
Thesis to Attain the Degree of Master of Business Administration

Design,
Evaluation & Validation,
and Analysis
of a
Five-Dimensional Leadership Questionnaire
for a
Project Leader
in an
International Scientific
Research Environment

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University IFM
INSTITUTE OF FINANCE AND MANAGEMENT
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MASTER THESIS

**Design,
Evaluation & Validation,
and Analysis
of a
Five-Dimensional Leadership Questionnaire
for a
Project Leader
in an
International Scientific Research Environment**

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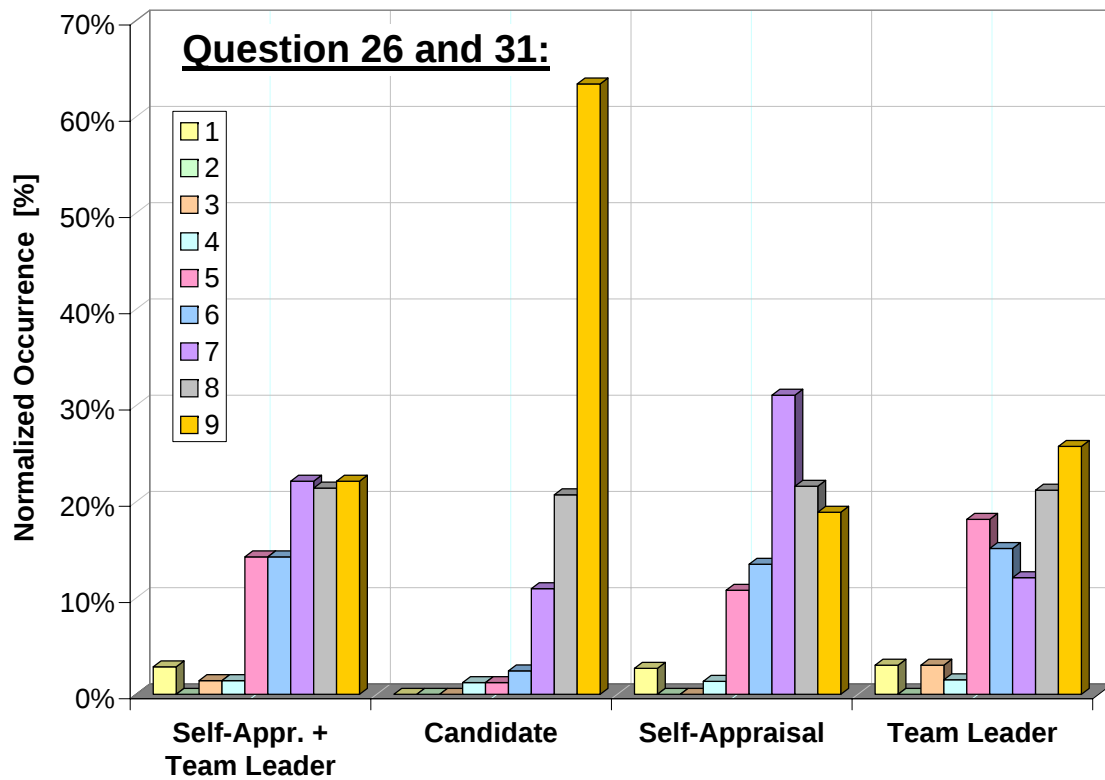
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To My Family . . .



What is the meaning of this picture?

(See last page for the answer.)

Executive Summary

The basic goal of the study is to develop a five dimensional leadership questionnaire for a project leader in an international scientific research laboratory and to verify statistically the independency of the individual questions from each other to ensure low overlap in content and meaning by achieving low correlation coefficients. This leadership questionnaire is designed to examine the behavior, personality, and character attributes of a project or experiment team leader in an international scientific research laboratory as perceived by her/his team members during the planning, design, implementation, and execution of the project itself. The leadership questionnaire is applied to a sample of about 40 participants from different international scientific research laboratories. This sample should represent in age, rank, and profession the whole population of employees and team members currently working in different international scientific research laboratories dealing with physics, informatics, and engineering sciences. The individual questions of the leadership questionnaire are evaluated & validated, and finally used to analyze the leadership traits of a candidate, a group of team members (self-appraisal), and their supervisors.

The basic principles of selected leadership theories are explained in Chapter 2 and historical overview of its progress over the past century is provided. The main purpose is to show that those leadership theories and their research are an empirical and dynamic process of establishing new theories and questionnaires and adapting existing ones to the changes of our society due to technological progress. Today's classical theories about leadership were established empirically and step by step by improving and changing existing theories. The development of those theories was induced by managements requirements to understand their team members and team leaders behaviors and to keep both their motivation and their performance high. Classic theories were modified and evolved to fit the daily needs of companies, organizations, and the evolution of societies. Therefore, it is possible for anyone develop a specific questionnaire by following certain scientific rules and procedures.

