

Knowledge Measurement and Interviewer Bias

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Abstract: Organizations can be defined as knowledge-based systems with the objective to influence all knowledge processes. Defining and measuring the knowledge value of the company are key strategic concerns in contemporary companies. First, this paper discusses the basic knowledge measurement approaches. During the process of knowledge identification the interviewing method is a commonly used tool. The paper portrays the impact of the interviewer bias to the quality of knowledge measurement processes. The reflection theory is the basic framework to measure interviewer bias associated with the knowledge measurement processes. Six case studies conducted by the author form the data bases for presenting improvement implications of the interviewer bias to knowledge measurement.

Keywords: Measurement, Interviewer Bias, Case Studies, Information System

Categories: H.1, H.4

1 Introduction

Knowledge Management has become a major research field in different disciplines in the last ten years [Laudon and Laudon, 05; Prusak, 97]. However, in recent years, not only knowledge management, but also primarily the measurement of knowledge [Housel and Bell, 01; Skyrme, 98] is developing into a new research field. Organizations have to measure the knowledge of their knowledge workers in order to optimize the business processes. Skyrme sees the measurement and management of knowledge-based assets as one of the most important issues for knowledge organizations. As a result, new methods, new methodologies, and new tools have to be developed to measure the knowledge of organizations and of the knowledge workers. In most knowledge management projects the interview method is chosen in order to gain information about the intangible assets of knowledge workers. During these face-to-face interviews process, the interviewer (knowledge-engineer) impacts the responses from the knowledge worker through their performance. Lyberg and Kasprzyky note that surveys often underestimate the measurement error [Lyberg and Kasprzyky, 91]. They identify two methods of dealing with this source of error: (1) reduction and (2) measurement. Measurement error through reduction is addressed by standardizing the interviewer performances. Reduction is possible reached through training, observation, and program monitoring. The second error measures interviewer error that can occur through sample designs that permit the calculation of the variance attributed to interviewers. One method – besides training, observation – to reduce interviewer bias is by applying the reflection theory of Donald Schön [Schön, 82]. The research seeks to determine whether the quality of the measurement

results during interview processes in a knowledge project is higher by applying the reflection theory than without this model.

2 Research Framework

2.1 State-of-the Art Knowledge Measurement

Chapter Two illustrates the three research fields of measurement. The first one is the *cognitive science approach* [Wilson and Keil, 99] with its six disciplines: philosophy, psychology, neurosciences, computational intelligence, linguistics and language, and final culture, cognition, and evolution. For cognitive scientists the objects under study are behavior and cognitions in humans. The examination of cognitive science can be seen as a basic explanation of how humans are perceiving, acting, thinking, speaking, and acting.

The second knowledge measurement framework is the *management approach* [Sveiby, 05] and it begins with the discussion of the key management measurement systems. Attention is mainly focused on how knowledge and/or intellectual capital is measured in an organizational context. Following the measurement framework from Sveiby four categories can be distinguished: Direct Intellectual Capital Methods, Market Capitalization Methods, Return on Assets Methods, and the Scorecard Methods. The Direct Intellectual Capital methods estimate the \$-value of intangible assets by identifying its various components. Once these components are identified, they can be directly evaluated, either individually or as an aggregated coefficient. The Market Capitalization Methods calculate the difference between a company's market capitalization and its stockholders' equity as the value of its intellectual capital or intangible assets. The Return on Assets methods average pre-tax earnings of a company for a period of time are divided by the average tangible assets of the company. The Scorecard Methods (SC) identifies the various components of intangible assets or intellectual capital and indicators/indices are generated and reported in scorecards or as graphs.

