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1. INTRODUCTION

The understanding of the survey response process is crucial to achieving high data quality. This holds with regard to either the prevention of errors based on the implementation of special design features or the reduction of errors based on the application of special statistical methods. When it comes to surveys of organizations too little is known about the actual response process and its mechanisms yet, that could be used to ensure data quality. In surveying organizations the "organizational information system"(OIS) is relevant, as it determines what kind of information is gathered in the organization, where and how it can be accessed. A related aspect is the proxy informant's knowledge. The proxy informant is the person, who is selected to respond on behalf of the organization. The informant's knowledge determines how accurate the responses are and how often information has to be retrieved externally (in the record-keeping system), and thus how burdensome a response will be. As far as organizational information systems and proxy informants differ between establishments, there is a risk of response bias, which needs to be dealt with. This research addresses the topic of response quality in establishment surveys by analyzing 31 audio-taped f2f-survey interviews of the SOEP-LEE establishment survey 2012/2013. The audio-recordings are analyzed by applying the method of Behavior Coding (Ongena/Dijkstra 2006). According to this every observable respondent behavior shown during an interview and with regard to a single question-answer-sequence will be coded based on a pre-defined coding scheme.

2. THEORETICAL CONSIDERATIONS ON RESPONSE QUALITY IN ESTABLISHMENT SURVEYS

The establishment or organizational survey response process is different to the one in individual surveys in two central aspects. Firstly, establishment surveys rely on the use of proxy informants who respond acting as an organizations' representative. The informant is an employee of the organization and will respond on behalf of the organization. Secondly, organizational surveys rely on the so called

organizational information system.[1] The organizational information system or OIS consists of all the information that is gathered and stored within an organization. Information or the "organizational knowledge" (e.g. Hecker 2012) might be stored either in records (as some kind of formalized knowledge) or in members' minds (as some kind of non-formalized knowledge). The OIS does not only determine the knowledge of the informant, who is an employee inhabiting a certain position in the hierarchy, fulfilling a certain job role with more or less tenure. It also determines what kind of information is existent or *available*, where it is stored, for whom and under what conditions it is *accessible*, and whether it is *accurate* or not[2]. Proxy informants are both, part of the OIS and using the OIS in order to derive a response, e.g. by looking up information in records.

In order to explain response quality (response processes and their outcomes) in organizational surveys these two special characteristics of organizational surveys, the reliance on a proxy informant and on an OIS, and thus individual as well organizational level factors, need to be taken into account. Looking at individual level factors survey response theory names the two aspects *motivation* and *ability* as determining responses (e.g. Krosnick 1991, Groves et al. 1992, 486, Beatty/Herrmann 2002, 72). An individual respondent needs to be willing and able to respond accurate, the more the better. Within satisficing theory Krosnick defines ability basically as the cognitive ability that is needed to comprehend a survey question and a response task (Krosnick 1991). *Ability* as an informant characteristic, in the organizational survey context, might not only include cognitive ability, but also whether the informant is capable and authorized to respond. The two factors *capacity* and *authority* were first mentioned by Tomaskovic-Deveys and his colleagues' (1995) in their analysis of organizational survey n onresponse. Based on this work the definition of capacity and authority is extended. Here, *capacity* comprises the informant's *knowledge* of the organization itself and of the organizational information system (Bavdaz 2010), as well as the informant's available *time* to respond. Knowledge of the organizational reality is needed to respond on factual (figures) as well as subjective (culture) matters. Whenever informant's knowledge is insufficient their knowledge on the OIS, on what kind of information is available, where to find it and whether it is accurate or not, comes into play. E.g. if an informant does not know about the inaccuracy of information, false information will lead to low response quality.

Whereas capacity also plays a role in individual surveys, a*uthority* is not at all relevant there. Fulfilling their job role, as part of an employment contract, informants need to be authorized to respond. Authority can further and beyond the definition of Tomaskovic-Devey and his colleagues be distinguished into the individual's authority to access and to disclose information.

