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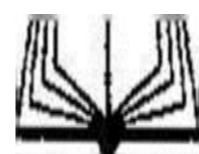
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ECONOMIZATION OF ACTIVITIES IN THE SATISFACTION SURVEY PROCESS BY MEANS ON-LINE ELECTRONIC QUESTIONNAIRE SYSTEMS

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Abstract. In the paper, the types of activities have been indicated which allow to economize the satisfaction survey process in case of which systems supporting on-line electronic questionnaires have been applied. The use of these systems leads to a departure - where possible - from traditional satisfaction surveys. The above mentioned activities include: adopting system activities that reduce costs; rendering available the protections that significantly reduce the supply of unreliable data; generating automatically many products (questionnaires) on the basis of the same platform formed by the IT system; minimising constrains on both the respondent's side and the research organiser's side; providing facilities that shorten the customisation process realisation time. The indicated types of activities have been provided with details. The types of activities economizing the said process create an ontology that may be applied by knowledge engineering.

Key words: satisfaction survey, on-line questionnaires, economisation of process activities, knowledge engineering

INTRODUCTION

Satisfaction (contentedness) surveys are more and more frequently used - at the very least - as an evaluation element. Satisfaction of customers, personnel members, students, patients, etc. is subject of examination. The parties ordering the surveys expect a quick and reliable feedback on the activities undertaken by them in relation to populations surveyed. In some cases (e.g. quality management systems conformable with the ISO 9000 series standard), the surveys have to be done obligatorily within the time limits indicated most frequently by the applicable procedure [Wolniak, Skotnicka-Zasadzien 2008]. The procedure is necessitated in turn by the requirement that the organisation intending to comply with the standard should monitor the customers' opinion on the manner in which their needs are satisfied [PN-EN ISO 9001:2009, 2009], since quality and satisfaction

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(contentedness) are related to each other in a specific way. As it has been demonstrated in the literature on the issue, quality precedes satisfaction [Stodolny 2006]. Quality is also identified as a factor determining the customer's satisfaction [Nieżurawski et al. 2010]. Apart from examining their customers' satisfaction, organisations usually survey the satisfaction of their personnel. The survey findings pertaining to the personnel should in consequence serve the purpose of limiting uncontrolled resignations of dissatisfied employees, and thereby reduce the company's operation costs - e.g. the costs related to renewed recruitment, new personnel's adaptation, etc. [Jaros 2005]. As regards the customers, the above mentioned surveys are undoubtedly aimed at gaining knowledge on customers and their preferences [Mruk 2012].

For examining customers' and/or personnel's satisfaction, questionnaire surveys are usually applied. Author has made an attempt at identifying the stages and scopes of activities in the questionnaire survey process. A review of reports available on such surveys (for instance, those published on municipal offices' websites) was helpful here. The verification of the reports was facilitated by author's personal participation in preparation, realisation and elaboration of similar surveys. It seems that in consequence of the performed and verified review, a structure of stages, scopes of activities and references to the same in the survey process can be proposed. The stages are presented in Figure 1.

Author defines the approach proposed as traditional, i.e. the one which does not use the tools provided by the e-business in the broad meaning of the term. It should be emphasised that the term "traditional" has not been used here in the pejorative meaning. Currently, specific situations occur - and will probably still occur in future - where traditional surveys are preferred, e.g. a survey of a relatively large group of farmers in the territory of a particular province [Borkowska, Kruszyński 2013].

The questionnaire surveys carried out in compliance with the stages indicated in Figure 1 have been classified as expensive. Their costs include, without limitation, the costs of questionnaire printing, traditional distribution (post, courier service, etc.), errors which sometimes occur in questionnaires and which cannot be removed when the paper carrier is applied. The possibility to economise the satisfaction survey process occurred when Internet applications became widespread and e-business emerged along with the solutions it offers. For the purpose of this paper, e-business can be defined as follows: "The concept of electronic business includes an exchange of information between producers, distributors and consumers of products and services, contracting, transmission of documents, etc." [Woźniakowski, Jałowiecki 2013]. The occurrence of mature e-business solutions has been met by survey organisers with approval and hope. These solutions include undoubtedly examining satisfaction in a broad meaning of the term by means of on-line electronic questionnaires (hereinafter called on-line questionnaires).