A description of the scientific research environment and the work within scientific research teams emphasizing the team leader's tasks and responsibilities is given in Chapter 3. The main premise for the application of standard leadership questionnaires [1, 2, 3] is that the team should consist mainly of experts with a broad overlap in knowledge and skills between individual team members, experience in achieving their goals as a team, and a solid background in their particular work field. Furthermore, most of the team members have been working with their colleagues already for a longer period of time and know each other very well. Scientific research projects, on the other hand, exist mainly for the purpose of a specific research project or experiment. Typically, teams are dissolved after a research project is finished. Hence, individual team members have only little experience in working with most of their actual colleagues. Also the motivation to develop long term work relationships between all team members is considerably lower than in typical companies. The team leader also has to work in the absence of any strong hierarchical structure in which everyone's position and the official channels or chain of command are clearly defined. Additionally,

international scientific research teams consist of team members from different countries who also vary considerably from each other in terms of culture, beliefs, habits, and work attitudes. These facts induce specific challenges for a team leader that may differ from the mentioned leadership questionnaires [1, 2, 3]. Therefore, a five-dimensional leadership questionnaire was designed to cover not only the two basic traits of task focus and relationship behavior, but also to account for the required skills and attributes to deal with the limited project life-span, the absence of any strong hierarchical structure supported by an organization, and the cultural differences: leading by example, participative behavior, and informing and coaching.

The design of the underlying leadership questionnaire and a discussion of the five leadership dimensions is given in Chapter 4. Furthermore, the chosen 360-degree/threefold feedback scheme to increase the statistics and reduce the statistical variance of the outcome for a low number of participants is described. The chapter also explains the research procedure, the sample, and the solutions for the limitations of the study. The used variables, the formulas for the correlation coefficients, and the correlation coefficient error calculations are given and an estimation of the required minimum number of data-sets is made. The MATLAB[®] script for the statistical analysis and the processing of the coding-matrix is shown in Appendix B.

In Chapter 5 the obtained data from the questionnaires are evaluated in terms of each individual question's specific content. The perception of the candidate's behavior, the team members self-appraisal, and the impressions they had about their supervisors are analyzed and compared for each individual question. Furthermore, the independency between each individual question and all the other questions within the questionnaire is being validated by calculating correlation coefficients between the individual questions for the data-sets of the research environment group. Questions with a large content overlap or strong causal correlation were either modified or deleted from the questionnaire. The final questionnaire consisting of 62 questions in total is given in Appendix D. An analysis of the obtained data is performed in Chapter 6. The results for the five different leadership dimensions are analyzed in terms of the various groups. The performance key categories are summarized into three groups to facilitate the interpretation of the individual plots.

The realizations gained from this leadership questionnaire provide a better understanding of a team leader's behavior in pursuing a scientific research goal that also might challenge the status quo and whose goals might change established opinions or create already new visions of the future in its initial planning. Changes and challenges put pressure on teams. If the vision and its benefits are not communicated correctly and complete, then the rate of resistances and conflicts might rise and the motivation would drop and affect the performance of the whole team. Therefore, a clear and complete understanding of a leader's behavior and character attributes as well as the induced perception of her/his personality by her/his team members is essential for the daily work in international scientific research laboratories. This understanding is provided by the established leadership questionnaire in this underlying work.

Table of Contents

Executive Summary	I
1 Introduction	1
2 Leadership Theories	5
2.1 Motivation and Behavior	6
2.2 Hierarchy of Needs — Abraham MASLOW	7
2.3 Hawthorne Studies — Elton MAYO	9
2.4 Theory X and Theory Y — Douglas MCGREGOR	10
2.5 Immaturity-Maturity Theory — Chris ARGYRIS	12
2.6 Motivation-Hygiene Theory — Frederick HERZBERG	13
2.7 Management Systems — Rensis LIKERT	15
2.8 Authoritarian vs. Democratic-Laissez Faire	17
2.9 Ohio State Leadership Studies	18
2.10 Michigan Leadership Studies	18
2.11 Group Dynamics Studies	19
2.12 Managerial Grid	19
2.13 Is There a Best Style of Leadership?	21
2.14 Adaptive Leader Behavior	21
2.15 Leadership Contingency Model	22
2.16 The Tri-Dimensional Leader Effectiveness Model	23
2.16.1 Effectiveness Dimension	25
3 Objectives of the Study	29
3.1 Overview	29

3.2	Scientific Research Environment	29
3.3	Leadership in International Scientific Research Laboratories	34
3.4	Objectives	34
3.5	Limitations	36
4	Designed Questionnaire & Research Methods	39
4.1	Design of a Five-Dimensional Leadership Questionnaire	39
4.1.1	Introduction of a 360-Degree/3-Fold Feedback Scheme	50
4.2	Research Method	50
4.2.1	Participants	50
4.2.2	Procedure	51
4.2.3	Solutions for the Limitations of the Study	54
4.3	Variables and Concepts	55
4.3.1	Mean Value, Variance, and Standard Deviation	56
4.3.2	Correlations between the Individual Questions	57
4.4	Estimation of the Minimum Number of Data-Sets	59
5	Questionnaire Evaluation & Validation	61
5.1	Task Focus	63
5.1.1	Question 01	63
5.1.2	Question 02	65
5.1.3	Question 03	68
5.1.4	Question 04	71
5.1.5	Question 05	73
5.1.6	Question 06	76
5.1.7	Question 07	79
5.1.8	Question 08	81
5.1.9	Question 09	84
5.1.10	Question 10	86
5.1.11	Question 11	88
5.1.12	Question 12	91
5.2	Relationship Behavior	93
5.2.1	Question 13	93
5.2.2	Question 14	95
5.2.3	Question 15	98
5.2.4	Question 16	100
5.2.5	Question 17	103
5.2.6	Question 18	105

