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## **AN APPLICATION OF E-MAIL SURVEY USING A WORD FORM**

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ALEXANDRE REIS GRAEML, Centro Universitário Positivo (UnicenP) – Brazil  
e-mail: alexandre.graeml@fulbrightmail.org phone number: 55 41 3352-4424

JOÃO MÁRIO CSILLAG, Escola de Adm. de Empresas de São Paulo (FGV-EAESP) – Brazil  
e-mail: csillag@fgvsp.br phone number: 55 11 3281-7780

## AN APPLICATION OF E-MAIL SURVEY USING A WORD® FORM

**Abstract:** As companies and people start incorporating the Internet to their work routine, using its resources to perform daily activities, it becomes easier to use the possibilities offered by the Web to collect data by means of questionnaires. This paper reports the authors' experience using an MS Word form to convey a questionnaire for a quantitative research project. The form was sent via e-mail to manufacturing companies in Brazil, with the intent to find out the perceived Internet's impact on the industrial sector. Response was significantly faster than it would be achieved with a conventional procedure, return rate was satisfactory and the cost was much lower, due to the virtualization of the contact with the participants.

The success of the initiative motivated the authors to share their experience with the academic community, hoping it is a contribution to the development of sound methodologies for e-mail surveys.

Although the focus of the study was strictly academic, the authors believe that the procedures that were used can easily be adapted to market research, feedback gathering from customers and other business needs.

**Key-words:** e-survey, questionnaires, market research, intelligent forms.

### *Introduction*

When the authors thought about carrying out a survey involving manufacturers in Brazil, with the purpose to identify the impacts of the Internet on their daily routine and their strategies to meet their customers' needs, the Internet, itself, seemed to be an interesting communication channel to reach potential participants. Previous work developed by other researchers (RAY AND TABOR, 2003; GUNTER *et al.*, 2002; TAYLOR, 2000) confirmed something in which the authors of this paper intuitively believed: Internet surveys are cheaper and present more favorable results with respect to speed.

For a survey to be sent through the Web, potential participants need to have access to it, of course. Gunter *et al.* (2002) remind us that it is not likely that Internet surveys are representative of the overall population if the profile of those connected and those that aren't is different, with respect to the object of the survey. Ray and Tabor (2003) agree with that and emphasize the fact that the choice of a suitable communication channel is of key importance to the success of the research project. For those authors, the Web works best for sample groups that have access to the Web and feel comfortable using computers. In that sense, a quick analysis of the database that was intended to be used for the survey, whose characteristics will be better explained further ahead, showed that 77.5% of the listed companies had an e-mail address in the database.

As the intention was to carry out a study that could involve the greatest possible number of participating companies, the tool that was chosen, from the beginning, was the questionnaire.

Taylor (2000) believes that the use of the Internet will represent such a revolution in the way to carry out surveys that it will be comparable to the demonstration that it was possible to predict the results of elections, using a sample of interviews, carried out following scientific procedures, according to the demonstrations of George Gallup, in the 1940's. Taylor considers that the Internet will dramatically reduce costs involved in research projects and will allow for much larger samples to be used, with much faster response.

Those advantages had been perceived by the authors of this paper, when they performed preliminary research with North American software companies, surveyed in 2002. They were also present in the current study.

There was still an important issue that had to be solved before going ahead with the project, though: should the digital questionnaire be developed as a Web form, to be filled in on-line, or should it be a form to be sent as an e-mail attachment, which could be answered while the participants were off-line? It was not just a matter of choosing the technology to be used. There would be considerable methodological consequences to such decision.

A questionnaire that is hosted in a web-site, to be filled in while the respondent is connected to the Web, can be conceived to have a dynamic behavior, using the answers to previous questions in order to determine the next ones. In other words, the questions depend on the interaction of each individual with the tool.

That doesn't happen with a questionnaire that is sent as an attachment to an e-mail message, though, which has a unique set of questions that is presented to all respondents. In that case, the only thing that can be done is suggest that a respondent skip a sequence of questions, when they do not apply to his/her case, according to an answer that was given above. This type of questionnaire can be developed using a regular word processor or even the e-mail message editor.

A third possibility would be to request participants to download a computer file to their machines from a link contained in a web page. The questionnaire sent as an attachment or downloaded from a web page has the advantage of not requiring the participant to remain on-line during the time the survey is being filled-in, i.e., it's possible to close the connection, fill in the questionnaire and connect again to return it. Of course, this advantage has to be evaluated against the possibility of more interactivity provided by web forms, as mentioned before.