According to Krosnick's satisficing theory motivation and ability does not influence response quality directly but in relation to *task difficulty*. The effect of motivation and ability depends on task difficulty. The higher the task difficulty is the lower will response quality be (or the higher the

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[1] Organizational response process models and theories have been developed so far and amongst others by Willimack/Nichols (2001, 2010), Bavdaz (2010), Lorenc (2006), and Tomaskovic-Devey et al. (1995). Willimack/Nichols extended the cognitive response process model from Tourangeau (1984) with steps on the organizational level. These steps refer to the relevance of the information system ("retrieval from record", "record formation") and the informant ("selection and identification of respondent/s"). Bavdaz (2010) proposes a broader perspective on the response process, distinguishing between organizational and individual level factors and specifically introducing the aspect of recurring surveys. Lorenc (2006) focuses on the paths of information processing and looking at the organization as a single cognitive unit (based on Socially Distributed Cognition Theory). Tomaskovic-Devey et al. (1995) introduce a theoretical perspective based on organization studies focusing on the organization as an actor.

[2] Lorenc (2006) made in his analysis of information paths aware of how error-prone records can be and how this affects quality.

chances of satisificing, respectively). With task difficulty, Krosnick considers situational factors, thinking of the varying difficulties that are related to varying survey items, item topics, item formulation, complexity, length of words etc. In organizational surveys task difficulty should also comprise the varying difficulties related to the OIS. The less available, accessible, and accurate information is, the higher the task difficulty and the more effort and knowledge is needed by the informant in order to respond accurately. There are many circumstances where responding is especially burdensome due to the OIS characteristics: Information that is requested by a survey institute might not be collected for the time period in question or for the organizational unit under review. The distribution of knowledge throughout organizations linked to the division of labor leads to the fact that not every employee or organizational unit is equally knowledgeable. Sometimes information is gathered even outside the organization itself for example due to the outsourcing of personnel or tax reporting tasks.

Summing up, it is expected that the informant's *motivation, capacity*, and *authority* as well as the *task difficulty that is related to the OIS* (information's *availability*, *accessibility, distribution*, *and accuracy*) determine response quality in organizational surveys. This can be shown in the formula below[3]: The probability of response quality depends on the individual informant's motivation and ability, whereas ability includes cognitive ability and (in addition to Krosnick's model) capacity and authority. The influence of motivation and ability on quality is not a direct one but depends on task difficulty, whereas task difficulty not only refers to survey items, but also (and in addition to Krosnick's model) on the difficulty that is related to the organizational information system, i.e. the differences in information's availability, accessibility, distribution, and accuracy. It follows that as far as organizations differ in their information systems and as far as individuals selected to being proxy informants differ in motivation and ability, there is a risk of response bias.

$$P(\text{Quality}) = \frac{\text{Motivation} * \text{Ability}_{(\text{Cognitive Ability, Capacity, Authority})}}{\text{Task Difficulty}_{(\text{Item, OIS})}}$$

The formula says, that the higher task difficulty is, the lower is response quality (given a constant numerator), and the higher motivation and/or ability is, the higher is response quality (given a constant denominator).

Within this paper the Behavior Coding method will be used to look at the following two hypotheses regarding establishment's size and informant's tenure more closely. It is hypothesized that the larger an organization is, the higher the task difficulty of responding and thus, the lower response quality. It is further hypothesized that the longer the informant is part of an organization, the higher his or her knowledge (capacity) to respond and thus, the higher response quality.

1) Hypothesis: informant's tenure + → knowledge + → high response quality	
2) Hypothesis: establishment's size + → task difficulty + → low response quality	

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[3] The original formula of Krosnick (1991): Task difficulty / Motivation * Ability = P(Satisficing).

3. BEHAVIOR CODING AND ITS APPLICATION ON ESTABLISHMENT SURVEYS

3.1. Behavior Coding

Behavior Coding (BC) is a method of observing the question-answer process (Ongena/Dijkstra 2006). By Behavior Coding interviewer and respondent behaviors shown during an interview will be coded. Thus, BC is used to standardize non-standardized, qualitative information by coding (Schnell 2012, 150). All kinds of behaviors can be coded such as wording or paralinguistic utterances, pauses, even body language, and facial expressions. The resulting information (i.e. the coded behaviors) can then be analyzed statistically and by so called "diagnostic" methods, using the full richness of the qualitative material (van der Zouwen/Smit 2004).