5.2.7	Question 19	108
5.2.8	Question 20	110
5.2.9	Question 21	113
5.2.10	Question 22	115
5.2.11	Question 23	117
5.2.12	Question 24	119
5.3	Leading by Example	122
5.3.1	Question 25	122
5.3.2	Question 26	125
5.3.3	Question 27	128
5.3.4	Question 28	131
5.3.5	Question 29	134
5.3.6	Question 30	136
5.3.7	Question 31	138
5.3.8	Question 32	141
5.3.9	Question 33	144
5.3.10	Question 34	147
5.3.11	Question 35	150
5.3.12	Question 36	153
5.4	Participative Behavior	156
5.4.1	Question 37	156
5.4.2	Question 38	159
5.4.3	Question 39	162
5.4.4	Question 40	165
5.4.5	Question 41	167
5.4.6	Question 42	169
5.4.7	Question 43	171
5.4.8	Question 44	174
5.4.9	Question 45	176
5.4.10	Question 46	179
5.4.11	Question 47	182
5.4.12	Question 48	184
5.5	Informing and Coaching	187
5.5.1	Question 49	187
5.5.2	Question 50	190
5.5.3	Question 51	193
5.5.4	Question 52	196
5.5.5	Question 53	199

5.5.6	Question 54	201
5.5.7	Question 55	204
5.5.8	Question 56	206
5.5.9	Question 57	209
5.5.10	Question 58	212
5.5.11	Question 59	215
5.5.12	Question 60	218
5.5.13	Question 61	221
5.5.14	Question 62	224
5.5.15	Question 63	227
5.5.16	Question 64	229
5.5.17	Question 65	233
5.6	Summary of the Evaluation & Validation and Final Questionnaire	236
6	Analysis of the Leadership Dimensions	237
6.1	Dimension 01 — Task Focus	238
6.2	Dimension 02 — Relationship Behavior	240
6.3	Dimension 03 — Leading by Example	244
6.4	Dimension 04 — Participative Behavior	246
6.5	Dimension 05 — Informing and Coaching	249
6.6	Summary of the Leadership Dimension Analysis	252
7	Analysis of the Individual Groups	253
7.1	Self-Appraisal & Supervisor Group	254
7.2	Candidate Group	256
7.3	Self-Appraisal Group	257
7.4	Supervisor Group	259
7.5	Summary of the Analysis of the Individual Groups	260
8	Summary and Conclusion	261
8.1	Future Directions	262
A	Leadership Questionnaire	263
B	Statistical Analysis — MATLAB[®] Script	277
C	Collected Raw Data	297
C.1	Research Environment	298
C.2	Self-Appraisal & Supervisor	315
C.3	Candidate	332

C.4 Self-Appraisal	349
C.5 Supervisor	366
D Final Questionnaire	383
Bibliography	396
Curriculum Vitae	397

1

Introduction

The progress in international scientific research laboratories throughout the last decade has been breathtaking. But still we find ourselves more and more wallowing in conflict-conflict situations between research teams and/or even between individual team members. These problems that may affect productivity and creativity cannot be solved by scientific and technical skills alone; they require social skills. Elton MAYO [4, 5] stated that pure knowledge is limited in value unless it can be applied in real situations. MAYO suggests, that four levels of change occur in people as their knowledge changes [6]:

1. knowledge changes,
2. attitudinal changes,
3. behavior changes, and
4. group or organizational performance changes.

Changes of knowledge are the easiest to make, followed by changes in attitudes. Changes in behavior are significantly more difficult and time consuming than either of the two previous levels. But the implementation of group or organizational performance change is perhaps the most difficult and time consuming. However, to be effective, regardless of the type of organization in which they operate, managers need to develop know-how in human skills rather than to increase their knowledge of the technical aspects of their jobs [6].

There is no insurance against outflows of human resources. Recruiting, training and developing large numbers of new personnel into a working team takes years. In a competitive environment this is almost an impossible task. Mutual training is not spontaneous and should be fostered by established staff and project leaders. Organizations are beginning to realize that their most important assets are human resources and that the managing of these resources is one of their most crucial tasks.

The general belief is that an organization is a unique living organism whose basic component is the individual and this individual is the fundamental unit of the underlying study. Thus, the following work will be focused on the interaction of people and leadership in international scientific research laboratories.

It is obvious after a review of the literature that there are almost as many definitions of leadership as there are writers in the field. But giving a coarse summary of what a leader “is” — or more idealistically, “should be” — one could generally say that leaders are accomplishing things, or going somewhere, towards a goal that is not always obvious. Leaders have the ability “to get things done” — through followers — or more specifically, they inspire followers to get things done.

So there immediately comes up the question: “Why do people follow a leader?” Either they respect or admire the person because of their acts of courage, or they want to be associated with the leader. Some followers are also afraid to face “the unknown” in daily life alone, or they recognize traits in the leader they cannot match but they would like to acquire or learn by being close to that leader.

Generally speaking, leaders have visions, imagine goals, and they also possess the ability to communicate that visions to others to inspire them to get things done and to finally achieve the initially imagined goals:

1. Vision — leaders must be able to envision solutions to various problems.
2. Communication — leaders are able to communicate that vision to others.
3. Thrust — leaders inspire trust in those who turn to them for guidance.

In this work leadership is defined as the ability to influence a group toward the achievement of a vision or a set of goals. The source of this influence may be formal in its nature, such as that provided by the possession of managerial rank in an organization. Because management positions come with some formally designated authority, a person may assume a leadership role simply because of the position she/he holds in the organization. But not all

leaders are managers, nor are all managers leaders. Leaders can emerge from within a group as well as by formal appointment to lead a group. Organizations need strong leadership and also strong management for optimal effectiveness. In today's dynamic world, leaders are needed to

- challenge the status quo,
- to create visions of the future,
- and to inspire organizational members to want to achieve those visions.