Dillman (*apud* GUNTER *et al.*, 2002) reminds us of the fact that surveys that are carried out on-line are completely different to off-line surveys. The interactive element of on-line electronic surveys, based on automatic routing of the respondent, according to the answers that are given to previous questions, sometimes brings them, methodologically, closer to telephone or face-to-face interviews than to other types of self-applicable questionnaires, such as off-line digital questionnaires (e-mail attachments, for example) or by regular mail.

After some reflection about the issue, the authors chose to use an off-line questionnaire, to be made available as an attachment to an invitation e-mail message and, alternatively, which

could be obtained from a download link from the researchers' website. The following reasons lead to such decision:

- the researchers feared that many of the participants had dial-up connections to the Internet. If that were the case, it wouldn't be convenient to keep them connected to the Web during the period of time required to fill in the questionnaire. That could make unavailable the company's telephone line, possibly also used for regular telephone communication, particularly in the case of small companies.
- the researchers intended to send the questionnaire via regular mail to a group of companies that didn't have an e-mail address in the database, for the sake of controlling and statistically validating the sample of respondents as part of the intended population (which involved all companies in the database). In case an on-line questionnaire were used, with interactivity features, the comparison with the results obtained by means of regular mail, on a later stage, would be biased.

The paragraphs that follow explain the methodology and the steps that were used in carrying out the survey, as well as difficulties that were faced and the solutions that were given to them.

#### ***Previous preparation for the survey***

First of all, the authors reviewed the literature and tested the survey methodology in a different situation, in order to get acquainted with the procedure, particularly with e-mail surveys, which consist on sending the questionnaire along with an e-mail message to potential participants.

The test of the methodology included a smaller scope survey, targeting a smaller database that included software development companies from the western coast of the United States. Those companies were submitted to a digital questionnaire, which was very similar in format to the one that was intended for the major project, involving Brazilian manufacturers. In the North American survey, the database included information of little more than 700 companies, 50 of which answered the questionnaire that was sent as an attachment to an e-mail message.

The reason to experiment with a database that was ca. 15 times smaller than the one that was going to be used in the major project was to evaluate the volume of interaction that would be required after the questionnaire was sent, in order to clear doubts and convince potential participants to respond. It would be frustrating for the researchers, and probably also for the participants, if the researchers didn't have enough time to pay attention to messages from potential respondents demanding further explanations, which would need to be treated individually. That would provide a bad impression about the survey and the research center that was sponsoring it.

### ***Definition of the scope and population, and choice of sample***

According to Gil (1991), a research project involves the following stages:

- Specification of objectives;
- Definition of concepts and variables;
- Elaboration of the instrument to collect data (the questionnaire, in this case);
- Pre-test of the instrument;
- Selection of sample;
- Data collection and verification;
- Analysis and interpretation of the results; and
- Presentation of results.

As this paper consists on the presentation of the methodology that was used in a specific research project, the analysis, interpretation and presentation of the results of the specific research project are not part of the scope, here. The other components, which relate more directly to the methodology, will be discussed in order to contribute to the understanding of the advantages and disadvantages of using e-mail surveys in academic and business oriented surveys.

Lakatos and Marconi (1991) explain that delimiting the research project means establishing boundaries for the investigation. Boundaries may be related to the characteristics of the research project, extension and several other factors.

In order to reduce complexity and allow better understanding of the achieved results, the research project was limited to manufacturing companies with head quarters in the state of Sao Paulo, the most industrialized state of Brazil. Another reason for such delimitation was the fact that the researchers had access to a database with information on 15279 manufacturers from that state, made available by FIESP<sup>1</sup>.

The next step, after performing the delimitation of the research project, i.e., establishing its boundaries, still according to Lakatos and Marconi (1991), was to decide if the research would involve all companies (census study) or just a sample. It's usually not possible to involve all individuals in a research project. In order to bypass this difficulty, a sampling method is used, which consists on working with a subset of the population that is representative of the whole group for the characteristics one intends to study.

Several issues may interfere with the validity of surveys that are carried out via the Internet. Ray and Tabor (2003) remind us that sample selection is a particularly important issue.

Although all companies that had an e-mail address registered in FIESP's database<sup>2</sup> were invited to participate in the survey, the researchers already knew that the return rate would represent just a fraction of the population, according to their previous experience with e-surveys<sup>3</sup> and the literature on the subject. The respondents would, therefore, represent a convenience sample, which could not be considered as a probabilistic distribution of the population, without a

careful statistical analysis. Thus, special attention needed to be paid to sample validation procedures.

Although no simple and definite solution was found, in order to ensure sample representativeness, measures were taken to improve its acceptability. One hundred companies, whose e-mail addresses in the database were wrong, were contacted via telephone, in order to obtain an alternative (working) e-mail address. The same way, one hundred companies that didn't have any e-mail address in the database were also contacted via telephone, requesting an existing e-mail address (and the great majority of them provided a valid e-mail address, then). The authors also considered sending the survey through regular mail to all of the remaining companies that didn't have an e-mail address in the database, but that was considered unnecessary, later on.