The third framework is the *knowledge potential measurement view* that measures the personal value of a knowledge worker. The knowledge potential view [Fink, 04] puts the knowledge worker with his skills, experience and expert knowledge in the center of the measurement process. The Uncertainty Principle of Heisenberg is the basic theoretical framework for the knowledge potential measurement process. The Uncertainty Principle functions as a reference-model for knowledge measurement because it is not a physical environment. The multiplication of the knowledge momentum value by the knowledge position value yields the knowledge potential value of each knowledge worker. Each measures property is determined by a certain number of dimensions explaining and describing the impact of each variable. The knowledge potential of a knowledge worker can be divided into ten measurement dimensions: Content Understanding; Company Knowledge Culture; Networking; Organizational structure; Knowledge worker skills; Learning and Training; Customer Information; Market and Competitor Information; Information and Communication Systems and Knowledge Management Systems; Knowledge Velocity. Therefore, the

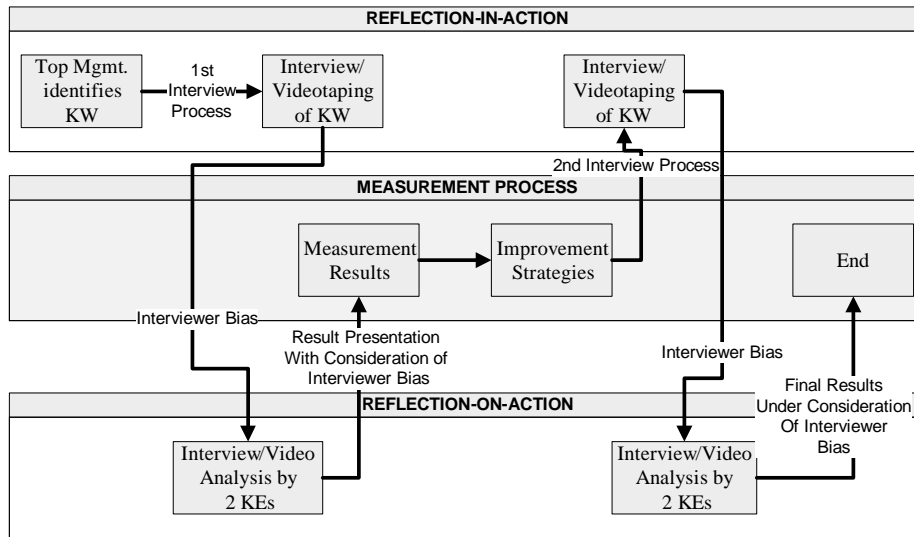
knowledge potential value can be defined as the multiplication of knowledge momentum times knowledge position by the application of the Uncertainty Principle of Heisenberg through the process of analogical reasoning.

2.2 Reflection Theory and Empirical Studies

Most of the above mentioned measurement methods use the process of interviewing to gain information about the experiences of a knowledge worker. The person responsible for conducting the interviews is called the knowledge-engineer – referring to the information engineering approach – who has social, technical, creative, and methodical skills required for leveraging knowledge embedded in the minds of the knowledge workers in an organization. The reflection theory by D. Schön [Schön, 82] is the theoretical framework for the derivation of interviewer related characteristics during knowledge measurement processes. The measurement design of the knowledge-engineer interview error is based on the theory by D. Schön, who distinguishes two reflection processes:

- *Reflection-in-action* which concerns reflection about actions during the process, i.e., spontaneous actions, recognitions, and judgments and
- *Reflection-on-action* which concerns reflection about actions which already took place.

Figure 1 illustrates the business process model for measuring the interviewer bias based on the theoretical research framework of the reflection theory (KE = Knowledge-Engineer; KW = Knowledge Worker). In the context of knowledge worker measurement, it means that two knowledge-engineers reflect in and on action about the information gained through the interview process with the knowledge worker. Successful knowledge measurement demands a person who is responsible for the achievement of the knowledge potential view, and the position is called knowledge-engineer. Each knowledge-engineer makes separately the rating for each knowledge potential dimension. This process characterizes the reflection-in-action process. Afterwards, the reflection-on-action process takes place. This means, that both knowledge-engineers reflect together about their individually scores. The two knowledge-engineers reflect-on-action when they communicate their views about rating the knowledge potential dimensions after the interview sessions. The discussion results in an agreement on a rating score on the ten knowledge variables. Moreover, the final measurement of each knowledge worker is discussed with top company management to develop an action plan for the improvement and re-enforcement of the ten knowledge variables. The objective of the second process lies in the evaluation of the improvement strategies and takes place about nine to twelve month after the first interview session. At the end, the two knowledge-engineers make a final reflection-on-action measurement session in order to summarize the improvement strategies and evaluate if the recommended strategies have improved the individual knowledge value and added value to the company's competitiveness.