There are many IT system available in the Polish market that support such surveys. In the literature to this paper, websites are indicated where descriptions of those systems can be found. In some cases, their demo versions are also available.

This paper is not aimed at indicating which on-line questionnaire supporting IT system, from among those available, is the best one. In the paper, types of activities economising the satisfaction survey process have been indicated. The types are assigned to individual stages and scopes of activities of the traditional approach to the customers' / personnel's satisfaction survey process. If we treat the proposed types of activities as an

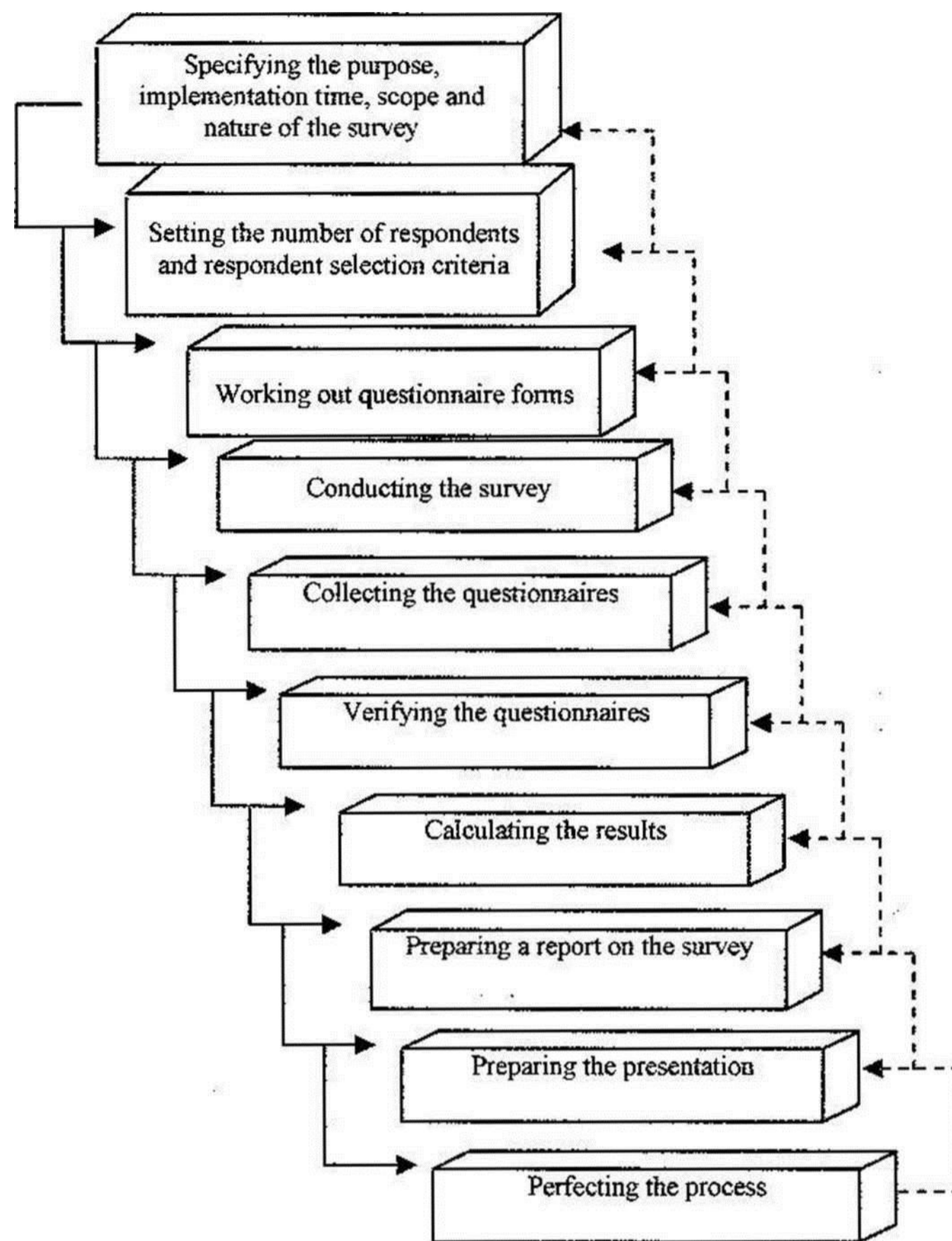


Fig. 1. Stages, scopes of activities and references to the same in the survey process. Traditional approach
Source: Own work.

ontology of the thematic area (field) of economisation of the satisfaction survey process activities, then we can use the knowledge on the thematic area for improving the tools applied, i.e. the software.

MATERIAL AND METHODS

Upon defining stages and scopes of activity in the survey process (Fig. 1), author began to search for activities that economise the process. The starting point was making an assumption that the types of those activities may be a component part of the software supporting the process. Author penetrated the Polish market of available software so that to find some IT systems from the satisfaction survey area. These systems support the satisfaction survey process by providing on-line questionnaires. Upon familiarising with the substance of the systems and making an attempt at operating them, e.g. by using the

demo versions, author identified the types of activities economising the process (Fig. 2), confronted individual versions of activity types with own practical experience and supplemented them accordingly. Author's experience results from leading the teams, which carried out on-line questionnaire based on satisfaction surveys in the years 2011-2013. The surveys were conducted for 13 entities and participated by several thousand of respondents (personnel and customers of territorial self-government units). They were a part of the Operational Programme entitled Human Capital, Priority V "Good Government" [Training... 2012].