### ***Planning and construction of the data collection instrument (questionnaire)***

The next step consisted on the elaboration of the data collection instrument. The questionnaire was considered the most suitable instrument, taking into account the type of data that the researchers were willing to obtain.

Questionnaires are, according to Gil (1987), an investigation technique that comprises a reasonable number of questions that are presented in written to respondents, with the purpose of finding out their opinions, beliefs, interests, feelings, expectations and experiences. In this case, the questionnaire had 75 objective and structured questions, 60 open fields for complementary information or explanations and 8 fields for the identification of the respondent and company (which were optional).

The questionnaire was developed based on information obtained from the review of the literature, with the purpose of collecting primary structured data that could be analyzed in order to evaluate the real impact of the Internet on the manufacturers' corporate environment.

Rea and Parker (2000) stress the fact that there are two fundamental issues to be considered during the elaboration of a questionnaire: content and format. With respect to the content, questions should be presented using language that is compatible with the respondents' cognition level. Vague sentences and words should be avoided, as well as questions with multiple purposes. With respect to the format, one should concern about the distribution of the questions in the questionnaire, as well as with the number and order of the alternative answers to each question.

Taking those recommendations into consideration, the form was divided in 6 sections:

- section 1: questions about the size of the company, field, type of access to the Internet, existence of intranet/extranet and existence of a web site for the company.
- section 2 (only for companies that claimed to have a web site): questions about the content of the company's web site.
- section 3: questions about the intensity of use of several communication tools made available by the Internet.

- section 4: questions about changes in the way companies perform specific activities, considering the possibilities offered by the Internet.
- section 5: questions about technologies/methods/techniques that the companies intend to use in the near future (next 3 years), which relate to the Internet.
- section 6 (optional): respondent's data and data on the company, for those who wanted to get the results of the research sent back to them.

### **Types of questions used in the questionnaire**

The questionnaire that was developed consisted on objective questions, which could be answered by means of check boxes or drop-down menus that could be activated by clicking the mouse without the need of any further typing (see Figures 1 to 4). There were also open fields for the inclusion of text, along the questionnaire, to allow for any complementation or explanation that the respondent felt like providing.

On sections 3 to 5 of the questionnaire, a scale was used, which was inspired in the Likert scale, so that the collected data could easily be submitted to statistical analysis, involving the evaluation of correlations and factor analysis. Among the advantages of the use of such scale are: it's easy to develop and apply the questionnaire and the respondents understand it very quickly (MALHOTRA, 2001).

The interval that was adopted for the scale was 7 points, for questions in sections 3 to 5.

In section 3, in which questions related to the intensity of use of several communication tools made available by the Internet, the scale included the following options: "company doesn't use", "very little use", "little use", "regular use", "large use", "very large use" and "essential to the business".

In section 4, which dealt with the changes that took place in the company, caused by the Internet, with focus on the last 3 years, the scale had the following options: "no change", "very little change", "little change", "reasonable change", "significant change", "very significant change" and "radical change".

On section 5, which intended to depict the technologies/methods/techniques that the company uses or intends to use in the next 3 years, the options in the scale were: "we use it very little", "we use it little", "we use it reasonably", "we use it much", "we use it very much" and "it's essential to the business". In addition to the options in the scale, this section had two additional possibilities: "we are not going to use it (next 3 years)", "we are going to use it in 3 years".

All questions from section 3 to 5 still had two other options that didn't belong to the scale, but that were considered important in order to avoid answers that could bias the quality of the collected data and, consequently, the analysis. Those options were: "I don't know" and "it doesn't apply".

The seven point scale offers, in case of sections 3 and 4, a neutral point in the middle of the scale (fourth alternative), which allows for the identification of neutral or indifferent

behavior, with respect to the statement being proposed. In case of section 5, a neutral point in the middle of the scale is not achieved, because the authors wanted to obtain additional information, with respect to the company's intentions for the future.

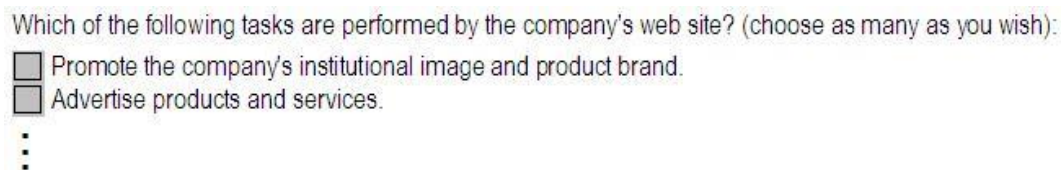
A 7 point scale has the advantage of presenting good discrimination power among the alternatives that are provided, without submitting the respondent to a stressful decision making process, resulting from the exposition to a large number of alternatives, which could happen, if the number of options were larger (MALHOTRA, 2001).