Managers, on the other hand, are also needed to formulate detailed plans, create efficient organizational structures, and oversee day-to-day operations [7].

In his research on motivation, William JAMES¹ of Harvard found that hourly employees could maintain their jobs, that is, not being fired, by working at approximately 20% to 30% of their ability or capacity (see Figure 1.1). His study also showed that employees work at close to 80% to 90% of their ability if they are highly motivated. Thus, if motivation is low, employees' and team members performance will suffer as much as if ability were low. For this reason, motivation is an extremely important function of management and leadership that should be considered in any of the leader's actions [6].

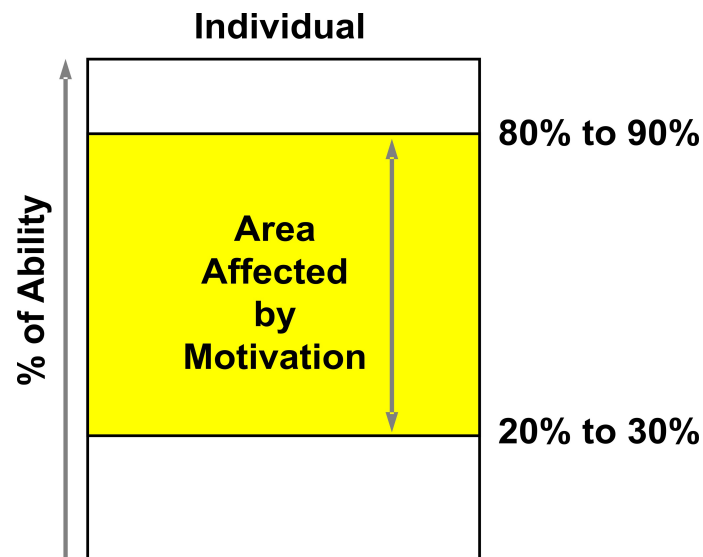


Figure 1.1: *The potential influence of motivation on performance.*

¹William JAMES, 1842–1910, pioneering American psychologist and philosopher, Source: Wikipedia, [8].

It is generally agreed that there are at least three areas of skills necessary for carrying out the process of management: technical, human, and conceptual skills. The appropriate mix of these skills varies as an individual advances in management from supervisory to top management positions. To be effective less technical skills tends to be needed as one advances from lower to higher levels in the organization, but more and more conceptual skill is necessary [6].

In this work a five dimensional leadership questionnaire is being designed and applied to a sample of about 40 participants from different international scientific research laboratories. This sample should represent in age, rank, and profession the whole population of employees and team members currently working in different international scientific research laboratories dealing with physics, informatics, and engineering sciences. The individual questions of the leadership questionnaire are evaluated & validated, and finally used to analyze the leadership traits of a candidate, a group of team members (Self-Appraisal), and their group of supervisors.

The realizations gained from this leadership questionnaire should provide a better understanding of a team leaders behavior in pursuing a scientific research goal that also might challenge the status quo and whose goals might change established opinions or create already new visions of the future in its initial planning. All those challenges affect not only the team leader, but also the team members and sometimes even more than just the immediate personal environment of a leader. Changes and challenges put pressure on teams. If the vision and its benefits are not communicated correctly and complete, then the rate of resistances and conflicts might rise and the motivation would drop and affect the performance of the whole team, as indicated in Figure 1.1. Therefore, a clear and complete understanding of a leader's behavior and character attributes as well as the induced perception of her/his personality by her/his team members is essential for the daily work in international scientific research laboratories. This understanding should be provided by the established leadership questionnaire in this underlying work.

2

Leadership Theories: Basic Principles & Historical Overview

The following chapter explains the basic principles of selected leadership theories and provides a historical overview of its progress over the past century. Several chapters out of many basic “Organizational Behavior” books [6, 3, 7, 1, 2, 9] have been summarized in the following sections. This summary is neither complete nor follows strictly the chronological sequence of its underlying theories.

The main purpose is to show that leadership theory and research is neither a precise and exact science nor static. Leadership and its description by theories is an empirical and dynamic process of establishing new theories and questionnaires and adapting existing ones to the permanent changes that our societies are daily experiencing due to the technological progress. Therefore, it is important to see that today’s classical theories about leadership were established empirically and step by step by improving and changing existing theories. The development of those theories was induced by managements requirements to understand their team members and team leaders behaviors and to keep both their motivation and their performance high. Classic theories were modified and evolved to fit the daily

needs of companies, organizations, and the evolution of societies.

The aim of this chapter is to show that it is possible for anyone develop a specific questionnaire by following certain scientific rules and procedures. This process could help to improve the understanding of the needs and perceptions of team members and the behavior of team leaders. Furthermore, it may contribute to identify and therefore reduce the potential for conflicts or resistances within teams and it should help to facilitate and improve the communication between leader and team members.

2.1 Motivation and Behavior

The basic unit of behavior is an *activity*. In fact, all behavior is a series of activities. Behavior is basically goal-oriented, in other words, our behavior is generally motivated by a desire to attain some goal. The specific goal is not always consciously known by the individual. Goals are outside an individual; they are targets toward which motives are directed. These goals are often called *incentives*. Managers who are successful in motivating employees are often providing an environment in which proper incentives are available for need satisfaction. Incentives can be tangible (pay, benefits, and clean surroundings) or intangible (praise, sympathy, approval, and feelings of achievement).