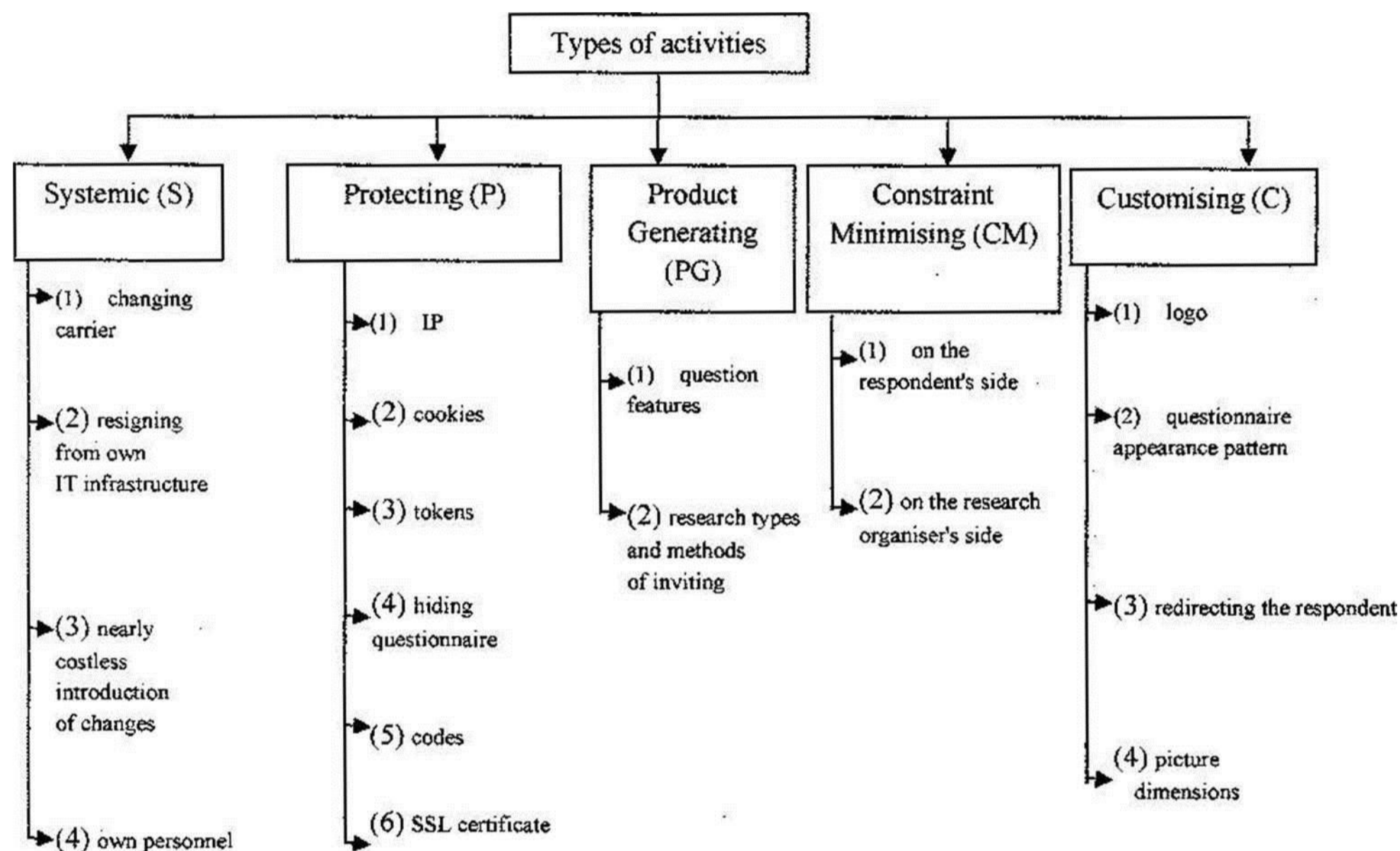


Fig. 2. Types of activities economising the satisfaction survey process by means of on-line questionnaires. A general approach. Source: Own work.

The identified types of activities economising the satisfaction survey process constitute the ontology of this thematic area (field). The ontology was "superimposed" on the above mentioned stages of the survey process in the traditional approach (Fig. 3). Once the ontology is formulated, improvement of the satisfaction examination process should commence with introducing changes and supplements to the ontology.

RESULTS

On the basis of literature research, author's personal experience gained in the course of managing satisfaction survey teams, and the review of available IT systems supporting satisfaction surveys with on-line questionnaire systems, author has isolated the following process economising activities (Fig. 2):