The scales that were used in the questionnaire aren't, in fact, interval scales, as true Likert scales should be. It is impossible to tell if the distance between "we use it very little", "we use it little", "we use it reasonably", and so forth is the same according to the respondents' perception, just to mention questions in section 3. Those scales are only ordinal. It is only possible to treat them as interval scales, in order to perform statistical analysis (most of which are based on the calculation of mathematical distances) if we are not very rigorous with respect to the methodological criteria.

### ***Digital questionnaire with automated fields***

Some developers of electronic questionnaires that participated in a survey that was carried out by Ray and Tabor (2003) believe that options that can be selected by means of *radio buttons*  or *check boxes*  make a questionnaire clearer. On the other hand, according to those authors, a list of *drop-down* alternatives reduces the required space.

The current survey was conceived using an "intelligent" MS Word form, which automates the procedure of choosing the answers, to some extent. As it was said before, most questions could be answered by means of just a simple "click" of the mouse on one of the provided alternatives. *Check boxes* were used for section 2 and *drop-down* menus for sections 3 to 5, according to the convenience and respecting best practices recommendations. Figures 1 to 4, below, show examples of form features that were used.



Which of the following tasks are performed by the company's web site? (choose as many as you wish):

- Promote the company's institutional image and product brand.
- Advertise products and services.
- ⋮

Figure 1 Example of *check box* questions. The participant just has to click on top of the relevant answers (section 2).



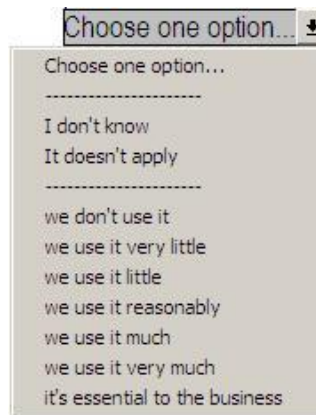


Figure 2 *Drop-down* menu used for questions about the intensity of use of Internet communication tools (section 3).

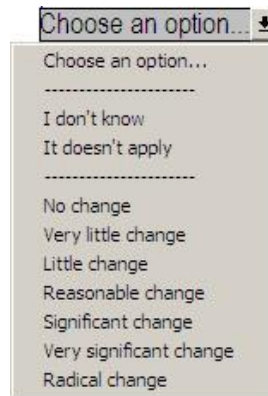


Figure 3 *Drop-down* menu used for questions about the level of change related to several value adding activities, resulting from the use of the Internet (section 4).

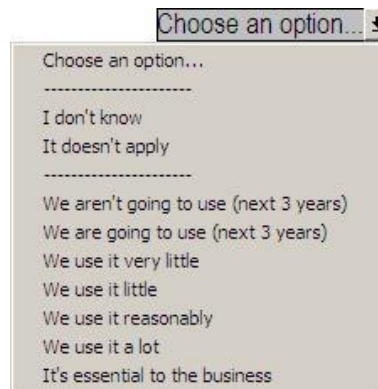


Figure 4 *Drop-down* menu used for questions about the intensity of use (or intention for the future) of a few technologies/methods/techniques, related to the use of the Internet (section 5).

The possibility to fill in most of the questionnaire with mouse clicks was implemented to make it faster and allow the survey to be completed at the time the participant checked his/her e-mails.

Filling-in needed to be simple in order to increase chances of a good response rate. The authors believe that the probability of achieving good response rates is dramatically reduced if the questionnaire is not completed as soon as the respondent finds it in his/her mail-box. This belief is supported not just by common sense, but also by previous research in the literature. Ray and Tabor (2003), for example, state that response rates are better if a questionnaire is brief, relevant and interesting to the respondent.

Another advantage of using a digital questionnaire is that it is much easier to collect and organize the data, significantly reducing the incidence of errors (GUNTER *et al.*, 2002).

### *Sending personalized messages using a bulk mailing software*

As the e-mail with the questionnaire would be sent to thousands of potential respondents, it would be very demanding to prepare a single message to present the survey to each one of them. However, the authors believed that if they could personalize the message, including the addressee's name and emphasizing the importance of the participation of the company, naming it, specifically, in the body of the message, that would increase the return rate. The respondent wouldn't perceive the message as some sort of spam but as a personal request for collaboration.