BC is used since the end of the 1960s (Cannell et al. 1968), and was originally applied to observe interviewer behavior as a form of interviewer monitoring. Until today, it has often been used during questionnaire pretesting and evaluation (Ongena 2005, 62). Applications of BC include researches on interviewer behaviors, respondent behaviors, the interaction between interviewer and respondent, the influence of certain types of questions on interviewer or respondent behavior, and consequently on determinants and consequences of the response process overall (Ongena/Dijkstra 2006, 434, Ongena 2005, 59pp). It seems that an application of the behavior coding method on establishment surveys and establishments' response behaviors has not been done so far.

The use of BC to infer response quality is based on the assumptions of the standardized interviewing paradigm (e.g. Beatty 1995). According to this every departure from the standardized interviewing rules – such as not reading the question exactly as scripted – can be considered as threats to data quality. Deviations go along with interviewer and interview effects, which should be minimized, and the interview situation of every respondent should be comparable. In the words of the theoretical model of response quality presented above, deviations from standardized interviewing rules comprise varying task difficulty and burden on respondents, which is not observed and controlled by design. Behavior coding will then be used to identify departures from the standardized or "paradigmatic" interview.

But, the interpretation of departures as being an indication of low response quality can be argued (e.g. Dykema et al. 1997, 288, Ongena 2005, 89). Firstly, deviating behaviors such as respondent's requests for clarification can be resolved by interviewers who explain unclear terminology correctly. Although, whenever interviewers do not probe neutrally but suggestively the responses will be influenced in a certain direction limiting response quality. Secondly, deviances can have several causes, which cannot be distinguished by the method itself. For example respondents' requests for clarification could be either caused by comprehension problems or by high respondents' motivation or diligence. Nonetheless, a request for clarification always increases respondent burden. Thirdly, with BC obvious (visible or audible) behaviors are observed, only. Thoughts, other kinds of problematic behaviors, which are not expressed, or misinterpretations of which the respondent is not aware of will not be coded anyway. But, obvious behaviors still signify response quality following Dykema and her colleagues: They refer to the phenomenon of the "classroom question" which shows that "… questions by only one or two students indicate that the class at large or in this case respondents in general, do not understand."(Dykema et al. 1997, 305)[4] Considering social desirability

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[4] There are studies which analyze the qualification of deviating behaviors as indicators of low response quality (Belli/Lepkowski/Kabeto 2001, Dijkstra/Ongena 2006; Dykema et al. 1997, Smit/Dijkstra/Van der Zouwen 1997, Van der Zouwen/Smit 2004). These studies show for example, that suggestive probes reduce response quality (Smit et al. 1997,

issues, it can be assumed that problematic behaviors are rather underreported than overestimated with the method.

BC might be a valuable tool for a thorough analysis of the question-answer-processes. The basis of BC is the observation of the complete and real-time response process, it is not as retrospective as respondent debriefings and it is not as intrusive as think-aloud methods for example. Through the standardization of qualitative material BC offers a quantitative look, the application of statistical analysis methods, and herewith the opportunity of making inferences about the distribution of phenomena. Quantitative findings can then be supplemented by a closer look into the qualitative material allowing mixed methods analyses. The richness of the qualitative material can be used in a more focused way and with a direct link to the quantitative findings (van der Zouwen/Smit 2004).

3.2. The coding scheme

Behavior Coding is based on a coding scheme, which is a list of codes used to observe and count all types of behaviors a researcher is interested in. Coding schemes used in the past vary much depending on the level of detailedness, the research purpose and theoretical considerations. The coding scheme applied here is based on the theoretical considerations of the establishment survey response process outlined above. It consists of 35 different codes and includes codes regarding interviewer as well as respondent behavior. It allows coding on the level of each question-answer-sequence. The codes generally allow to distinguishing between actors, occurrences of behaviors, types of deviating behaviors, and the intensity of certain behaviors (minor or major departures). With the coding scheme paradigmatic sequences can be distinguished from problematic and inadequate sequences, where a problem that arose (such as a request for clarification/comprehension issue) could not be repaired by the interviewer.