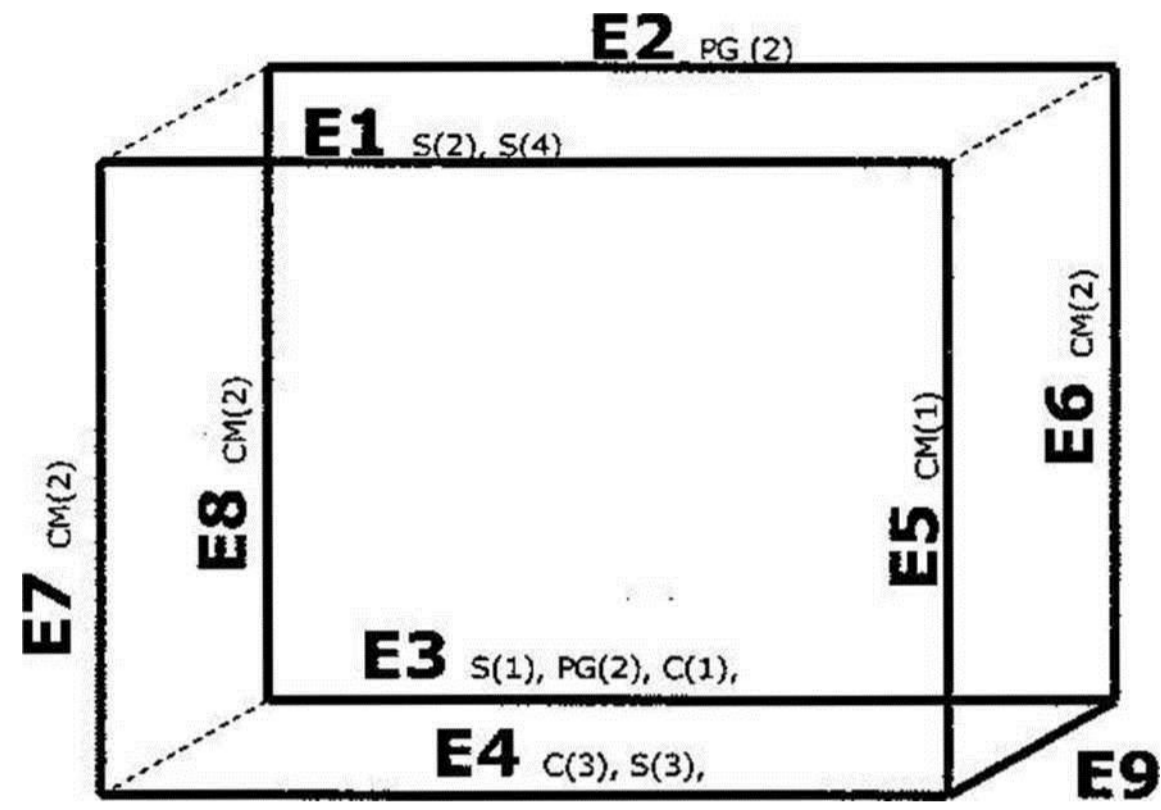


Fig. 3. Types of activities economising the satisfaction survey process by means of on-line questionnaires as related to stages and scopes of activity of the survey process in the traditional approach Source: Own work.

- a) Adopting cost-reducing system solutions,
 - b) Providing protections that significantly reduce the supply of unreliable data,
 - c) Generating automatically multiple products (questionnaires) on the basis of the same platform of the IT system,
 - d) Minimising constraints on both the respondent's and the research organiser's side,
 - e) Providing facilities that shorten the process realisation time, including customisation.
- Each of the activities indicated has been elaborated (provided with details) on Figure 2.

Adopting cost-reducing system solutions

The cost-reducing system solutions are the ones that can be defined as radically changing the satisfaction survey process with the use of electronic questionnaires. They include as a minimum:

- a) A change of the carrier for the available questionnaires. In practice, this means that the use of paper is eliminated or significantly reduced. The consequences of this fact should be related to the place of the questionnaire carrier in the survey realisation cycle (creating a questionnaire, preparing it for printing, printing, organising distribution, collecting filled-out questionnaires, processing paper questionnaires, preparing the final analysis, archiving the data). Monitoring of progress of each of the above stages is laborious, hence errors often occur. Even a slight mistake noticed after questionnaires have been collected from a printing house frequently results in the necessity to destroy the whole stock of printed material and start the process of preparing a new questionnaire for printing.