People differ not only in their ability to do, but also in their “will to do” or *motivation*. The motivation of a person depends on the strength of his motives. Motives are sometimes defined as needs, wants, drives, desires, or impulses within the individual. Motives are directed toward goals and they are the whys to behavior. Motives and needs are interchangeable and they are mainsprings of action.

Motives and needs are the reasons underlying behavior. Every individual has many hundreds of needs. All of these needs compete for his behavior. The need with the greatest strength at a particular moment in time leads to activity. Exceptions may occur when environmental or social pressures deter behavior in this direction. In these cases desired activity is delayed until some more appropriate situation exists.

If an individual wants to influence another person’s behavior, he must first understand what motives or needs are most important to that person at that time. An incentive to be effective must be appropriate to the need structure of the person involved. If an individual has a need for recognition — to be viewed as a contributing, productive person — praise is one incentive which will help satisfy this need.

As an individual matures he develops habit patterns or conditioned responses to various stimuli. The sum of these habit patterns determines his *personality*.

$$\text{habit 1} + \text{habit 2} + \text{habit 3} + \dots + \text{habit } n = \text{personality}$$

An individual begins to behave in a similar fashion under similar conditions. This behavior is what others learn to recognize as that person, as his *personality*. They expect and can even predict certain kinds of behavior from him.

Basic personality structures are developed quite early in life and it tends to become more difficult to make changes in personality as people grow older. When a person behaves in a motivating situation, that behavior becomes a new input to his inventory of past experience. The earlier in life that this input occurs, the greater its potential effect on future behavior. The reason is, that at the time, this behavior represents a larger portion of the total past experience of a young person than the same behavior input would later in life. In addition, the longer behavior is reinforced, the more patterned it becomes and more difficult it is to change. The older a person gets the more time and new experiences are necessary to effect a change in behavior.

2.2 Hierarchy of Needs — Abraham MASLOW

Abraham MASLOW stated that there seems to be a hierarchy into which human needs arrange themselves. The physiological needs (see Figure 2.1) are at the top of the hierarchy because they tend to have the highest strength until they are somewhat satisfied. These are the basic human needs to sustain life itself — food, clothing, shelter. Until these basic needs are satisfied to the degree needed for the sufficient operation of the body, the majority of a person's activity will probably be at this level, and the other levels will provide him with little motivation.

Once the physiological needs become gratified the security or safety needs become predominant (see Figure 2.2(a)). These needs are essentially the need to be free of the fear of physical danger and deprivation of the basic physiological needs. While emphasis on security (fringe benefits such as health, accident, and life insurance, and retirement plans) may make people more docile and predictable, it does not mean that they will be more productive.

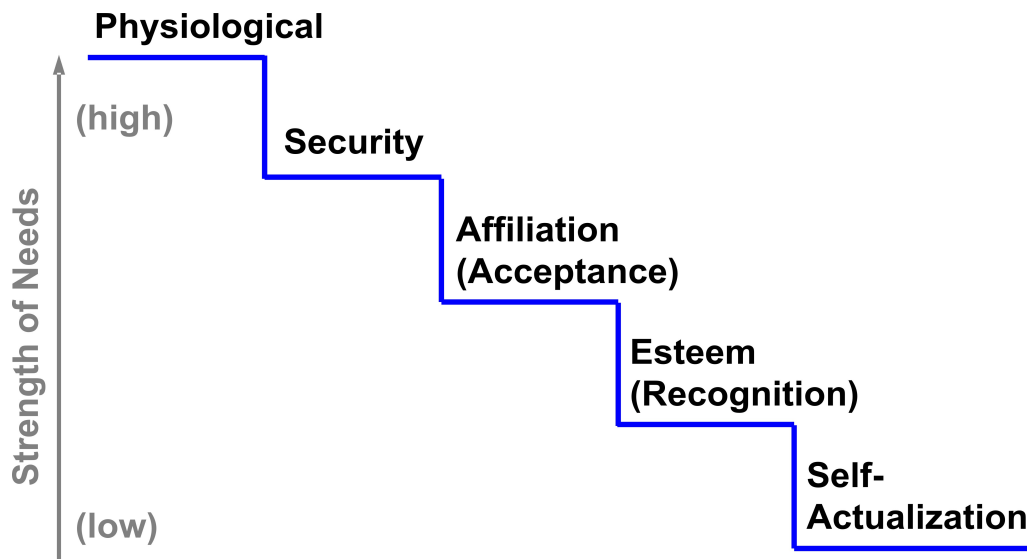


Figure 2.1: Abraham MASLOW's hierarchy of needs.

After the physiological and safety needs have become somewhat satisfied, the affiliation needs may become predominant in the need structure (see Figure 2.2(b)). Since man is a social being, he has a need to belong, and to be accepted by various groups. Such a person will strive for meaningful relations with others. In many instances, people seek affiliation because they desire to have their beliefs confirmed. People who have similar beliefs tend to seek each other out, especially if a strongly held belief had been shattered. This attitude hints at some of the problems inherent in any change.

