in the process can be defined as sub-problems that together form part of the main problem. Before going into details of these three problems, a description of the survey will be given, that will serve as a background of this paper.

3. Background

The mail survey covered the transport pattern of the core service i.e. the actual transport today. It also contained questions regarding how the respondents evaluate different aspects of logistic services (such as delivery time, price etc) and environmental issues regarding transports, and how these aspects are met in their current situation. In the questions where the aim was to measure the respondent's attitudes and opinions, the respondents had to evaluate a statement on a closed-ended 7-point intensity scale (Nardi 2003). The survey contained 30 main questions, but when including sub-questions and attitudes towards various items, the total was 155 questions. It took about 25-60 minutes to answer the survey, depending on the statistics available.

It must be emphasised that this 9-page mail survey was very extensive and included many detailed questions about the respondent's transports. In many cases, it was required of the respondents to give detailed transport statistics divided over several destinations, time periods etc, which meant that several questions required data collection and statistics from the respondents. Of course, we understood that this would strongly influence the response rate in a negative way. One option discussed was to break up the survey into two,

e.g. the environmental aspects of transportation could have been a separate survey in itself. However, the option with one larger survey was chosen and instead the intention was to increase the response rate by putting more resources into the collection phase. The main reason for choosing this alternative was the possibility of establishing relationships and to, for example, make multivariate analyses, if everything was included in one questionnaire.

A great deal of effort was put on the construction of the survey, including a test survey, and collaboration with both internal and external researchers. We looked at how prior used questionnaires, both within the research group and in external surveys, had been formulated. Lammgård (Lammgård 2004) and Saxin had performed an interview study each in companies about transports (including environmental issues), that formed base for this work. In order to make the survey process manageable, and at the same time efficiently access and store information, a computer database was designed by Bernt Saxin. The database contains the raw data from Statistics Sweden's Business Register (see section 4.1) in a user-friendly environment. Mainly three researchers worked in the collection phase and all activities performed were entered into the database, such as each telephone calls made to business units, a short summary of the telephone calls, reasons for not participating, mail survey and remainders sent etc. All data input was automatically coded with date and time.

We used double sampling in this survey. In a first step, we found out which of the Swedish manufacturing and wholesale companies in the original sample from Statistics Sweden, that were in our target population i.e. having outbound goods transports exceeding 150 kilometres. In a second step, we made a stratified random sample of 1154 local units in our target population in which the respondents were personally asked to participate in the mail survey.

4. Research findings and interpretation

4.1. Identifying the elements and target population

The original frame was the Statistics Sweden's Business Register (SCB 2004), where a random, stratified sample was made with a total of 1.800 local units out of the total of 13.325 in the register. The term local unit is not equal to company as many companies have more than one local unit, and an active company must have at least one local unit, but may have several. An additional local unit for the company exists if the location (1) has some activity (2) is in a geographically defined unit (i.e. a separate address), (3) is permanent for some period of time and (4) have employees (SCB 2004). We chose to use local units instead of companies, as one aim of the survey was to locate the transport flows geographically. The register also classifies each local unit according to one or several industry codes[1]. The register has different size classes based on number of employees, which also determined our classification of our strata: small-, medium- and large-sized local units in manufacturing and wholesale companies respectively (see Table 1). The large-sized companies included all existing large-sized companies in Sweden.

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[1] The activity of a company or a local unit respectively is described by a five-digit code according to Swedish standard industrial classification (SNI), that is based on the EU standard NACE. An enterprise as well as a local unit can be coded with several industry codes depending on the activities´ contribution to turnover or their part of worked time (SCB, 2004).

Table 1**:** Classification made based on number of employees at local units and industry code.

Industry code	Number of employees		
	Small-size	Medium-size	Large-size
Manufacturing	10-99	100-399	400-
Wholesale trade and commission trade	5-19	20-99	100-

An initial correction of the frame from Statistics Sweden had to be made as 107 local units did not exist anymore, due to e.g. bankruptcy. These inactive local units belonged to the highest extent to the strata with small manufacturing- and wholesale companies. There were then 1693 active local units left in the frame (see Column D in Table 2).

It is crucial that the frame represents the target population. In a first step, we had to find out the share of units in the sample from Statistics Sweden that was in our target population. One alternative was to estimate this share by assuming that the share for the remaining units in the frame was the same as in the sampled units in our smaller frame, but this was not chosen since the precision was not judged to be satisfactory. Instead, all local units in the sample from Statistics Sweden (see Column C in Table 2) were contacted by telephone to determine whether they had transports exceeding 150 kilometres or not, including those that were not sampled to answer the survey. In this way we could determine exactly which elements in our sample that was in the target population.

