

Soft Skills REquired: A practical approach for empowering soft skills in the engineering world

Birgit Penzenstadler, penzenst@in.tum.de
Technische Universität München, Germany

Gabriele Haller, haller@gt-muenchen.de
gt-muenchen, Germany

Tobias Schlosser, tobias.schlosser@nibasco.de
NIBASCO, Germany

Gabriele Frenzel, frenzel@newtec.de
Newtec GmbH, Germany

Abstract

Unfortunately, most requirements engineers and their project managers are not (or not enough) aware of the need for soft skills in addition to latest technology and state of the art methods.

This paper presents first a definition and categorization of soft skills, then characteristic soft skill fingerprints elaborated for requirements engineering practices, illustrated by a number of examples, and finally guidance for applying that knowledge in project and human resource management.

1 Motivation

More than any other software engineering (SE) discipline, requirements engineering (RE) is based on communication and on interaction between people. Most work on requirements engineering focuses primarily on technical or scientific aspects and only secondarily on soft skills, e.g. communication abilities for eliciting requirements [8, 16]. The methods designed for dealing with RE challenges hardly take into account people's different personalities and talents.

Practical experience from requirements engineering and consulting over several years has made us believe that the clue for success is each individual person's participation in a project.

Contribution The integration of practical experience within our working group and the knowledge gathered from literature tries to derive simple guidelines for analyzing, detecting, and working with soft skills. The discussion in this paper is based on the questions: How can soft skills be classified? Which RE practices require which soft skills? How can this knowledge be used in project and human resource management?

Our intention is to share our approach as basis for discussion and incrementally improve it by adding more detail in the form of concrete guidelines and extending this approach to other domains.

Outline Sec. 2 defines the term “soft skills” and describes our way of working on the topic. Sec. 3 discusses the assessment of soft skills, their classification and a mapping to RE practices that allows to develop soft skill profiles for specific tasks within RE. Sec. 4 proposes concrete guidelines for applying the profiles in project management and human resource development. Sec. 5 concludes by giving an outlook on future work.

2 Background

Soft skills have been recognized as important prerequisite for performing RE, e.g. by [8, 16]. However, searching for a common, appropriate definition of the widely used term ‘soft skills’, we found that there is no consistent understanding of this term but many different definitions: **Soft skills** are “communicative abilities enhancing the efficiency in interactions.” [13, p.15], “the ability to communicate and work in teams.” [4], or “is a sociological term for a person’s Emotional Intelligence Quotient” [7].¹ Within this paper, “soft skills” are understood as communicative abilities for interacting with other people.

The term ‘social skills’ brought more results when scanning international realms²: **Social skills** “and adaptive behavior represent two subdomains of the superordinate construct of social competence.” [9] or “are

¹Some authors seem to avoid the problem of defining the term by specifying its components separately without defining the whole subject (cf. [4]).

²Google Occurrence Index @06/12/2009:
social skills 4.16 m; soft skills 1.77 m; social competence 0.78 m

viewed as an organizing principle for relating a variety of superficially dissimilar behaviors under a single megaconstruct.” [3].

3 Soft Skills and RE practices

To enable communication between people, it is obvious that they need at least a common language (verbal) and an idea of common behavior (manners, body language, sign language, touch, eye contact), both in passive and active form (coding and decoding). Practical experience shows that people are more likely to misunderstand each other when they have different personal backgrounds and if the purpose of the communicative act is less functional. Differences between people are fundamental (natural and necessary) for their general development. The basic idea in our culture is that everybody is unique. Each individual has their uniquely developed (soft and hard) skills at a specific level and at a specific point in time which constitute their unique personality.

3.1 The Building Block Model

The assumption is, that a person’s existing soft skills characteristic can be determined by building blocks which interact mutually. Our building block model in Tab. 1 defines four hierarchical layers which are responsible for acquiring or shaping the soft skills of a specific person. There are two levels which are basically independent yet they also influence each other.

Level	Building Block	Age	Model	Changeable
Profession.	3 Training			Within weeks
	2 Professional Experience	15+	Apprenticeship	Within years
Personality	1 Sociocultural Imprint	3-15	Lewis Model	Very little
	0 Core Identity	0-3	Tangible Character types, Big Five	Not at all

Table 1. Soft skills acquirement layers

Core identity The base block is called the persons core identity. By the age of 3, the specific personality traits of a person and related soft skills are pretty much settled³.

