Interview process model for requirement elicitation

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ABSTRACT
Requirement elicitation is the process of extracting the requirements from the project stakeholders. The success of the project depends on how well requirements have been extracted, whether they are completely obtained or not. As from Standish report it is clear that the number of project fail due to failure of the elicitation process to recognize the need of the customer. Interviewing stakeholder is a communication intensive activity involving various techniques & tactics requiring communication skills apart form experience and knowledge. Interviews are most natural technique also used in other domains like press interviews, interrogations, criminal examinations etc. where it has been refined, matured and used effectively. In this paper we present an interview process model for requirement elicitation, which explores nine set of questions adopted from other domains to effectively extract the requirements from stakeholders and also in a case where they fail to express their needs or are not co-operating. It also highlights the verbal & nonverbal communication, inhibitors & facilitators of communication and its analysis relevant to the interviews. The model uses layering of the questions in a fixed format and suggest criterion for analysis of the response by using psychological parameters**.**

Categories and Subject Descriptors
D.2.1 [**Requirements/Specifications**]: Elicitation methods – interview.

General Terms
Design, Experimentation, Human Factors, Languages, Theory.

Keywords
Elicitation, interview, question types, psychological response.

1 INTRODUCTION
Requirement elicitation is to extract & dig out the knowledge about requirements. Elicitation techniques like interviews, brainstorming, workshop, use case, focus groups, JAD/RAD, prototypes, etc are used. Overall these techniques have one thing common that is the elicitation team has to interface with the stakeholder(s) representative(s) or user groups using questions to enquire requirements. Out of which the interview is the most natural, easy to use mechanism and most popular [37] [8] for the requirement elicitation. It can collect information, for uncovering opinions, feelings, goals, can probe in depth. Interviewing is the technique that has being used over years in some or other from such as press interviews, interrogations, criminal examinations, selection interviews etc. where it is used effectively and the techniques has matured and refined during the course of its development [8] [1]. The interviews have many advantages over other elicitation techniques. It employs direct interaction with users and other stakeholders. The preference is for one-on-one sessions with the analyst providing directed probes to elicit the knowledge desired. Both formal and informal procedures are used in this technique, generally characterized by structured and unstructured questions.

2 PROBLEMS IN ELICITATION INTERVIEW
The interview technique also faces with few problems apart from the problems which are the intrinsic part of requirement elicitation. Such as (1) the stakeholders may have difficulties in expressing the needs of the software system that is desired [35] [15]. (2) Stakeholder also has limitations of memory and communication abilities [30] [41]. (3) Whatever the people do the most they cannot describe it as they think it is usual without any importance “tacit knowledge”[17]. (4) Information may be inaccurate as suggested by cognitive sciences [16] [48] [49]. (5) Communication problems such as domain terminology, different view, biases, status, gender, and environment [17] [4] [44]. (6) Interview generate large amount of data. (7) It is hard to compare the different response [42] [50]. (8) It is difficult to analyze that a particular question is still unanswered [15]. (9) The personality, attitude, and manner of asking questions can affect information the elicitation teams receive [27] [13]. (10) Social, political, cultural and educational backgrounds of stakeholders influence the information flow, distort it and limiting it. (11) People have differing abilities to remember & articulate their observation.

3 PROPOSED PROCESS MODEL FOR INTERVIEW
Using interview during the requirements elicitation is not a process of simply asking stakeholders to tell you everything they need from it [28]. The interviewer will witness stakeholders who are obnoxious, dull, excited, they have different personality traits and cultural influence etc [38] hence they cannot all be treated in the same way. As an interviewer, one should learn the techniques for maximizing the completeness and reliability of information sought from so many different kinds of people [14].

The proposed process model tries to corner the particular stakeholder with the help of the question and layering as the order of questions affect the information & facts in their reply. It also helps them coin words for facilities and needs that should be incorporated in the system being designed at hand. The model modifies and adapts interview technique from domains like judiciary & criminal investigations [46] [25], psychology [2] [13] and uses in context of the requirement elicitation. The model not only puts a question and records response but evaluates the response in terms of psychological parameters such as confidence, verbal & nonverbal responses. Other facts are revealed like accuracy in the information given in the responses, intrinsic problems of perception, accuracy, memory and recall. The components of interview process framework are as follows.