- b) Resignation from own IT infrastructure in favour of an outsourced one. In these circumstances, customers do not have to purchase servers and network software, employ network administrators, etc. The care for efficiency of the IT infrastructure is a responsibility of the IT company that offers software in the form of an on-line questionnaire system. *The research leader and research participants only need computers fitted with any operating system with a simultaneous access to a browser.*
- c) Possibility to introduce, nearly costlessly, continuous improvements to the questionnaire system. The possibility to introduce continuous improvements is an unquestionable advantage of on-line survey systems. The improvements may consist in eliminating any errors noticed and introducing new investigations that make allowance for the experience gained. What more, they are currently visible for all survey participants without having to reinstall relevant software.
- d) Minimising the time when the organiser's own personnel is engaged in the course of the survey process. One of the greatest advantages of on-line electronic survey systems is the fact that they are ready to use 24 hours a day. Additionally, survey organisers do not have to worry about the lengthy period of preparing questionnaires (developing the survey concept, preparing a list of inquiries and answers, making the analysis and synthesis of results, including possible interpretation of results, etc.), and creating project groups for conducting surveys with the use of on-line questionnaires. The procedures are "embedded" by means of relevant algorithms which are coded with the use of a proper programme language. In case of any doubts, one can use the assistance of the personnel of the company providing the system and related solutions.