In a second step, a random stratified sample from the sample provided by Statistics Sweden was made. These selected units were to be contacted and asked to answer our survey. Two considerations determined the sample sizes in the different strata:

1) In three strata (medium- and large-sized manufacturing local units, and large-sized wholesale local units), most local units had a substantial amount of transports. We therefore decided to include all local units in these strata from Statistics Sweden's sample, in our sample.

2) In the remaining three strata (small- and medium-sized wholesale local units, and small-sized manufacturing local units), it turned out that a large portion did not have any transports, or only local distribution less than 150 kilometres. About 85% of those that did (and therefore were in our target population) in these strata was selected.

In the end, there were only 539 local units from the Statistics Sweden sample of 1693 active local units left, and 87 of these were in the target population but were not asked to answer the survey. There were only two local units that we did not manage to get in contact with despite several attempts (more than 8). This resulted in a total of 1154 local units in our target population that were contacted for the survey (see Column G in Table 2). Note that by applying this method in the sampling process, the sample sizes were arrived at through double sampling.

Table 2: Total units in Sweden, respectively in target population, and contacted for survey

	A	B	C	D	E	F	G
	Total local units in Sweden N	Estimated total local units in Sweden in target population N´	Total initial sample from SCB	After adjusting for inactive units in SCB sample (C)	Number of local units in target population in SCB sample (D)	% of local units in target population in SCB sample (E/D)	Contacted in target population for survey n
Small manufacturing	3503	2244	345	322	221	68.6%	183
Small wholesale	6711	3385	345	302	174	57.6%	148
Medium manufacturing	970	787	345	335	280	83.6%	279
Medium wholesale	1721	1063	345	318	213	67.0%	192
Large manufacturing	242	222	242	241	222	92.1%	221
Large wholesale	178	131	178	175	131	74.9%	131
Total	13325	7832	1800	1693	1241	73.3%	1154

4.2. Frame- and sampling problems

This discussion aims at identifying frame problems that aroused while conducting this survey. The risk of an incomplete frame always exists, but by using the Statistics Sweden's Business Register which is updated continuously, this risk was minimised. An obvious correction of the frame had to be done when the sampled local units were contacted and it turned out that some did not exist anymore for some reason, for example bankruptcy. When conducting a survey using simple random sampling, there are several frame problems to confront. According to Kish (1965), there are four basic frame problems: missing elements, clusters of elements, blanks or foreign elements, and duplicate listings. All those problems may affect the possibility to choose elements from the target population with the same probability. In our survey, we confronted the frame problems with clusters of elements and foreign elements.

The frame problem with *clusters of elements*, is present when one selected element contains several elements of the target population. One method that can be used if the clusters are not too large and too frequent, is to measure all elements hiding behind the selected elements and to include all of them in the sample. This makes the sample larger but this is not a disadvantage (Kish, 1965). In our survey, we got a sample of local units where some only had administrative functions locally, but had warehouses (that were not listed as local units) with physical transports. This fact that one local unit could hide several units at different locations, resulted in a cluster of elements in our frame. We solved this by primarily get the respondent at the local unit to answer one questionnaire for each sub-unit. Therefore, all elements in the strata had the same probability of selection.

The frame problem with *blanks or foreign elements* is present when there are elements in the frame that are not in the target population and it is necessary to eliminate these elements from the sample. In our sample from Statistics Sweden, all local units that did not have transports exceeding 150 kilometres were considered as foreign elements. This frame problem also existed in other cases that we did not foresee in advance. An example of foreign elements found within manufacturing companies, was in the sub-sector of publishing and printing of newspapers. The local units of newspaper companies´ editorial offices were coded as manufacturing companies (since it is the content that is being produced), however, the physical transport is generated by the local units printing the newspaper. Therefore, the editorial offices were excluded from the frame, while the printing units were allowed to remain in the frame. In addition, many examples were found where the central head office for a manufacturing company group (often located in Stockholm) was recorded in the frame as a wholesale company but the rest of the local

units were recorded according to their business e.g. manufacturing of an industry product. As the head office did not have any transports as an administrative unit, it was excluded as a foreign element.