Table 1 lists the most relevant codes – from an organizational survey perspective – and gives additional information on relations with underlying theoretical constructs.

Table 1: coding of respondent behavior (selection of the coding scheme)

	Indicating … on the individual level	Effect on response quality
Response: 1. Direct and adequate response (=paradigmatic sequence) 2. Qualified response (e.g. "approx.", "roughly") 3. other behavior (=problematic sequence)	-	positive negative negative
Comprehension issue	capacity -	negative
Sensitivity issue	motivation -	negative
Authority issue	authority -	negative
Knowledge issue	capacity -	negative
Retrieval from records	capacity - *(knowledge -, time +)* motivation +	negative (burden +)
Consultation of colleagues	capacity - *(knowledge -, time +)* motivation +	negative (burden +)
Additional comments and reports	capacity + motivation +	positive

These codes, i.e. the observed behaviors, can be interpreted as indicating the individual level factors motivation, capacity and authority which were outlined above as determining response quality on the individual level. The use of the OIS, i.e. whether informant gathers information in records or by colleagues, can be observed as well.

Ongena 2005), or that certain types of problematic deviances correlate negatively with response quality (Dijkstra/Ongena 2006). In the contrary other authors find mixed results (Dykema et al. 1997, Mathiowetz 1999).

Behaviors will be interpreted as having a negative or positive effect on response quality. A high prevalence rate of certain behaviors regarding one survey question indicates a higher chance of low or high response quality over all responses to that question.

3.3.   Measuring knowledge and task difficulty

The two hypotheses mentioned above focused on the correlation of respondent characteristics (size, tenure) with knowledge/capacity and task difficulty. During BC all knowledge-related behaviors of the respondents are coded. In order to test the hypotheses the informant's knowledge is indicated by the codes or behaviors (1) low number of use of tools, and (2) low number of knowledge-related behaviors. Task difficulty is indicated by (1) a high number of use of tools, and (2) a high number of knowledge-related behaviors.

Examples of knowledge-related behaviors are, the respondent says "I am not sure, as I wasn't here in 2011.", or "I don't know, I would have to guess.". Also, every record-lookup or consultation of colleagues will be treated as a knowledge-related behavior. The respondent behaviors "record lookup" and "consultation of colleagues" (short: use of tools) not only indicate knowledge problems but also the task difficulty of responding. Whenever an informant looks up information or consulates a colleague to derive a response, the task difficulty is increased, and responding is more burdensome.

With regard to the behavioral indicators of task difficulty and knowledge the following arguments have to be considered. (1) Here, use of tools indicates insufficient knowledge. But, use of tools can also be an indicator of high diligence, and thus, high motivation of the respondent. High motivation has the opposite effect on response quality as low knowledge. (2) Use of tool also indicates high task difficulty, and thus has a negative effect on response quality. But, it is unknown to what extent. If tools are accurate, only the extra burden that is related with the collection of external information will have an influence. The perceived burden of this information collection will be different. If tools are inaccurate, the inaccuracy plus the burden of collecting this information will both influence response quality negatively. (3) If a respondent has insufficient knowledge and thus uses tools to derive a response, this might better response quality in a specific situation. Item nonresponse might be prevented, the single informant's responses is validated by someone or something else. This can be objected based on the theoretical model presented above. The overall effect on response quality would still be negative: extra motivation and capacity are needed to look up information externally, because task difficulty is increased. These three difficulties in interpreting use of tools and its applicability as an indicator of low knowledge and high task difficulty should be optimized by further qualitative analysis.