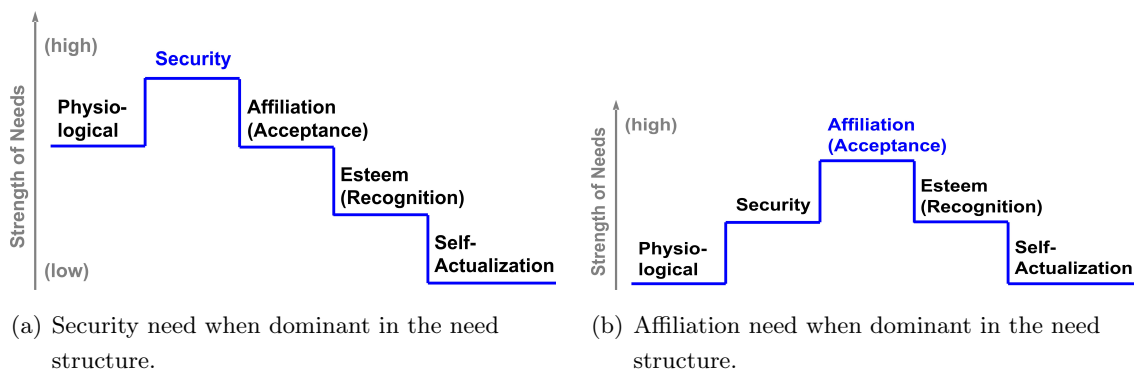


Figure 2.2: When basic needs begin to be fulfilled other levels of needs become important and these motivate and dominate the behavior of the individual.

After an individual begins to satisfy his need to belong, he generally wants to be more than just a member of his group. He then feels the need for esteem — both self-esteem

and recognition from others. Most people have a need for a high evaluation of themselves that is firmly based in reality — recognition and respect from others. Satisfaction of these esteem needs produces feelings of self-confidence, prestige, power, and control. One begins to feel that he is useful and has some effect on his environment. When this need is dominant an individual may resort to disruptive or immature behavior to satisfy his desire for attention. An employee may engage in work restriction or arguments with his co-workers or boss. Thus, recognition is not always obtained through mature or adaptive behavior. It is sometimes garnered by disruptive and irresponsible actions. In fact, some of the social problems may have their roots in the frustration of esteem needs.

Once esteem needs begin to be adequately satisfied, the self-actualization needs become more prepotent. Self-actualization is the need to maximize one's potential, whatever it may be. As MASLOW expressed it, "What a man can be, he must be". Thus, self-actualization is the desire to become what one is capable of becoming. Individuals satisfy this need in different ways: desire to be an ideal mother, managing an organization, athletically, or others.

The hierarchy does not necessarily follow the pattern described by MASLOW. It was not his intent to say that this hierarchy applies universally. MASLOW felt this was a typical pattern that operates most of the time. In reality, most people in our society tend to be partially satisfied at each level and partially unsatisfied, with greater satisfaction tending to occur at the physiological and safety levels than at the affiliation, esteem, and self-actualization levels.

2.3 Hawthorne Studies — Elton MAYO

Efficiency experts had long been trying to find the ideal mix of physical conditions, working hours, and working methods which stimulate workers to produce at maximum capacity. In the initial study at Western Electric's Hawthorne plant, efficiency experts assumed that increases in illumination would result in higher output. Two groups of employees were selected: an experimental or test group which worked under varying degrees of light, and a control group which worked under normal illumination conditions in the plant. As lighting power was increased, the output of the test group went up as anticipated. Unexpectedly, however, the output of the control group went up also — without and increase in light. The efficiency experts felt, that in addition to technical and physical changes, some of the behavioral considerations should be explored.

MAYO's researchers improved the working conditions of the girls by implementing such

innovations as scheduled rest periods, company lunches, and shorter work weeks. The researchers suddenly decided to take everything away from the girls, returning the working conditions to the exact way they had been at the beginning of the experiment. This radical change was expected to have a tremendous negative psychological impact on the girls, and reduce their output. Instead, their output jumped to a new *all-time high*. Why?

The answers to this question were not found in the production aspects of the experiment (i.e., changes in plant and physical working conditions), but in the human aspects. As a result of the attention lavished upon them by experimenters, the girls were made to feel they were an important part of the company. They no longer viewed themselves as isolated individuals, working together only in the sense that they were physically close to each other. Instead they had become participating members of a congenial, cohesive work group. The relationships which developed elicited feelings of affiliation, competence, and achievement. These needs, which had long gone unsatisfied at work, were now being fulfilled. The girls worked harder and more effectively than they had worked previously.

After several interview sessions it was found that the workers wanted to talk freely about what they thought was important. The interviews were therapeutic. The workers got an opportunity to get a lot off their chests. Many felt this was the best thing the company had ever done. The result was a wholesale change in attitude. Since many of their suggestions were being implemented, the workers began to feel that management viewed them as important, both as individuals and as a group; they were now participating in the operation and future of the company and not just performing unchallenging, unappreciated tasks. The Hawthorne studies signaled the need for management to study and understand relationships among people. The findings also encouraged management to involve workers in planning, organizing, and controlling their own work in an effort to secure their positive cooperation.

2.4 Theory X and Theory Y — Douglas MCGREGOR

According to Douglas MCGREGOR, any traditional organization with its centralized decision-making, superior-subordinate pyramid, and external control of work is based upon assumptions about human nature and human motivation.

Theory X assumes that most people prefer to be directed, are not interested in assuming responsibility, and want security above all. Accompanying this philosophy is the belief that people are motivated by money, fringe benefits, and the threat of punishment. Managers

who accept Theory X assumptions (see Table 2.1), attempt to structure, control and closely supervise their employees. These managers feel that external control is clearly appropriate for dealing with unreliable, irresponsible, and immature people.

MCGREGOR concluded that Theory X assumptions about the nature of man are generally inaccurate and that management approaches which develop from these assumptions will often fail to motivate individuals to work toward organizational goals. Management by direction and control may not succeed, because it is a questionable method for motivating people whose physiological and safety needs are reasonably satisfied and whose affiliation, esteem, and self-actualization needs are becoming predominant (see Section 2.2, page 7). MCGREGOR felt that management needed practices based on a more accurate understanding of the nature of man and human motivation. As a result of this feeling, MCGREGOR developed an alternate theory of human behavior called Theory Y (see Table 2.1).