Providing protections that significantly reduce the supply of unreliable data

The protections refer to a number of spheres. They include the following:

- a) a particular computer can be used only once in a given time interval as its IP (Internet Protocol) identifier is verified,
- b) some information sent by the Internet service is saved in the user's side in the form of cookies,
- c) a professional system of tokens is applied which generates, as cryptographic devices, single-use passwords,
- d) the questionnaire and its results are hidden,
- e) the questionnaire is protected by a code,
- f) the questionnaire is protected with an SSL certificate which ensures a complete protection during the communication flow process between the user and the server.

Generating automatically multiple products (questionnaires) on the basis of a common platform of the IT system

The IT system allows to generate automatically products dedicated to various applications through the use of parametrisation (a selection of features of objects, e.g. questionnaires, types of questions used, etc.). Below, some object features are specified which form products when properly configured.

A number of features have been indicated for questions treated as an object. The following question types have been distinguished:

- a) Multiple choice question - more than one answer can be marked (checkbox),
- b) Multiple choice question with an open option - more than one answer can be marked and the item can be chosen which allows to give a yet another, individual answer (open checkbox),
- c) Multiple choice question - one of several answers can be marked (radio button),
- d) Multiple choice question - one of several answers can be marked through selection from a list (drop down list),
- e) Multiple choice question with an open option - one answer can be marked and the item can be chosen which allows to give a yet another, individual answer (open radio button).

The above mentioned questions can be positioned horizontally or vertically, whereas matrix multiple choice questions with an option to mark one answer from among many answers are formatted into a series of questions and answers in the form of lines and columns.

Different features were taken into account for various types of surveys and for methods of inviting for participation in a survey. Below, exemplary types of questionnaire surveys are presented:

- a) open questionnaire,
- b) closed questionnaire,
- c) personalised questionnaire.

The open questionnaire is the one which is open to everybody and anonymous. Every person who finds a link to the questionnaire can take part in the survey. An invitation to fill out such a questionnaire is usually sent by e-mail, placed on an Internet/Intranet site as a link or as a redirecting link under a banner on a website.

The closed questionnaire is the one which is closed and anonymous. The questionnaire

is available only upon providing a relevant password. An invitation to fill out such type questionnaire is usually sent to a specific number of people by e-mail together with a password enabling an access to the survey. The password is common for all the participants. In case of such type surveys, the survey organiser should have a selected group of respondents along with their e-mail addresses. A preferable addressee of the questionnaire is personnel groups.

The personalised questionnaire is a closed survey available only to persons who have been invited to participate in it and have logged properly in the system with the use of the password sent. An invitation to participate in the survey is sent to each participant separately by e-mail. The mail includes a link to the questionnaire with a proper password - unique for each participant. The survey is addressed to narrow groups of employees, executive staff, and customers.

The open questionnaire and the closed one do not allow to learn how a particular respondent has answered and it is possible in case of the personalised questionnaire.

Minimising constrains on both the respondent's and the survey organiser's side

Below, there are solutions reducing constrains on both the respondent's and the survey organiser's side. The solutions minimising constrains on the survey organiser's side include the following:

- a) An embedded gallery manager allows to add photos and films from the YouTube service,
- b) The questionnaire can be divided into pages; the effect of a random order of pages, questions, and answers to a question can be obtained,
- c) Whole questionnaires, individual pages and questions can be copied, and the bucket function can be used, if need be,
- d) Questionnaires can be defined and assigned randomly to survey conditions,
- e) Any logical expressions can be constructed, which makes it possible to apply filtering questions,
- f) Questionnaires can be edited continuously, even after publication, what more, without losing the data collected,
- g) Respondents' address book can be embedded, which allows to send invitations to respondents from the system level,
- h) Individual sheets can be viewed from the system level,
- i) Summary result sheets (schedules) can be generated automatically,
- j) Complete results can be automatically exported in two formats (text and zero-one date) to CSV, XML Excel, SPSS (beta) formats,
- k) The survey can be completed after a specified time or once the questionnaire is filled out by a set number of respondents,
- l) Maximum time for giving answers can be specified.