4 COMPONENTS OF INTERVIEW PROCESS MODEL

The effectiveness of an interview depends on the stakeholder perception and recollection, differences or similarities in socioeconomic status or language used in the interview, unconscious emotional reactions and etiquette barriers, time and place of the interview, the number of interruptions, and the scope and wording of questions. Personal factors also influence accuracy of the interview such as biases and attitudes, ability to listen, and awareness of nonverbal communication. Finally the interview procedure should able to extract information from even the non-cooperating stakeholders. Below are given concerns on which the homework should be done.

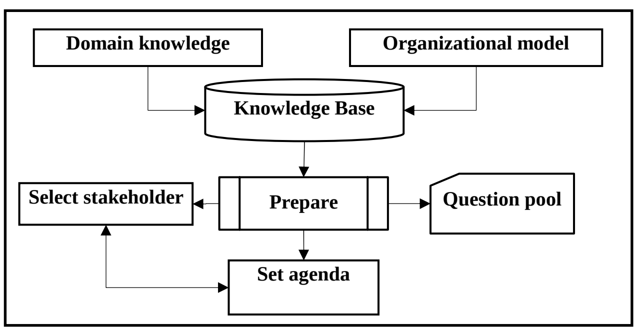

Figure1. Preparation for elicitation interview.

4.1 Domain study & organization study

Pre-Study of the domain and organizational model of the client reveal a lot of things [10] [20] like what are the procedures that operate near the people in question, what effort they put in, and what are the usual problems that they face. It ensures the familiarity with the subject, sharing and cooperation. It easy to know about the delegation of work, task, process etc in the organization [3] while discovering what they have to do, with whom they should meet, what information is to be extracted from them [43] [47].

4.2. Pre-interview Preparation

The preparation for the interview includes activities like (1) Furniture should be as such where the interviewer and client interact across a corner of desk or table allowing flexibility and visual & eye contact and does not hamper important psychological conclusions [21] [5] while revealing non-verbal communication and psychological traits in the interview. (2) Timing should facilitate good communication. This involves how much time should be spent for interview, what time during the day is best [38] [14]. (3) To reveal problems of the client selecting the people to interview [7] [23] [11], should be random, across the ends of the domain and from the top to bottom of hierarchy this avoid an unnecessary requirement [11]. Educational background, social, political, economical, job profile should be evaluated before the giving call to a person to interview in context of requirement elicitation. (4) Pool of questions should be according to domain of the problem or as per agenda of the interview, the elicitation team should prepare the pool of the question under the various categories, they should be precise and unambiguous so that it is conducted smoothly without any hassle and efficiently. These are classified to nine classes; each class extracts specific information while others are useful to regulate the interview. The closed end questions [36] seek confirmation, commitment, verification and to refresh memory. Open-ended questions [36] and mirror statements [39] are used to reveal detailed information former is usually used to start an explanation and later one are used to probe little deeper. Ancestry idiosyncratic questions [34] gives reveals past, finds out details, likes, dislikes. Negative-Balance Questions [34] helps to end dominance, stopping over emphasizing, and braking and controlling the conversation. If we want candidate's reflexes to agree then a reflexive question [26] can achieve this. Judgment-call questions [26] establish priority & judgment. To help stakeholder to reply the answer we can use half-right reflexives question [26] or a leading questions [36] [24] [39] but later one is also helpful for stakeholder to recall its memory.

4.3. Agenda

The interview agenda should be informed in advanced to each stakeholder called for interview. This gives them time to gather the necessary information either by studying or by recalling the features and problems of current or some known system.

4.4. Record response & Response analysis

The response to the interviews questions are source of tremendous data & knowledge [6]. Analyzing response is to check relevancy, sufficiency of information and completeness of answer. Archive the response in the knowledge base and also in the repository for further reference and analysis [6] [9] [29]. Responses are analyzed in terms of psychological parameters namely verbal, non-verbal, inhibitors and facilitators of communication [19] [27]. It gives a sounding base to select the next question [12]. This also helps to control the interview and prevent deviations from the main concerns and establishes what is left to question in a context of a particular requirement that should be covered in next question or the follow up interview. The psychological analysis is very helpful in understanding the stakeholder mindset, social, economic, political, stress levels so that the better questions can be framed & information in the responses can be verified. These interviewers should be taped or digitally record the interviews [42] [50] [26].