Sociocultural imprint The second layer is labeled as sociocultural imprint. In this phase, the influence of the social environment (e.g. culture, religion, family,

³The ratio between genetic and environmental disposition of a specific characteristic contributes in roughly equal proportion [10]

playmates, siblings, education, schools) defines the development and manifestation of a given characteristic. Example: A child is extroverted (core identity trait), but will develop differently in his behavior and communication style in varying cultural environments [6]. So a person, although fundamentally extroverted, may be sensed as introverted in a culture which appreciates extroverted people when socialized in an environment which is fostering more introverted behavior. If a person has gone through the first two layers in our model, the first level, a person’s *personality* is basically fixed.

Professional experience The following layer is called (professional) experience as specific soft skills have to mature by practice, for example dealing with conflicts. Some soft skills are developed from scratch, e.g. facilitation of meetings, although they normally depend on some other soft skills. Additionally, some informal competencies need time to develop, e.g. adequate expectation of reactions of co-workers or organizations in specific situations [1].

This layer is governed by the fundamental principle of apprenticeship. Practical experience develops in 3 stages: First, as apprentice you learn the basics, then as a journeyman you gain practice until you finally reach perfection as a master.

This apparently archaic or old-fashioned model is a fundamental human concept which seems to be codified in our brain’s elementary structure.

Training The last layer is training. There are soft skills which can be achieved in a relatively short time by training, but only if the basic skills already exist and there is just need for some awareness or specific knowledge to bring out the hidden skills.

In contrast to that, experience shows that training of a specific communication skill may seem to work in role plays but it does not in a usual working situation. According to our model, the reasons for this lie in more fundamental personality traits which are unconsciously conflicting in the normal environment.

3.1.1 Core Identity

We assume every human person has a basic core identity. In psychology, the ‘Big Five’ personality traits, also known as the ‘Five Factor Model’ (FFM)[11] is a well known, empirically validated, and practical model for defining 5 multidimensional basic factors which are stable, independent and, for several countries, culturally unswayed. These five factors are **O**penness to experience, **C**onscientiousness, **E**xtraversion vs. introversion, **A**greeableness, and **N**euroticism.

There is common understanding that the characteristic setting of these factors for a psychologically

healthy person are generally stable, even though there exists a tendency for a maturation effect during a person's lifespan.

In our daily work and living we come across fundamental character types, which are identified with a typical set of bipolar personality characteristics (tangible character types). An interesting example are the antipodes of a *systemic inspirator* (SI-type) and *linear efficientist* (LE-type). People are normally not aware of it, but everybody seems to experience the clashes when these two types are forced to interact or to build a working team.

To give a rough impression, the *SI-type* is regarded as being not very comfortable with executing linear planning, detailed documentation, routine work, fixed timelines etc., but very good in building relationships and providing new innovative ideas. The *LE-type* feels traumatic about a spontaneous change of given timelines, neglecting of stipulated rules or agendas and non-efficient, non-focused behavior, but very comfortable with working in constant, continual, controlled environments and hierarchical, well organized process-oriented organizations. In addition, this type has a tendency towards detailed and exhaustive documentation. Each of these two character types has its own definitive strengths (e.g. big picture view vs. elaborateness). For getting optimized results in RE practice (cf. examples in 3.3), soft skills of both types are needed.

The questions are: Are there feasible methods for these two character types to interact in most productive way, and how to identify these types in practice? Time management is a very good example where *SI*- and *LE-types* are colliding in daily work. The typical methods and requirements of classical time management practices are more appropriate for and are working best *LE-types* only, as *SI-types* are typically not comfortable with fixed time lines [14, 17].

3.1.2 Sociocultural Imprint

The experiences in the cultural and sociological environment during childhood and adolescence are defining further personal traits.

The Lewis model [12] of international diversity uses a practical and handy categorization of different countries for understanding and enhancing cross-cultural communication. The basic idea is that there exists a triangle of national cultural profiles where the external corners are defined as *multi-active* e.g. Argentina, Brazil, Italy, Spain, *linear-active* e.g. Germany, Switzerland, and *reactive* e.g. Vietnam, Japan, China.

All other countries can be arranged along the edges

between the three corners. Typical cultural characteristics are distinguished in *basics*, e.g. values and core beliefs, concept of space and time, self image, *communication*, e.g. body language and listening habits, and *interaction*, e.g. concept of status, gender issues, style, management. These cultural characteristics influence the development of each individual's personality in interdependency of the inherited parts of the big five.

For example, a more extroverted person will usually find this more supported in a multi-active environment (Brazil) than in a linear-active or reactive country like Germany or Japan, where extraversion tendencies of a person normally show themselves in more subtle behaviors.