The solutions minimising constrains on the respondent's side include the following:

- a) Support for multi-language questionnaires (edition of the contents of navigation buttons, the welcoming message and the parting one),
- b) Filling out of questionnaires can be paused and resumed any time,
- c) Own patterns can be created, typeface, background colours and margins for individual elements can be edited,

- d) Support is available for tests, including automatic scoring for answers provided, recording and control of the answering time.

Facilities that shorten the process realisation time, including customisation

Diversely designed questionnaires and surveys should be adjusted to the customer's expectations [Hill, Alexander 2003]. The facilities that shorten the process realisation time and enable customisation include:

- a) Applying an own logo,
- b) Selecting a pattern for the questionnaire appearance from many proposals,
- c) Redirecting the respondent to the organiser's own website once the questionnaire is completed,
- d) Setting the size of the pictures that can be placed in questionnaires.

CONCLUSIONS

Author's analysis of the problem started with mapping stages and scopes of activities of the questionnaire survey process in the traditional approach (Fig. 1). In the course of the analyses, activities economising the satisfaction survey process by means of on-line electronic questionnaires were identified. Electronic questionnaires are generated by relevant IT systems. The solutions adopted in the questionnaires, as well as author's practical experience related to organisation of 13 satisfaction surveys (customers, personnel) for several thousands of respondents allowed to work out an ontology of activities economising the above process. As a result, five groups of activities were identified (Fig. 2). The scope of individual groups was specified in detail. In the final part of the paper, author assigned types of economising activities proposed in the ontology to individual stages of the traditionally presented survey process (Fig. 3).

The presented ontology of activities economising the satisfaction survey process by means of on-line electronic questionnaire systems is a promising starting point. Application of knowledge engineering achievements will allow to extend the proposed ontology. Additionally, it will be possible to include successively ontology elements to the tools offered (here: the software). Placing of the presented subject matter in areas of interest of knowledge engineering could have the following structure [Goluchowski 2012]:

- a) Tasks - surveys of customers' and personnel's satisfaction,
- b) Task solving models - economisation of activities of the customers' and personnel's satisfaction survey process with the use of on-line electronic questionnaires,
- c) Model of the field of activity, i.e. ontology - types of activities economising the customers' and personnel's satisfaction survey process,
- d) Systems for generating knowledge-using applications - software supporting the customers' and personnel's satisfaction survey process.

The presented structure of areas of interest of knowledge engineering corresponds to process improvement as the final stage of the survey process (Fig. 1). The proposed ontology is a key to improvement of the satisfaction survey process through economisation of undertaken activities. Changes and supplements introduced to the ontology should be reflected in the software supporting the process, with particular regard to the knowledge contributed.

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EKONOMIZACJA DZIAŁAŃ W PROCESIE BADANIA SATYSFAKCJI POPRZEZ SYSTEMY ELEKTRONICZNYCH ANKIET W TRYBIE ON-LINE

Streszczenie. Artykuł wskazuje na rodzaje działań, których realizacja ekonomizuje proces badania satysfakcji w sytuacji zastosowania systemów obsługujących elektroniczne ankiety stosowane w trybie on-line. Posługiwanie się tymi systemami powoduje odejście - tam gdzie to jest możliwe - od tradycyjnych badań satysfakcji. Do wspomnianych rodzajów działań zaliczono; przyjęcia działań systemowych obniżających koszt}; udostępnienie zabezpieczeń znacząco zmniejszających dostarczanie niewiarygodnych danych; automatyczne generowanie wielu produktów (ankiet) według tej samej platformy, jaką stanowi system informatyczny; minimalizowanie ograniczeń zarówno po stronie respondenta, jak i organizatora badań; wprowadzanie ułatwień, które skracają czas realizacji procesów kustomizacji. Wskazane rodzaje działań są uszczegółowiane. Rodzaje działań ekonomizujących wspomniany proces tworzą ontologię, którą może zastosować inżynieria wiedzy}.

Słowa kluczowe: badania satysfakcji, ankiety on-line, ekonomizacja działań procesu, inżynieria wiedzy}

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