4.4.1. Verbal & non-verbal communication

A successful interview can be conducted only if you hear what is being said, which is not an easy skill to master. There may be two reasons for this [13]: 1) Most of us prefer to talk rather than listen; and 2) we are able to listen three or four times as fast as the other person talks this "gap" is usually filled by thinking of similar situations, leaping ahead and anticipation. It has been estimated that at least sixty percent of all important messages are passed nonverbally so we should "hear" nonverbal communication [18] [45], body movement and positioning (kinesics); variations in pitch, intensity, and rapidity (Para-linguistics); spacing and distancing (proxemics) [45] [40]; and by gaze and eye contact, head nods, gestures, and arrangement of furniture. Some common types of cues are as follows: (1) Too-vigorous and vociferous denial is shown upon asking certain questions meaning that something is forcing interviewee to resist. (2) Lapsing into silence after making a tentative statement stakeholder goes silent then they are unsure whether to proceed, or has a hidden agenda. (3) Pacing shows a speech which is halting or hesitant indicate that the stakeholder is still trying to sort things out in his or her mind or is uncomfortable. (4) Voice timbre and inflection reveal a variety of emotions in the tone like anger, sadness, excitement, worry, jitteriness, doubt, etc. (5) Physical gestures like folded arms, clenched fists, crossed legs, and leaning back indicates distrust, irritation, embarrassment, or anger while open arms, uncrossed legs, and leaning forward indicate friendliness, openness, honesty, and truthfulness. But these are cultures-specific. (6) Facial Expressions indicate emotions, expressed by changing facial expressions. The stakeholder may adopt a wooden face suggesting that they want to avoid the question.

4.4.2. Inhibitors and facilitators of communication

An inhibitor is a barrier or obstacle to communication that should be avoided, circumvented, or removed from the stakeholders' mind [40] [13] [45]. They are as follows. (1) Competing Demands for Time and Greater need, the stakeholder may like to spending time with other subjects but not in an interview session greater need is similar to competing time demands but the stakeholder may have a greater or more immediate need to discuss one issue than another, does not concentrate on topics at hand and want to change to other. (2) Forgetting is natural they could have partial memory of an event [22] [32] [33 [31]. (3) Chronological Confusion is the tendency to confuse in chronological order of two or more events like stakeholder may either be unsure which event happened first, or may remember the order incorrectly [31]. (4) Inferential Confusion is to make errors of inductive and deductive logic. Induction errors are to make erroneous, exaggerated, and unfounded generalizations based on a few anecdotal concrete experiences. Deduction errors are less common and more difficult to detect but are rooted when they give a concrete examples to illustrate the interviewer's generalization. (5) Perceived irrelevance is indicated when stakeholder thinks information is irrelevant, they will not offer it. A facilitator is a positive force motivating the stakeholder to communicate they are social-psychological products of the relationship between the information and the situation in which it is communicated. Using facilitators maximizes the flow of relevant information and maintain optimal interpersonal relations like (1) Recognition should be shown to the interviewee for a job well done. (2) Changing the frame of reference is helpful when we cannot get at information from one direction, change the frame of reference that is to circumvent the problem by changing the perspective that a stakeholders "X" was saying this. (3) Always ask why for every requirement, there should be a question asking why it is so as answers may be superficial, general and oversimplified