Thus, the first contact with the respondents was carried out by means of a customized message, sent using a special mailing program (Mach5 Mailer), capable of including variable information in each e-mail, prior to sending it. Figure 5, below, shows the English translation of the customized e-mail message that was sent to invite potential participants to the survey.

```
Subject: ###'s survey on the impacts of the Internet on manufacturing companies' routine
To: <[%[Contact] %>
    <[%[Company] %>
<%IF[Sex]="F" THEN%>Dear Ms. <%ELSE%><%IF[Sex]="M" THEN%>Dear Mr. <%END IF%> <[%[Contact] %>,
We would like to include <[%[Company] %> in our survey about the impacts of the Internet and other IT
on industrial companies. Would you be the ideal person to answer the proposed questionnaire? (The
respondent should be someone with a strategic view of the company). If you think there is someone
who's better suited, could you please tell us his/her name, position and e-mail address?

The survey won't take more than 10 or 15 minutes of your time and it is very important for us to
understand the way the Internet is changing the industrial scenario. Even in case the company
doesn't use the Internet much, please, answer the questionnaire. Its questions may help your
company reflect about the ways the Internet and other technologies may contribute to greater
competitiveness in the next few years, according to ###'s studies.

In case the survey's Word form (which is sent in annex) doesn't reach you, possibly due to the
existence of a firewall blocking attachments, it can also be obtained in the following address:
http://www.### (click on <Research Projects> and do the "download"). The file is free of virus,
having been checked with AVG 6.0.535.

We thank you for your cooperation. Individual data of the participating companies will not be
revealed, but we will prepare an executive summary, with aggregate results, to be distributed to
all participants, in recognition for their help.

Regards,

###name of the researcher###
```

Note: The name of the research center that sponsored the survey, as well as the name of the researchers, were replaced by ###, in order not to bias the *blind review* procedure.

Figure 5 Customized e-mail message that was sent to present the survey to potential participants.

Additional contacts that were, eventually, needed in order to answer participants' questions, were carried out in a personalized way, with individual answers being prepared for each case, due to the difficulty of addressing individual demands by means of standard messages.

Previous experience of the authors with a survey sent as an attachment to an e-mail message was essential to improve the achieved response rate. In the survey with North-American companies, the effect of personalizing messages to get higher return rates had already been noticed. One other thing that the researchers had realized was that using an informal message to request help is more efficient. In that case, a formal message had been sent to a pilot group, providing the information on the research center and about the purposes of the research project. The return rate was lower than expected, so that the authors decided to use a second pilot group, to which a more informal message was sent. Although the second message had, basically, the same content, it addressed the respondent in a more friendly way and asked almost for a "special personal favor" of dedicating a few minutes to the survey. The result was significantly better, so that the second message was used for all of the remaining potential respondents.

Dilmann (1978) provides some recommendations, which match previous perceptions of the authors of this paper with respect to their experimentation with e-mail surveys. One interesting thing is that Dilmann wrote them much before the Internet became a common and useful way of carrying out surveys. Dilmann's advices, which were used in the conception and implementation of this research project, were conceived to improve the return rate of regular mail surveys:

- provide a reward to the respondent, showing consideration, supplying verbal appreciation, using an approach that shows the importance of the respondent, supporting his/her values, offering tangible compensations and making the questionnaire interesting to him/her;
- reduce the respondent's costs, making the task brief, reducing the required mental and physical effort, eliminating chances of exposition to embarrassing situations, allowing for anonymous responses, eliminating the sensation of inferiority towards the researcher; and
- establish a trust relationship, previously providing evidence of appreciation and relating the survey to a known and respected organization, and building other interchange relationships.

Another issue that the authors found to be important, in their previous experience with the e-mail survey with North-American companies was the need to know beforehand how each of the questions would be treated, later on, in the analysis stage. The form of treatment defines, to a great extent, the way a specific question should be presented to the participants of the survey.

### ***Pre-test and pilot use of the questionnaire***

According to Gil (1987), the pre-test has the main objective of evaluating the research instrument (the questionnaire, in this case), to ensure that it measures exactly what it is expected

to. One should not intend to capture any information from the pre-test that directly contributes to reaching the final objectives of the research project.

Lakatos and Marconi (1991) consider that the pre-test is also important to check if the questionnaire presents three important elements:

- Trustworthiness: the results should not depend on the person who applies the questionnaire;
- Validity: collected data should be needed for the research; and
- Operability: the words used in the questionnaire should be accessible and have a clear meaning.

Pardinas (*apud* LAKATOS AND MARCONI, 1991) reminds us that the researcher needs to be sure that each of the questions is required for the investigation; it is also important to know if it needs support from other questions and if the respondent has the required information to answer the question, accordingly.