KW=Knowledge Worker; KE=Knowledge-Engineer

Figure 1: Business Process Model for the Derivation of Interviewer Bias during Knowledge Measurement Processes

To investigate the knowledge measurement process, the *case study method* [Gillham, 00] was chosen because it excels at the development of an understanding of a complex issue or object. Once agreement was reached about the questionnaire design, a pre-test was administered with two major objectives: to test the questionnaire and to train the knowledge-engineers for the interview process. The questionnaire pre-test was the proving ground for open versus closed responses, question wording, question sequence, administration convenience, and time required to administer the interview [Fowler, 95]. Afterwards, six case studies have been conducted by the author at the University of Innsbruck, Department of Information Systems, and can be structured as follows:

- Three case studies were conducted at American software companies in the New Orleans area.
- Two case studies were conducted at Austrian Companies working in the field of document management systems and market research.
- One case study is representing a large European software company acting in Central and Eastern Europe.

These six case studies represent the data sample for the derivation of knowledge interviewer characteristics. An interview with open questions was developed and administered by the knowledge-engineers. The sample size was 40 knowledge workers working in one of the above mentioned companies and given answers to 40 questions conducted by the knowledge-engineer. This means, the total data size is based on 1600 answers. Two experimental groups evaluated in a laboratory setting of the department of Information Systems (University of Innsbruck) the process of

knowledge potential measurement. Those who participated in the evaluation process can be considered typical students who are familiar with knowledge management and measurement.

3 Interviewer Bias

The results from the six case studies show that six key interviewer skills – knowledge-engineer skills – are necessary to assure a high quality knowledge measurement process. The list below is ordered by importance of the interviewer skills:

1. *Number of Interviewers*: The knowledge potential measurement quality can be assured by the use of at least two knowledge-engineers. During the reflection-in-action and reflection-on-action measurement points it is important that the interviews with the knowledge workers are conducted by at least two interviewers. This process helps to reduce on one hand interviewer fatigue, because the knowledge-engineers ask alternating questions and on the other hand it also minimizes respondent fatigue by receiving questions by two persons.
2. *Use of multimedia technologies*: The use of multimedia technologies helps to enhance the quality of the knowledge potential measurement process. The face-to-face interview communication with the knowledge workers was coupled with videotaping. This audio-visual based communication improved the ability for decision making during the reflection-on-action process and therefore the quality of the measurement results. Maxwell and Pringle [Maxwell and Pringle, 83, pp. 33] point out that the use of videotaping has added a new dimension to the study of human behavior because of the considerable advantages of increased measurement reliability and validity. Through videotaping, the measurement is not limited to what is occurring in the real-time interview situation and to the number of observers. More importantly, measurement reliability can be increased through videotaping because the “ability to replay all or part of a recorded [interview] makes it possible to develop scoring techniques that are highly reliable and to ensure that this is maintained throughout rating procedures” [Maxwell and Pringle, 83, p. 36]. Furthermore, Maxwell and Pringle note the benefit of videotaping as a research method for very complex situations with subtle behavior changes. With respect to the knowledge potential measurement method, the situation is very complex for the knowledge-engineers. The quality of measurement for each knowledge worker by the interviewer is improved by videotaping because the ability to replay the interviews leads to a more accurate rating for each dimension.
3. *Interviewer Experience*: The result of the measurement process depends highly on the experience in measurement of the knowledge-engineers. Both knowledge-engineers had long-term experiences and skills in interviewing. Many knowledge potential measurement case studies by small Austrian companies were conducted during the last six years to collect experience in interviewing. Both knowledge-engineers were trained in advance to use the method of knowledge potential measurement, the video equipment and in the efficient and effective administration of videotaping and interviewing process. To reduce interviewer

error, the knowledge-engineers must have special training sessions. Before conducting the case studies, the two knowledge-engineers had a two day special training program to improve interviewer skills. Additional, pre-test case studies were conducted to apply and learn the process of interviewing. Special focus was given to the probing of open ended questions because they are the most different task for interviewers [Fowler, 91, pp, 279]. Furthermore, the interviewers should have a procedure which they can follow to minimize the extent to which they will influence the respondent answers. The key rules for the knowledge interviews are:

- The knowledge-engineers must read the questions exactly as they were written down, this means; they have to follow the questionnaire design which was developed in advance.
 - If the knowledge worker fails to answer the questions adequately in response to the original question, the interviewer should conduct nondirective follow-up probes and questions.
4. *Knowledge Management/Measurement Communication Skills:* Furthermore, it is the task of the knowledge-engineers to communicate the measurement process and the objectives of the knowledge potential result. The six case studies showed that at the beginning the knowledge workers are cautious and reluctant towards the measurement process. The case studies conducted with knowledge workers coming from Central and Eastern Europe showed that these respondents were extremely cautious at answering questions. A special communication of the value of videotaping was necessary because many knowledge worker were afraid that the video clips were passed to their country managers and that this data could be used in a negative way affecting their daily work. In order to assure a higher quality, the participants were informed about the interview procedure and the intension of the knowledge interviews. The knowledge potential view was explained to top management and the participating knowledge workers. The support of top management made the questionnaire administration easier, and it created an open atmosphere during the interview sessions. The transcribed interviews with all knowledge workers were made available to top management on CD-ROM [Roithmayr and Fink, 04] with a navigation system that leads one through all the interview questions and videotapes.
 5. *Interview setting:* In addition, it was necessary to have a separate room set up for the videotaping. For Summerfield [Summerfield, 83, pp. 7], videotaping in a controlled setting requires a special room prepared for that special purpose. In all six case studies conducted, a special room was assigned for the sole purpose of the knowledge interviews.
 6. *Trust Agent:* A major interviewer skill must be in establishing a situation of trust between the knowledge workers and knowledge-engineers in order to reduce respondent bias. Only if the knowledge worker has the feeling that there is an atmosphere of well-being, he is willing to give answers corresponding to the questions. Interviewers have to be aware that when questions about sensitive topics such as giving insight of the tacit knowledge are being asked, their characteristics have a major impact on the result.

The key lessons learned from the research are, that videotaping helped reduce the unreliability caused by knowledge-engineer fatigue during lengthy interview sessions. This source of unreliability also is the reason why the interviews always were conducted by two knowledge-engineers. During the pre-test, it becomes obvious that the interviews had to be conducted by two trained knowledge-engineers to ensure a standard interview session. The presence of two interviewers for knowledge measurement processes is highly recommended and guarantees better scoring results. Another source of unreliability is inexperience with the use of the video equipment. There, both interviewers were trained in advance in the use of video equipment and the conducting of interview sessions. A training program lasting about two days turned out to be enough for reduction of interviewer bias.

4 Future Research

The intension of this article is to discuss the role of the interviewer bias to knowledge measurement processes. The case studies gave insight about the qualification of interviewers and their impact to the quality of the measurement result. In the next step it is necessary to support the measurement process by information technologies. The basic research idea is to develop a knowledge control center in addition to the information control center. The *knowledge control center* [Fink, 05] must support the different stakeholders concerned with the measurement process in order to reduce measurement error. The use of the term stakeholder in the context of knowledge measurement processes in combination of the information systems research fields is recent [Fink and Roithmayr, 03]. However, if companies want that their knowledge workers use information more effectively for decision-making, they have to pay attention to the different interest groups (stakeholders) using the information system. Companies need to communicate more effectively with their stakeholders. As a direct consequence, the management must focus on a stakeholder analysis for knowledge measurement. A process model for stakeholder analysis in the field of knowledge management/measurement should include the following steps: (1) Stakeholder identification for Knowledge Measurement, (2) Stakeholder influence and importance portfolio analysis, (3) Design of a multi-stakeholder information system [Pouloudi, 99], (4) Implementation of the multi-stakeholder information systems for knowledge measurement (knowledge choice board).

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