4.6. Question selection and asking method

Whole process of asking systematic questions with stakeholder is as follows (see figure 2). Start the interview by selecting the closed ended questions, casual in nature. Like "are you comfortable… "Or "shall we begin" or "I think that it was not hard to find the time for this interview "and "I would like to remind you about the agenda of this interview" etc. Ancestry idiosyncratic questions enquires about any previous experiences, likes, dislikes and the knowledge about system being build or any previous system they know or have used like "can you explain or describe or share the experience… with previous or any system which you have used or come to know about?" These questions reveal halo effect and find out how much the participant can dominate as an experienced participant can dominate young elicitation team. To counter this effect the team should have some negative balanced question which ask to quote a bad experience or problem they have faced with the system or some drawback about the system which they describes to be good one. After this you will find that they quickly resort back to the interview this saves time, effort, reduce cost. With analysis response team can ensure that participant have been tuned enough and is ready to give more detailed answers. To seek details, an opened question can be pushed forward to enquire about a requirement in detail. This could have many possibility and effects like if the respondent co-operates and easily gives details then a the mirror question could be asked to further investigate in requirement(s) if required, after analysis of the response the topic could be closed by asking judgment –call questions with the mix blend of few closed ended questions and the reflexive question to confirm what statement they had made and what is the conclusion.

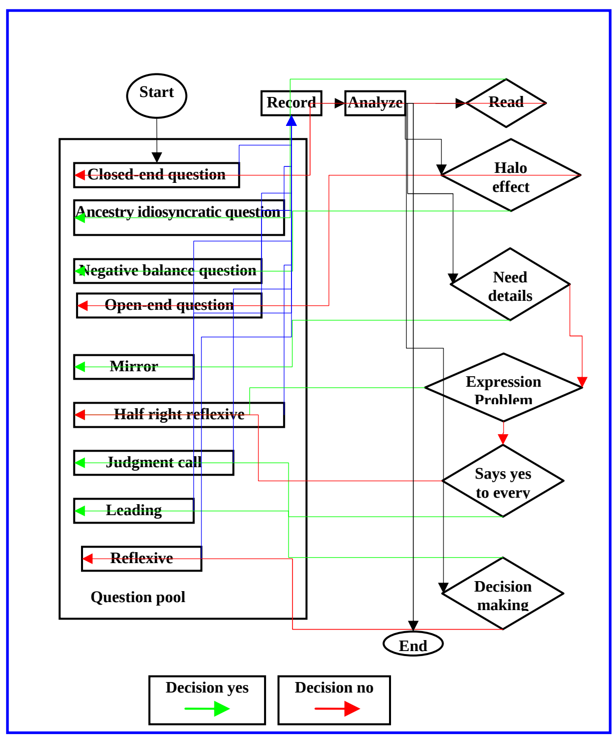

Figure2. Interview process model for requirement elicitation.

But when the participant does not co-operate, or has the problem of coding their needs, phrasing them, or not sure about requirements at all and says yes to every thing asked. To extract the information in this case is hard and requires skills and control over the interview. If the participant(s) are forced to give answers by cornering them with a quality of good phrased questions this could be achieved easily. Out of three possibilities the major one is that the stakeholder does not know the requirement and find hard to express them in phrases. Then give a reflexive question and then put a leading question to the stakeholder. As the leading question always has the correct indication of the answers. This question gives them a seed of thought and the base to think upon. Leading question is decided with the help of domain knowledge. This sets an example of how to express the needs, motives them. If they respond then put a mirror question to probe more. If they again have problems in expression & details of requirements then phrase a half-reflexive question, this stops them from agreeing on every thing and would use their own brain. This will make them practice of that what is desired from the stakeholders during an interview. If the team succeeds, then elicitation team should prepare for a follow-up interview or next interview with the peers on same agenda to verify requirements with other participants. In case of failure, the team should train stakeholders, as how a previous system was build and how the stakeholders drive the project.

5 FUTURE WORK & CONCLUSION

If the elicitation team conducts the interview with the proposed process then the chances of failure to extract the requirements form the stakeholders is reduced. This process requires less skill to learn up and training; as far as elicitation team is considered. Thus further lowering the dependency on several factors that are responsible for the extraction of the requirements like skills & experience for the interview, communication skills etc. this framework is helpful to the elicitation team who face a stakeholder that have problems in phrasing their needs and expectations from the system. Further the elicitation team can conclude the other psychology facts which are helpful in the establishing & revealing information about the responses given by the stakeholders. This information can be used in the follow-up interviews or with the other peer interviews on the same agenda. Future work should be done on the refinement of the framework; as this framework for interview is coarse. More work is required in relevance of the psychological responses. Due to large amount of data and question formats a tool to support the framework is desired.

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