3.2 Mapping Soft skills to RE practices

The so-called RE "practices" in ReqMan [5] matched the RE activities we had identified out of practical experience, so we decided to adopt their terminology and to concentrate on the question: Which soft skill does an engineer need in order to accomplish the duties and responsibilities of each practice?

We analyzed the required soft skills for all basic practices covered in ReqMan [5] and singled out the following three practices as examples for this paper: Elicit non-functional requirements, document customer requirements, and review requirements. The matrix in Tab. 2 displays the assigned soft skills according to the building block model (see Sec. 3).

3.3 Soft skill profile of an RE practice

Each RE practice can be assigned its own characteristic fingerprint of technical skills and soft skills.

The *technical profile* consists of the classification and description suggested by the ReqMan framework [5]: a classification according to the general RE activity to be performed, the description of the methods and techniques resulting in the practice, and the ranking of a practice according to its importance.

The *soft skill profile* complements the technical profile by assigning the soft skills for a practice (as in Tab. 2), also including priorities.

The combination of the technical skills required to perform an RE activity and the respective soft skills that complete the picture, provide an integrated and specific profile for each RE practice.

Taking both into account, technical skills as well as soft skills, will surface a complete picture of skills required to perform a certain task. The percentage of matching the required soft skills to the soft skills a person has, gives an indication of how good the respective

RE Practice	Core Identity	Sociocult. Imprint	Prof. Experience	Training
Elicit non-functional requirements	be insistent	- disciplined - empathize with customer - be interested in - to have foresight - be self-confident	- be able to follow the train of thought - anticipate the need of the stakeholder	active listening
Document customer requirements	- be persistent - be patient - be diligent (exact) - be detail-oriented - not creative - accept customer's view	- have empathy and intuition - be able to adopt the customer's view - be disciplined	be able to follow the train of thought (of the future readers)	be able to phrase precisely
Review requirements	- not creative - detail-oriented - diligent - objective		- diligent - be able to comprehend and capture connections and context	- systematic - be able to read precisely (= be able to perceive language precisely)

Table 2. Classification of Soft Skills

person may fulfill the assigned job.

For example, for documenting customer requirements a requirements engineer needs to have technical documentation skills and to be familiar with the technical subject or project context. Mandatory soft skills (acc. to Tab. 2) are patience, persistency and empathy.

Discussion The example discussed above shows very clearly that placing the wrong person in the job may create misunderstandings and lead to a different (maybe even wrong) flow of work that can hardly be changed later on during a project. This is why so many projects fail, even if they are equipped with enough man power and best-practice methods.

Of course, you will never find the ideal person to bring 100% of the soft skills specified for one practice. And of course, it is not the aim of the mapping to state that all the soft skills listed are absolutely necessary to do a good job. The advice given by the mapping is that, looking for a person to do a job like for example documenting customer requirements, you need to look for someone who is matching as many as possible of the given personality criteria.

Generally, a RE job does not involve working on only one practice. The elaborated mapping of soft skills and practices may give a hint on which practices should be performed by the same person because they require a similar set of soft skills. For example, the documentation of customer requirements and the elicitation of non-functional requirements may be done by the same person, whereas the review of requirements demands for a different soft skill profile.

4 Application

The approach described above can be used in different ways: it allows for general improvement of communication and for human resource management.

Communication An improved perception of the different soft skills and their occurrences within different personalities has an effect on the mutual perception of and understanding between team members. To be aware of the existence of different types of personalities (see Sec. 3), leads to a better understanding of their behavior. Team-internal communication can in general be improved by achieving an “empathy treaty”:

1. *Self perception* What personality type do I have?
2. *Observation* What personality type and communication patterns does my counterpart have?
3. *Acceptance* Every personality type has certain benefits he can bring into a project and within heterogeneous teams, the members can complement and replenish each others skills.
4. *Analysis* Which methods are suitable to communicate with the other team members for which tasks?

Human Resource Management There are three potential purposes within human resource management that can be supported by using soft skill profiles:

Staffing Analyzing the required soft skill profile for the vacant position and explicating it as a checklist for the candidate interview helps in finding adequate matches for short term project manning.

Personnel development Analyzing the soft skill profile of employees helps to plan human resource development. You can assign them the tasks they are best suited for and you can suggest and organize trainings to improve certain soft skills.

Project management Analyzing a team on soft skills is useful for kick-offs and/or currently problematic projects. In the first case, tests can assist in finding adequate manning for certain tasks (practices) and, in the second case, it helps to detect missing soft skills that led to failures. In either case, the team can be staffed with personnel that possess the missing soft skills or be trained accordingly.