4. ANALYSES

The data for the analyses stem from a representative establishment survey of German employers (N=1708) that was conducted in 2012 and 2013 using f2f- and paper-and-pencil-interviews.[5] Establishments were sampled based on address information given by employed participants in the Socio-Economic Panel Study (SOEP). Information from both surveys can be linked in order to create a linked employer-employee data set on organizational strategies and labor market outcomes. Within the SOEP-LEE establishment survey 31 interviews were audiotaped and form the sample where

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[5] For more information, please see http://www.diw.de/sixcms/detail.php?id=diw_01.c.394066.en. The technical report and the dataset will be available in spring 2014.

behavior coding is applied.[6] There is a total of 145 coding instances or behavior observations per interview. So far the following eleven question-answer-sequences have been coded:

1. establishment's age (date of foundation) ***
2. independency status (single, headquarter, branch, and other)
3. unit's sovereignty in/of hiring decisions *
4. unit's sovereignty of income policies/wage policies *
5. no. of departments ***
6. last year's change in demand (5-point scale) **
7. establishment's turnover last year ***
8. job vacancies last year (yes/no) **
9. last year's change in employment (5-point scale) **
10. no. of hierarchy levels ***
*item is filtered; ** factual item; *** factual item, absolute figure required*

The table below shows the number of knowledge- and tools-related behaviors that were shown. It also shows the number of qualified responses and additional comments, as they might be interpreted as a soft form of knowledge problems. As only 11 items have been coded so far, the amount of observed behaviors might be strongly correlated with the characteristics of those items. Especially, there may be differences depending on whether subjective evaluations or factual knowledge were requested. Therefore, the last column shows the number of behaviors for factual items, only.

No. of	No. of 325 question-answer-sequences	No. of 31 interviews with at least one such behavior	No. of 215 question-answer-sequences for factual items
Direct and adequate responses	170 (52%)	-	-
Qualified responses	35 (11%)	-	-
Other behaviors	120 (37%)	-	-
Of Other Behaviors:			
Additional comments	63 (19%)		
Knowledge-related behaviors	34 (11%)	18	30 (14%)
- without repair	12		
a. Record lookup	8	7	8
b. Consultation of colleagues	1	1	1
c. More than one respondent	33 (10%)	3	-
Use of tools (a,b,c)	42 (13%)	10[7]	-

Source: SOEP-LEE data, own calculations

Knowledge-related behaviors are shown in 34 of 325 question-answer-sequences, and in 18 of 31 interviews at least one such behavior occurred. If we take a look at factual items, the rate of knowledge-related behaviors is a bit higher (14% compared to 11%). Of these knowledge-related behaviors seven respondents looked up information in records in eight sequences, and only once a colleague was consulted. There was more than one respondent present in 3 of 31 interviews. In sum, about one third of respondents required external tools to derive a response, i.e. in 10 of 31 interviews and 42 of 325 question-answer-sequences.

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[6] Originally, 100 audio-recordings were planned and 109 of 502 field interviewers had been ordered to record interviews. Coding was primarily based on written transcripts, as each interview had been fully transcribed. For the application of certain codes the audio-recordings were consulted in addition. In order to ensure the reliability of the coding, random parts of multiple interviews will be double-coded.

[7] There was one interview where two respondents were present during the interview and in order to respond to one item another person were called and asked for the required information.

Based on the BC literature departure rates between 10 and 20% are considered as problematic in terms of quality (van der Zouwen/Smit 2004).

Furthermore bivariate and multivariate analyses were computed to check correlations with establishment's size and informant's tenure according to the hypotheses.

	Use of tools	Knowledge issues
Direction	Tenure: mixed	Tenure: negative
	Size: positive	Size: positive
Significance	Tenure: no	Tenure: weak
	Size: yes	Size: yes

Use of tools: 0/1; whether at least one record look-up or consultation of colleagues could be observed
Knowledge issues: sum of knowledge-related behaviors per interview and establishment

Bivariate statistics (chi2-statistics, gamma, Cramers' V) show correlations in the assumed directions, test statistics are weakly (size) or not significant (tenure). These results hold for use of tools as well as knowledge issues. Results from multivariate analyses (with two covariates only) show that tenure is negatively related to knowledge issues, as expected, and size is positively correlated with knowledge issues, as expected. The model statistics of the logistic model explaining use of tools-behaviors are not sufficient. Therefore a third model was computed to explain the sum of record-lookup and consultation, only (excluding more than respondent present).