The pre-test may increase the researcher's confidence with respect to such issues, allowing for the verification and correction of potential problems, before the survey is presented to the participants. It is also an opportunity to notice things that need to be better explained, because they generate doubts or dubious interpretation, situations in which the text needs to be improved.

A preliminary version of the questionnaire was applied to a group of executives who were taking an extension course at the school where one of the authors teach, with the purpose of checking if the content was suited. This group provided an important contribution in the sense of making questions more accessible and comprehensible to the actual participants, who would be submitted to the questionnaire later on.

Another objective of this initiative, in addition to ensuring that the questions were comprehensible, was to detect the need of inclusion of any important question that had been left out, for some reason. Those involved with the pre-test were invited to present their impressions on the questions that were proposed, and to suggest additional questions, in open fields in the form.

With respect to the technical skills and computer knowledge, required to handle the questionnaire, prior to sending it to the whole group of potential participants, a fraction of them (1%) was chosen in a random way, to be submitted to a pilot test. Differently to the intent of the pre-test, the objective of the pilot test was to anticipate any possible difficulties the participants could have to open, fill in and send back the questionnaire. This pilot group received the questionnaire a month ahead of the others. Although some participants showed isolated difficulties, which will be further discussed in the "Limitations of the method" section, further ahead, the authors didn't think it was necessary to perform major changes to the instrument. However, the application of the survey to this pilot group allowed the detection of a problem that had not been anticipated: the form was being sent in the format of the last version of MS Word, which would prevent some potential respondents, who were still using previous versions of the

product, to participate in the survey. A few tests were carried out and it was chosen to use the format of MS Word 95, instead, considering that it didn't affect the functionality of the research instrument and could "democratize" access to it. The use of a pilot test had a second benefit that was most appreciated: it allowed the authors to have a clearer idea of the return rate they would have after sending the survey to all companies in the database.

### ***Application of the questionnaire (data collection)***

This is the stage of a research project in which a data collection instrument is applied, in order to obtain evidence that can be used to answer the research questions. In practice, the data collection stage is when the procedures that were planned to reach the objectives of the scientific work are launched (SANTOS, 1999).

The e-mail message with the invitation for the companies to take part in the survey (see Figure 5) was posted on 11.18.2003. Twenty days latter, on 12.08.2003, a reinforcement e-mail message was sent.

The number of messages that arrived back each day, with the participants' answers to the questionnaire was accounted for. Figure 6, below, shows the response pattern along the time, since the first message was sent on November 18, 2003. During the period of time shown in Figure 6, 631 questionnaires were received back. Twenty six additional questionnaires were received in January and February, 2004.

It is interesting to note that 75.9% of the answers that were received from the date the invitation was issued until the reinforcement e-mail message arrived back in less than a week and 93.8% within two weeks. The same pattern of behavior took place after the reinforcement e-mail message: after a week, 78.7% of the answers were back. After two weeks, 92.3% of the whole volume of answers had already been accomplished. This shows that e-mail surveys provide very fast results: more than 90% of the response took place in less than a month, since the first contact with potential respondents.

### ***Data tabulation***

All questionnaires that were received back were manually opened with MS Word. A macro was then executed in order to extract data fields<sup>4</sup>, eliminating the questions as well as any other text formatting resource and keeping just the answers that were provided by the respondent. This procedure was required for each of the 657 files, corresponding to all of the responses, so that the information could be transferred to an MS Excel worksheet for the generation of graphs and other simple statistics and to Minitab, for more sophisticated statistics.

Figure 7 shows the content of a response file that was received from one of the respondents, after having been submitted to the data field extraction macro (data is in Portuguese, exactly as extracted from the participant's form).



Note 1: Data fields are separated by ";" (or <tab>) to show that they represent independent information pieces, when they are transferred to MS Excel or to a database management software.