Theory X	Theory Y
Work is inherently distasteful to most people.	Work is as natural as play, if the conditions are favorable.
Most people are not ambitious, have little desire for responsibility, and prefer to be directed.	Self control is often indispensable in achieving organizational goals.
Most people have little capacity for creativity in solving organizational problems.	The capacity for creativity in solving organizational problems is widely distributed in the population.
Motivation occurs only at the physiological and security levels.	Motivation occurs at the affiliation, esteem, and self-actualization levels, as well as physiological and security levels.
Most people must be closely controlled and often coerced to achieve organizational objectives.	People can be self-directed and creative at work if properly motivated.

Table 2.1: List of assumptions about the nature of man which underline MCGREGOR's Theory X and Theory Y.

Theory Y assumes that people are not, by nature, lazy and unreliable. It postulates that man can be basically self-directed and creative at work if properly motivated. Managers

who accept the Theory Y image of human nature, do not usually structure, control, or closely supervise the work environment for employees. Instead, they attempt to help their employees mature by exposing them to progressively less external control, allowing them to assume more and more self-control. Employees are able to achieve the satisfaction of affiliation, esteem and self-actualization needs within this kind of environment, often neglected on the job.

Even though management based on the assumptions of Theory X is perhaps no longer appropriate in the opinion of MCGREGOR and others, it is still widely practiced. Consequently, a large majority of the people today are treated as immature human beings in their working environments. It is this fact that has produced many of our current organizational problems.

2.5 Immaturity-Maturity Theory — Chris ARGYRIS

Chris ARGYRIS examined industrial organizations to determine what effect management practices have had on individual behavior and personal growth within the work environment. According to ARGYRIS, there are seven changes which should take place in the personality of an individual if he is to develop into a mature person over the years.

Immaturity	→	Maturity
(1) passive		increased activity
(2) dependence		independence
(3) behave in a few ways		capable of behaving in many ways
(4) erratic shallow interests		deeper and stronger interests
(5) short time perspective		long time perspective (past and future)
(6) subordinate position		equal or superordinate position
(7) lack of awareness of self		awareness and control over self

Table 2.2: ARGYRIS' *immaturity-maturity continuum*.

ARGYRIS postulates that these changes reside on a continuum and that the “healthy” personality develops along the continuum from “immaturity” to “maturity” (see Table 2.2). These changes are only general tendencies. Norms of the individual’s culture and personality inhibit and limit maximum expression and growth of the adult, yet the tendency is to move toward the “maturity” end of the continuum with age. ARGYRIS would be the first to admit that few, if any, develop to full maturity.

In examining the widespread worker apathy and lack of effort in industry, ARGYRIS questions whether these problems are simply the result of individual laziness. He suggests that this is not the case. He contends that, in many cases, when people join the work force, they are kept from maturing by the management practices utilized in their organizations. They are given minimal control over their environment and are encouraged to be passive, dependent, and subordinate; therefore, they behave immaturely. According to ARGYRIS, keeping people immature is built into the very nature of the formal organization. Management tries to increase and enhance organizational and administrative efficiency and productivity by making workers “interchangeable parts”. This implies directive, task-oriented leadership where decisions about the work are made by the superior with the workers only carrying out those decisions. This type of leadership evokes managerial controls such as budgets, some incentive systems, time and motion studies, and standard operating procedures which can restrict the initiative and creativity of workers.

ARGYRIS challenges management to provide a work climate in which everyone has a chance to grow and mature as an individual, as a member of a group by satisfying his own needs, while working for the success of the organization. Implicit here is the belief that man can be basically self-directed and creative at work if properly motivated and, therefore, management based on the assumption of Theory Y (see Section 2.4, page 10) will be more profitable for the individual and the organization.

It is being found over and over again that broadening individual responsibility is beneficial to both the workers and the company. Giving people the opportunity to grow and mature on the job helps them satisfy more than just physiological and safety needs (see Section 2.2, page 7), which, in turn, motivates them and allows them to use more of their potential in accomplishing organizational goals. While all workers do not want to accept more responsibility or deal with the added problems responsibility inevitably brings, the number of employees whose motivation can be improved by increasing and upgrading their responsibility is much larger than most managers would suspect.

2.6 Motivation-Hygiene Theory — Frederick HERZBERG

HERZBERG concluded from his studies that man has two different categories of needs which are essentially independent of each other and affect behavior in different ways. He found that when people felt dissatisfied about their jobs, they were concerned about the environment in which they were working. On the other hand, when people felt good about

their jobs, this had to do with the work itself. HERZBERG called the first category of needs *hygiene factors* because they describe man's environment and serve the primary function of preventing job dissatisfaction. He called the second category of needs *motivators* since they seemed to be effective in motivating people to superior performance.