	(1) Knowledge issues	(2) Use of tools (0/1)	(3) Record-lookup and consultation (0/1)
Informant's tenure (log)	-.454* (.193)	n.s.	n.s.
Establishment's size (log)	.401** (.126)	n.s.	1.4* (.530)
(1) Prob > F (2), (3) Prob > chi2	0,0039	n.s.	0.0016
(1) Adjusted R2 (2), (3) Pseudo R2	0,28	-	0,42
N	31	31	31

Model (1): OLS regression, Model (2) and (3) logistic regression   Source: SOEP-LEE data, own calculations
Standard errors in brackets
*$p<.05$, **$p>.01$, ***$p<.001$

5. DISCUSSION AND OUTLOOK

The results from these preliminary analyses show that informants' tenure is negatively correlated, and establishment's size is positively correlated with knowledge-related behaviors. The correlations with use of tools are mixed. It was theoretically argued that knowledge-related behaviors will result in low response quality. Knowledge-related behaviors indicate low capacity, which reduces response quality, and are departures from the standardized interview. It follows, that the longer an informant is part of an organization the better response quality, and that the larger an organization the worse response quality. It has to be considered that these results might only hold in multi-topic-questionnaires with one informant per establishment, only, as it was the case in the SOEP-LEE survey. Although the behavior coding method is mode sensitive, it can be assumed that the actual knowledge issues are underreported because only behaviors that are obviously shown by respondents are coded. Some respondents might not reveal knowledge problems with responding due to social desirability.

The analyses will be replicated after more question-answer-sequences are coded. Statistical analysis possibilities are limited due to the low number of observations (31 interviews) and because only 11 question-answer-sequences have been coded so far. Thus, there is no reliable interpretation possible at the moment. Generally, the correlation of response behaviors with respondent's characteristics is problematic, as it may result in response bias and affects statistical estimates.

Nonetheless, these results hint at the extra burden that is placed on (informants of) large establishments, which needs to be considered in future survey design. Solutions may have to be found to deal with the problem of lower response quality in large establishments, such as the splitting of questionnaires throughout organizations and the use of multiple informants. The relevance of informant's tenure shows that special care is needed in the selection and identification of this person within the establishment. The measurement of informant characteristics in surveys on a regular basis can be recommended. As space is a scarce good in questionnaires it is important to know which the most relevant informant characteristics are.

The preliminary findings presented in this paper will further be analyzed by looking at the qualitative material more deeply (van der Zouwen/Smit 2004). Future research could realize additional value of BC if the findings of these analyses were combined with other types of data as Ongena (2005, 52) suggests. This can be done in two directions. First, hypotheses can be built upon the findings of BC which can then be analyzed using other response quality indicators such as Item Nonresponse or quality indicators which are based on editing information or interviewer debriefings. The question behind is, whether additional analyses show similar results. The SOEP-LEE data includes several types of (para-)data that can be used in that sense: interviewer survey data, interviewer debriefings regarding every interview situation[8], data regarding the editing process[9], and data based on the handwritten responses and comments in the original paper questionnaires[10]. Second, findings based on quantitative analyses of the whole establishment sample using the different sources of data and paradata can be supplemented by the BC method. In this case, BC and especially the qualitative material can be helpful in an explanatory sense as it allows a closer look into the actual response process.

6. LITERATURE

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[8] These evaluations include questions regarding the respondent (difficulties of identifying, his/her accuracy and knowledge), regarding the interview situation (interruptions), and regarding the response process (information retrieval, use of records, response burden).

[9] Within the editing process, several procedures of data cleaning were done such as checks of plausibility, consistency, sums and filters. While the checks themselves were done automatically, breaches were settled based on personal inspection done by survey institute staff. Settlement was done by looking at the original questionnaires and by re-contacting the establishments. This kind of paradata includes quantitative information on the number of checks done, the number of items checked, and the number of breaches found, the number of re-contacts, whether a clarification was based on a re-contact with a person other than the original respondent, or whether an attempt to re-contact was unsuccessful. It also includes qualitative information stemming from the editing group's comments regarding the telephone contacts.

[10] During the process of digitalizing paper questionnaires all of the responses that were not encodable within the coding scheme for the corresponding question were documented. Examples are handwritten comments next to a survey question or inadequate responses, such as the wrong use of scales.

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