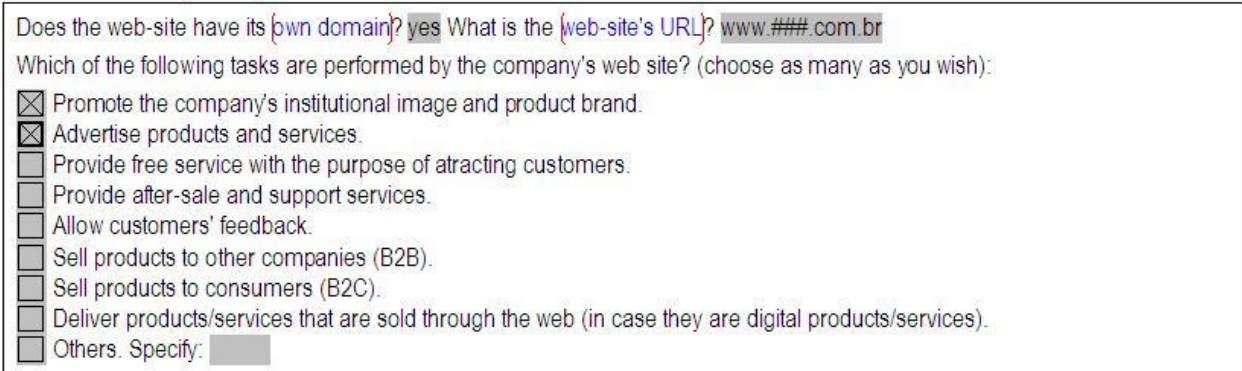
Note 2: The extraction macro, when "cleaning" the file, kept the information exactly in the same order as presented in the original form. Thus, the field with the answer "até 49 funcionários" ("up to 49 employees") corresponds to the first question of the survey ("How big is the company?"). The second field, containing the answer "metalúrgica" ("metallurgy"), refers to the second question ("Field:") and so forth.

Note 3: The sequence of fields with values "1" or "0" (fields 10 to 18) are associated to the questions about the use of the company's web site, which were yes/no questions, filled in by clicking on top of check-boxes (or not). "1" means that the respondent checked the box and "0" means the box was left untouched.

Note 4: Several fields are empty (" "), in Figure 7. In the case of this company, specifically (and that was a general trend), the respondent didn't write anything in the fields "Comment, if you wish:", which were included all over the questionnaire, in order to give the respondent a chance to provide additional information that could enrich the predominantly quantitative analysis that had been planned.

Note 5: Fragments of information that could permit the identification of the company whose data were presented in Figure 7 were replaced with ### in order to preserve the confidentiality of individual information.

Figure 8 contains the answers that were given by the same company whose data were presented in Figure 7 for some of the questions. Only the first two check-boxes were marked, thus, after the extraction macro was executed, fields 10 to 18 presented the following values: 1,1,0,0,0,0,0,0 (see Figure 7 and Note 3, above).



Does the web-site have its (own domain)? yes What is the (web-site's URL)? www.###.com.br

Which of the following tasks are performed by the company's web site? (choose as many as you wish):

- Promote the company's institutional image and product brand.
- Advertise products and services.
- Provide free service with the purpose of attracting customers.
- Provide after-sale and support services.
- Allow customers' feedback.
- Sell products to other companies (B2B).
- Sell products to consumers (B2C).
- Deliver products/services that are sold through the web (in case they are digital products/services).
- Others. Specify: \_\_\_\_\_

Figure 8 Respondent's answers to questions in section 2 of the survey.

After "cleaning" the files with the respondents' answers, according to the explanations above, the data for each company were copied to MS Excel, by means of a simple "cut and paste" process, which generated the data file that was used for the analyses later on. In the MS Excel file, each line contains the data fields related to a specific company. Each one of the 145 fields that were generated from the MS Word form filled in by each respondent takes a cell in the MS Excel worksheet, from column A to column EO.

### ***Statistical treatment of the tabulated data***

The tabulated data were treated using MS Excel's analysis resources and, for a deeper statistical study, Minitab®, with special emphasis to the multivariate statistical analysis.

The preliminary analysis that was carried out using MS Excel basically consisted on counting the number of observations of each possible answer for a percentage analysis and the generation of explanatory graphs.

The main techniques that were used for the multivariate analysis with Minitab were exploratory factor analysis and multiple regression.

The exploratory factor analysis is a technique that allows for the identification of correlations among variables associated with a specific phenomenon, grouped in factors that keep explanation power about the situation.

Multiple regression is another statistical technique that allows for the estimation of a dependent variable based on the values of other independent variables.

This paper doesn't intend to discuss the conclusions that were obtained from the analysis of the responses provided by the 657 participants of the survey, which originated a research report and other papers that the authors would be pleased to share with those interested.

### ***Limitations of the method***

Dommeyer and Moriarty (2000) mention a series of studies that discuss problems with the use of e-mail as the means for the application of questionnaires, among which they highlight the fact that it is impossible to keep anonymity, the survey can be easily excluded or ignored and, worst of all, it may generate confusion in many respondents that don't know how to respond when faced with the technology involved.

The authors of this paper didn't feel that the impossibility to remain anonymous was an issue, in this case. Although the survey included information that many companies would probably wish to keep as a secret, the research center that was sponsoring the study is considered very idoneous and the researchers committed themselves not to reveal individual information. That seemed enough to ensure a relatively high return rate. A high percentage of respondents did identify themselves, openly, providing personal and corporate information, presumably intending to receive the results of the research, in an aggregate form, which were promised to those who collaborated.