In order to solve sampling problems, we developed principles in situations that required special attention. Some of the principles are discussed below. As mentioned before, the origin of a physical flow is not always the same place geographically as where the local unit is located, nor where the transport is bought. An example of this type of situation is when the transports are outsourced to a Third party logistics provider (3PL), so that the goods are distributed from an outsourced stock. This affects the results when analysing the answers divided by strata. If the 3PL is answering the questionnaire on behalf of a middle-sized company, then the answers probably will differ from other middle-sized companies, since the goods volume transported is larger for the 3PL. Another example is when the transports are managed from a central stock, located at a geographically different location than the local unit in the sample. In cases like this, contact was established with the stock facility. All those considerations have to be taken into account when the results are analysed according to local unit size or geographical location etc since they may not be representative for its´ strata.

In some cases, a central function of the mother company was in charge of buying all goods transport for a group of companies. Then, the questionnaire had to be divided into two parts, where the questions regarding the flows of goods were answered locally at the local unit while the questions addressing criteria when purchasing transports were answered at the central function. The primary focus was locally but the purchasing criteria are many times formed centrally in the company. Also, all transports are often managed at this central unit for transports. All types of information about how the work was divided within the companies came to our knowledge in the phone calls made in search for the proper respondents i.e. as partial result of the telephone initiated method applied.

The aim of adapting these principles was to ensure that the respondent answering the survey had knowledge of the transports. In this way, we believe that the validity became better than if the mail survey would have been sent out without identifying the respondent in advance. At the same time, there was a risk by adopting principles and by introducing an element of personal judgement from our side, based on the information given in the phone calls, which might affect the reliability in a negative way. Finally these risks were evaluated and we judged these risks to be inferior than if we had not adopted those principles at all.

4.3.   Identifying respondents and how to get the questionnaires back

The mail survey covered outbound transports bought or managed by the local units. However, in many supply chains, industry leaders may control and purchase also their inbound transports. The consequence for the survey was that some of the sampled local units had outbound transports but these were ex-works flows i.e. the buyer of goods paid and managed the transport. The problem was therefore that the decision-maker was not at the local unit, but in another company. Since these flows can be substantial, for example suppliers to the car industry, they were followed up by contacting the buyer of the goods i.e. the transport buyer. In this way a separate stratum was created dealing with ex-works flows that later could be integrated with the rest of the collected data.

Along with the correction of frame and solving the sampling problems, was the work of finding the proper respondent at each local unit. Included in the mail survey, was a hand-signed, personal introduction letter from Professor Arne Jensen of the Logistics and Transport Research group. As a test, a few hundred surveys were sent directly without

prior personal contact to some of the smaller local units (addressing the person in charge of transports) in order to test the response rate. The outcome of this test was a response rate of about 10% and this confirmed our suspicion that the survey was too time-consuming that respondents would answer it without further efforts from our side. Also, we learned later when the proper respondents were phoned up and identified, that these surveys often had not reached them at all.

Instead, we began making telephone calls to the local units, in order to identify the persons in charge of the outbound goods transport. The first contact in almost all large and middle-sized companies was with the telephone exchange of the company. After asking for the logistics/transport manager or someone in comparable position, the connecting of the phone calls was normally not correct. Either the person answering was just a receiver of goods at the factory floor, or working within other areas. Often, the telephone exchange did not know of anyone having this or similar job tasks. In addition, the person connected to was often not available to answer the phone call, many times in a meeting. It often took more than 2-3 phone calls to talk to a person, and finally it turned out to be the wrong person anyway. The result was that every local unit in the sample demanded many phone calls. Once located, we took note of the e-mail address and/or cellular phone number which helped later on in the process of reminders of the mail survey. Finally, besides from identifying the proper respondent, the advantage with the initial phone call was that it gave useful background information of the transport situation and how the logistics function was organised within the local unit, as well as within the company. Also, this information helped us to understand the complexity of the problems of reliability when conducting a survey study.