Preparation In order to benefit from soft skill profiles as described above, the questions to answer and steps to consider when setting up a soft skill profile are the following:

1. *Task description* For a job advertisement, elaborate an explicit description of the technical profile.

2. *Soft skills* The mapping in Sec. 3.2 gives examples for how to make a list of required soft skills.

3. *Prioritization* We suggest to assign a weight to each soft skill, as one person might not fulfill the list completely.

Procedure After the setup, the profiles are ready for use in tests, assessment centers and job interviews, guided by the questions:

1. *Occurrence* How distinct or developed is the soft skill of a particular person? This can be assessed either through a set of appropriate questions or a test. For example, the factors of the Five Factor Model (see Sec. 3.1.1) can be easily tested with the NEO-Five Factor Inventory. The latter is an internationally used, standardized 15 minute version (60 questions) of the NEO-PI-R (NEO Personality Inventory Revised) personality test [2]. The SI/LE type characteristics might be tested with thought style analysis[15].

2. *Fulfillment* How well does the candidate person match the profile? Having received an answer to either tests or questions, the interviewer can sum up the results and decide whether the candidate fulfills the given profile. However, an open question is how this can be judged.

3. *Perspectives* What are the personal development perspectives of the candidate? Depending on the result, the analyst can suggest specific training or courses to enhance some of the skills that might still require improvement.

5 Conclusion

In this paper we have provided a classification and discussion of soft skills in the context of RE and, on the basis of that, a mapping of soft skills to RE practices. This mapping allows for the development of profiles for finding the right manning for a project team.

Future Work To validate the approach in practice, we would like to apply Tab. 2 in several RE projects. We are aware that an empirically resilient evaluation of such a method requires an extensive field study. A long-term goal is to analyze and apply it to other disciplines within software engineering.

To extend the approach, we want to develop a set of questions to help assessing certain soft skills in job interviews. Furthermore, we seek integration with methods for soft skill assessment in human resources, for

example in the form of tests.

Acknowledgements We thank Paul Huber, Tim Jakobi and Tobias Hauzeneder for valuable discussions.

References

- [1] F. Böhle and A. Bolte. *Die Entdeckung des Informellen: Der schwierige Umgang mit Kooperation im Arbeitsalltag*. Campus Verlag, 2002.
- [2] P. Costa and R. McCrae. *The sage handbook of personality theory and assessment*, chapter NEO Personality Inventory Revised. 2008.
- [3] J. Curran. Pandora's box reopened? the assessment of social skills. *J. of Psychopathology and Behavioral Assessment*, (1), March 1979.
- [4] Deutscher Manager-Verband e.V., editor. *Handbuch Soft Skills - Band I: Soziale Kompetenz*. Vdf Hochschulverlag, Zuerich, 2003.
- [5] Doerr et al. Implementing requirements engineering processes: Using cooperative self-assessment and improvement. *Software, IEEE*, (3), May-June 2008.
- [6] Eaves et al. Comparing the biological and cultural inheritance of personality and social attitudes in the Virginia 30 000 study of twins and their relatives. *Twin Research and Human Genetics*, (2), 1999.
- [7] D. Goleman. *Emotional Intelligence - Why it can matter more than IQ*. Bantam Books, 2007.
- [8] E. Gottesdiener. *Requirements by collaboration - Workshops for Defining Needs*. Addison-Wesley, 5th printing edition, October 2007.
- [9] F. Gresham and S. Elliott. The relationship between adaptive behavior and social skills. *J. of Special Education*, 1987.
- [10] Jang et al. Heritability of the big five personality dimensions and their facets. *J. of Personality*, (3), 1996.
- [11] John et al., editor. *Handbook of personality: Theory and reasearch*. Guilford Pubn, 2008 edition, 1999.
- [12] R. Lewis. *When Cultures Collide: Leading Across Cultures*. Nicholas Brealey, 3rd ed. edition, 2005.
- [13] R. Niemeier. *Soft Skills - Das Kienbaum Trainingsprogramm*. Haufe Verlag, Hannover, 2006.
- [14] C. Nussbaum. *Organisieren Sie noch oder leben Sie schon?* Campus Verlag, 2007.
- [15] C. Nussbaum. Test Denkstilanalyse / Test Thought Style Analysis. www.kreativechaoten.com/denkstilanalyse/test.php, 2009.
- [16] S. Robertson and J. Robertson. *Mastering the Requirements Process*. Pearson, 2nd edition, 2006.
- [17] L. Silber. *Time Management for the Creative Person*. Three Rivers, reprint (feb 28, 1999) edition, 1999.