A few blank questionnaires were received, as well as a few e-mail messages without the attachment. Most of such situations were easily fixed with additional exchange of e-mails with the respondents, for the problem to be solved.

The e-mail message that presented the survey was emphatic in stating that the Word form had been checked against viruses, in order to ensure that no respondent would have his/her computer infected. Even so, it is possible that some potential respondents didn't accept the invitation to participate in the survey because they feared opening a Word document, sent through e-mail. It needs to be said that no respondent demonstrated this concern, explicitly.

There were a few reports of situations in which security devices blocked the delivery of the form to the addressee, i.e., the e-mail was filtered by a firewall and the attachment didn't go through. The alternative that was found, in those cases, was to request that the respondent downloaded the questionnaire from the web-site, something that was explained in the invitation message, as well. It is possible that some potential respondents were lost as a result of this issue.



Three companies reported that they could not fill in the questionnaire because they didn't have MS Word. They were companies that worked using free software and Linux as the operational system. This was not a serious limitation with respect to the percentage of cases, considering that most respondents use Microsoft software. However, it's a matter that demands reflection from the ethical point of view, considering that the survey, the way it was proposed, reinforces the technological lock-in situation, experienced by most users of Microsoft software now-a-days. The issue is the following: is it fair to assume that the potential respondents will be able to access a questionnaire that is sent in a proprietary format as an attachment of an e-mail message? Should exempt researchers contribute to technological lock-in?

Another problem that was faced by the authors, with respect to the answers that were received, was that some respondents cut the answers from the Word form and pasted them in the body of their e-mail reply. Unfortunately, that prevented their responses from being used, because the fields, when pasted to an e-mail message, appeared as blank fields, regardless of having been filled in the Word form. In many cases, the problem could be solved after the respondents were contacted, but that involved re-work, sometimes, as some respondents had not saved the Word form.

### *Final considerations*

Having the limitations of this kind of approach been discussed, the authors of this paper still believe that there are more advantages to using e-mail surveys than disadvantages.

The cost of applying an e-mail survey is almost inexistent and the return speed is high. In addition to that, it is not necessary for the respondent to remain connected to the web, in case s/he doesn't have a permanent Web connection. A survey with the characteristics of the one presented in this paper can be downloaded, filled in and sent back the next time a connection is available, as an attachment to an e-mail message. That may be an important thing, particularly when the researchers believe that many respondents may still have dial-up connections.

E-mail surveys do not allow for the interactivity that is possible with on-line, real time, questionnaires, using Web forms. That may be considered a disadvantage, sometimes, but it also makes it easier to compare the results of an e-mail survey with those obtained from questionnaires applied using traditional means (letter sent through regular mail), which may be useful when the research project relies on conventional and electronic instruments at the same time.

The authors of this paper were really pleased with the results that they achieved using e-mail surveys. That was the main reason why they decided to share their experience with other colleagues who can also probably benefit from this tool. It's fast, it's convenient and it's almost free!

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## Notes

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- <sup>1</sup> FIESP is an association of companies in the industrial sector that operate in the state of Sao Paulo, Brazil.
- <sup>2</sup> FIESP's database (from 2002), which was used in the survey, included 15,279 manufacturing companies. As companies would be contacted via e-mail, only those having an e-mail address in the database would, originally, be invited to participate in the survey. Such companies were 11,838. However, a previous survey that had been carried out by Cohen (2003) the year before, using the same set of data, had already found out that 1,247 of the e-mails in FIESP's database were wrong. Thus, target companies to the survey were reduced to those manufacturing companies contained in FIESP's database that had a valid e-mail account. During the application of the survey, approximately 30% of the messages that were sent didn't reach the addressee, as a result of wrong e-mail addresses. The increase in the number of invalid e-mail addresses from 1,247 to 3,547 was not interpreted as companies giving up the use of e-mail. Although no scientific verification was made for the significant increase of invalid e-mail addresses, the authors speculate that it was the result of Internet provider replacement, or the creation of the company's own domain and, therefore, the change of the e-mail address, in order to use the company's own e-mail server. This suspicion is supported by the great number of companies that, even having received the message in the e-mail address contained in FIESP's database, requested that future contacts took place by means of a different e-mail address.
- <sup>3</sup> The survey with software companies in the United States had a return rate of 7% (50 filled-in questionnaires out of ca. 700 that were sent).
- <sup>4</sup> Another simpler way of carrying out this procedure, of which the authors only became aware after the "cleaning" of the MS Word forms was almost over, is to open the forms and choose >Tools >Options >Save >Save data only for forms. Even so, it would have been necessary to open each received form, save the form data according to the explanation above and export, file by file, to MS Excel. Thus, there would still be intense manual work to be carried out.