A vital purpose of the phone calls was at the psychological level, as the respondents promised to help our research by filling in the questionnaire if we sent it. The cultural setting in Sweden is often that "a promise is a promise". Therefore, it would have offered resistance not to comply with this promise. It happened that respondents asked us to phone them up again to remind them if we did not receive the questionnaire within the next weeks. If it happened that the questionnaire was not sent back and time went by, then more reminders were used. This was done through written reminders, e-mails, and phone calls. When the respondents were phoned up, they often felt bad about not having answered the questionnaire. Note that a small share of the contacted units in our target population, equal to 3% (37 local units), turned down to answer the survey on the initial phone call, and therefore did not even receive the first survey by post. Most of theses were among the small- and medium-sized companies. A majority, 86%, said that it was due to lack of time.
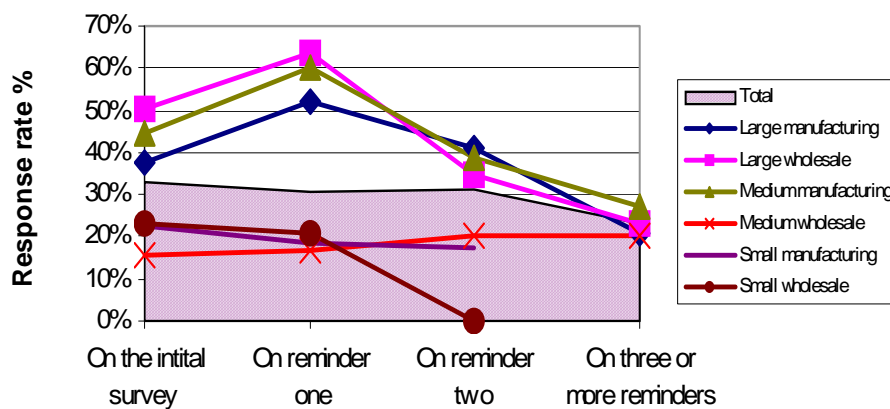

Figure 1: Response rate on each activity, divided by stratum.

The effect of the initial survey sent out (always initiated by a personal telephone call where the respondent agreed on participating in the survey) was more effective than the second reminder sent out, as seen in Figure 1. The graph shows the response rate on each individual reminder, i.e. the number of questionnaires that were returned in relation to the number of reminders performed. Reminder one gave the best overall effect among all activities carried out in the large-sized companies as well as in the medium-sized manufacturing companies. The reminders in general had less impact on the response rate among the smaller companies, and for the medium-sized wholesale companies. Fewer reminders were sent out in these strata due to their relative small share of the total transport volume. Also, the effect of three or more reminders was decreasing rapidly (with the exception for the medium-sized wholesale companies), so the work of reminding respondents was put to an end. Note that the down-sloped curve showing the effect of reminder two among the small-sized wholesale companies, is based on only a few cases. However, it can be concluded that reminders, not surprisingly, do affect the response rate in a positive way.

Beforehand, a concern was that the respondents would be annoyed by getting many phone calls and reminders. Few respondents contacted at the local units did not want to participate when they were initially contacted, even though this amount increased after a few reminders, as some local units realised then that they could not find the time to answer the questionnaire. Time was in general the most common reason for not answering the survey as the questionnaire took about 20-50 minutes to fill in, depending on what available statistics the working place had. This was especially the case for the local units in the smaller companies and the response rate was lowest in these groups, 32% (see Table 3). A probable explanation is that these companies have low volumes of goods transported and therefore do not put a major effort into collecting data about their transports. A visual presentation of the cumulative response rate per stratum can be seen in Figure 2.

Table 3: Effect on response rate divided per stratum for each activity performed, and also final response rate and total number of contacted in target population.

|	After the first survey	After one reminder	After two reminders	Final response rate	Number of responses	Contacted in target pop. for survey
Small manufacturing	23%	17%	17%	32%	58	183
Small wholesale	19%	19%	0%	32%	48	148
Medium manufacturing	44%	66%	39%	66%	183	279
Medium wholesale	19%	18%	24%	29%	55	192
Large manufacturing	39%	53%	41%	59%	131	221
Large wholesale	50 %	74%	35%	70%	92	131
Total	**32%**	**41%**	**26%**	**49%**	**567**	**1154**
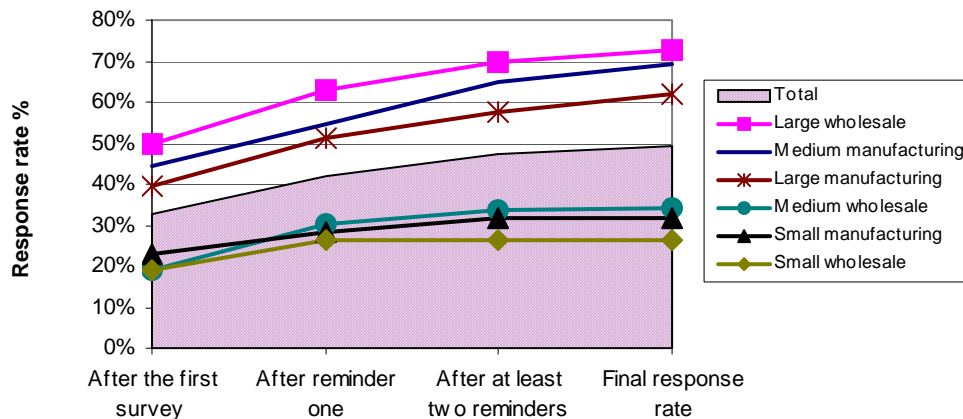
Figure 2: Total cumulative response rate, also divided per stratum, based on activities performed.

The final response rate was 49% but if this figure is adjusted by excluding the small manufacturing- and wholesale companies, then the final response rate was 56% (where 63% were in the manufacturing companies and 46% in the wholesale companies). Important is the fact that the largest companies in the two groups got a 63% response rate and about the same percentage is achieved also if the medium-sized manufacturing companies are included (64%). These three groups of companies have the largest volumes of goods transported (about 98% of total transported goods stated in the survey, measured in tonne equivalent weight) and therefore the major efforts to get the surveys sent back were made in these groups i.e. highest number of contacts by telephone and mail. The reward for this work is shown in the high response rates for these groups.

5.   Conclusions and recommendations

As expected, the personal contact made the commitment of answering the questionnaire stronger. Frequently, when the respondent was phoned up to be reminded, the respondent could say that the questionnaire would be sent in "since I gave you that promise in our last phone call". In one case, a respondent called up only to excuse himself for not answering the survey as he had promised, because the person he needed the information/statistics from, had died a few days earlier. His commitment to his promise was not in doubt. As mentioned before, the most common reason for not answering the questionnaire was that time was lacking or lack of statistics. The response rate in smaller companies (32%) was also much lower than in the medium- and large-sized working places (56%), where it was probably more common with a specialised function working with transports exclusively. This seems to be the case especially for the largest companies, whose strata got a response rate of 63%. Also, the smaller companies did not have available or easy access to data for answering the questionnaire. Looking at these larger companies and comparing our study with other international studies, it can be concluded that 63% is a very high response rate, particularly considering the very complex questionnaire used. Almost certainly, this is due to the personal contact established with the respondents and the frequent remainders.

Regarding practicability, it is advisable to be a few persons involved as the work of making phone calls can be very tiring, and it is important to always be alert when talking to the respondents. The risk that has to be taken into consideration is that the more persons in

the process, the harder it is to coordinate and control the information. The value of a well-structured database to log all activities cannot be underestimated, as this method put high demands on the research team to keep many contact activities in order. In this way, everyone is fully informed of all prior contact when for example respondents phone up and to discuss or ask about the questionnaire. Naturally, it also helps if the database is created in a user-friendly environment so that everyone can enter and use the information independently. If all data is automatically stored with date and time records, it is easy to get statistics and get a true view of the collection process in time, a type of research diary.

All practical problems of finding respondents etc. were underestimated initially and especially how time-consuming solving them would be. The result was that the collection phase of the survey stretched out in time to approximately 10 months. In our case this was not a major problem for the results since they did not include any longitudinal information. Evidently, the comparable long time-period of collecting data, including identification of proper respondents and the establishment of personal contact, affected the budget and raised the final economic cost of the project, compared to if a traditional self-administrated questionnaire would have been used. However, by looking at the process and cases described in this paper, it is obvious that the quality of the data would be a lot worse if the mail questionnaire would just have been sent out according to Statistics Sweden's business register. What worse is, not only would the response rate have been lower, but we, as researchers, would have thought that the answers truly represented the actual situation in the companies studied. Doing research and writing articles based on such inaccurate data would most likely do more harm then good for our research area and scientific knowledge gained. By taking a personal contact will all respondents, we have both increased the quality of the data and are better aware of any shortcomings in the material. If we would have used a traditional survey method, i.e. just sending out the questionnaires addressed to the "logistics manager" etc. we would have been unaware of what the answers actually represented, e.g. a group of companies, outsourcing, foreign elements etc.

In sum, these results show how a telephone initiated survey method affected the response rate in a positive way and also gave a better understanding of the data collected. By taking personal contact with the respondents, an informal link was established which generated a greater commitment to answering the survey. In addition this method made it possible to generate knowledge of how the transports are organised within the companies, which is important background information. We also believe that the validity increased as a result of the work of identifying the respondents most suitable for answering the survey in advance and by adopting some principles to follow, despite the possible risks of introducing an element of personal judgement from our side, based on the information given in the phone calls. We most certainly know that the quality of the answers of the questionnaire improved by assuring that the respondents were the best suited for the task. This fact along with the increased response rate, are probably the most valuable outcome of using this telephone initiated survey method. The conclusion is that a telephone initiated survey method is well suited for logistics research and can be highly recommended. The experiences of this survey method hopefully provide knowledge for collection methods of future surveys within and outside the boundaries of logistics research.

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