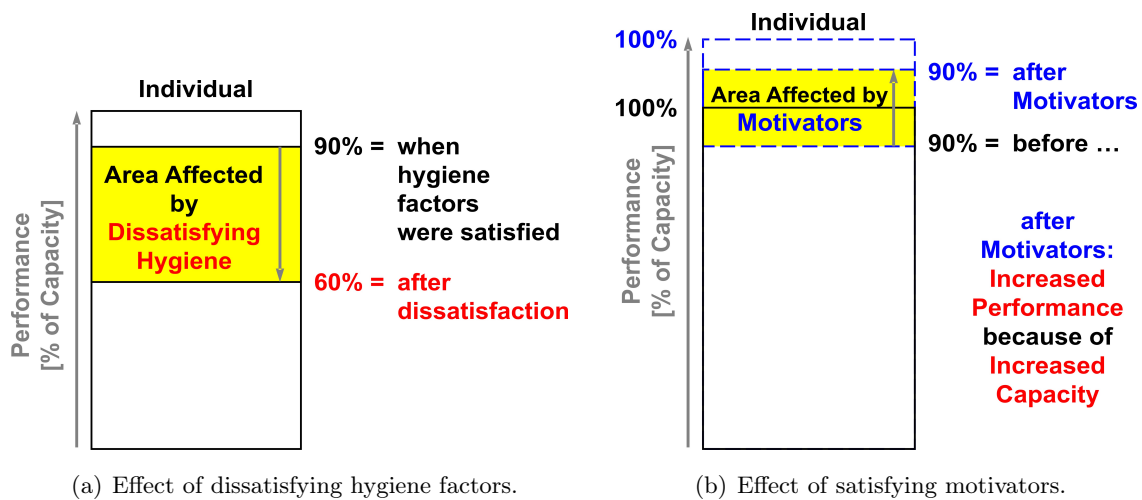


Figure 2.3: Effects of hygiene factors and motivators on performance.

Company policies and administration, supervision, working conditions, interpersonal relations, money, status, and security may be thought of as hygiene factors. These are not an intrinsic part of a job, but are related to the conditions under which a job is performed. HERZBERG relates his use of the work "hygiene" to its medical meaning (preventative and environmental). Hygiene factor produce no growth in worker output capacity; they only prevent losses in worker performance due to work restriction (see Figure 2.3(a)).

Satisfying factors that involve feelings of achievement, professional growth, and recognition that one can experience in a job which offers challenge and scope are referred to as motivators. HERZBERG used this term because these factors seem capable of having a positive effect on job satisfaction often resulting in an increase in one's total output capacity (see Figure 2.3(b)).

HERZBERG's framework (see Table 2.3) seems compatible with MASLOW's hierarchy of needs (see Section 2.2, page 7), as schematically illustrated in Figure 2.4. Hygiene needs, when satisfied, tend to eliminate dissatisfaction and work restrictions but do little motivate an individual to superior performance or increased capacity. Satisfaction of the motivators, however, will permit an individual to grow and develop in a mature way,

Hygiene Factors	Motivators
<i>Environment</i>	<i>The Job Itself</i>
Policies and administration	Achievement
Supervision	Recognition for accomplishment
Working conditions	Challenging work
Interpersonal relations	Increased responsibility
Money, status, security	Growth and development

Table 2.3: HERZBERG's motivation and hygiene factors.

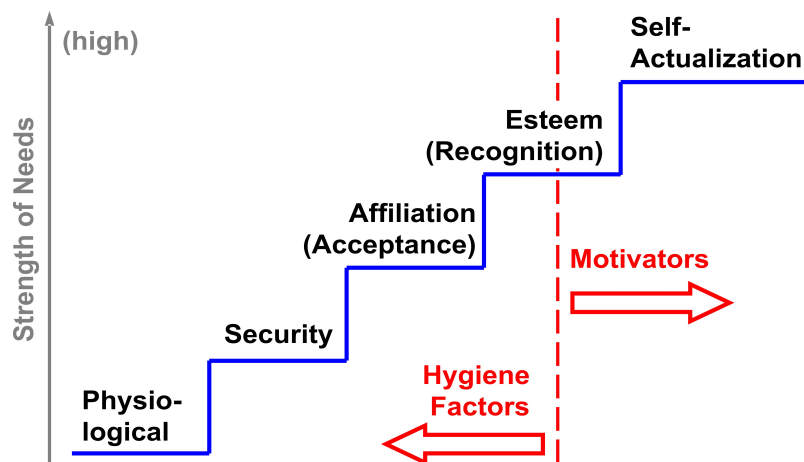


Figure 2.4: The relationships between the motivation-hygiene theory and MASLOW's hierarchy of needs.

often implementing an increase in ability. HERZBERG encourages management to design into the work environment an opportunity to satisfy the motivators. By job enrichment is meant the deliberate upgrading of responsibility, scope, and challenge in work.

2.7 Management Systems — Rensis LIKERT

Rensis LIKERT emphasized the need to consider both human resources and capital resources as assets requiring proper management. LIKERT has found that the prevailing management styles of organization can be depicted on a continuum from System 1 to System 4:¹

¹[6], P. HERSEY & K. H. BLANCHARD, "Management of Organizational Behavior", 1969, page 52–54.

System 1 — Management is seen as having no confidence or trust in subordinates since they are seldom involved in any aspect of decision-making process. The bulk of the decisions and the goal setting of the organization are made at the top and issued down the chain of command. Subordinates are forced to work with fear, threats, punishment, and occasional rewards and need satisfaction at the physiological and safety levels. The little superior-subordinate interaction which does take place is usually with fear and mistrust. While control process is highly concentrated in top management, and informal organization generally develops which opposes the goals of the formal organization.

System 2 — Management is seen as having condescending confidence and trust in subordinates such as master has toward servant. While the bulk of the decisions and goal setting of the organization are made at the top, many decisions are made within a prescribed framework at lower levels. Rewards and some actual or potential punishment are used to motivate employees. Any superior-subordinate interaction takes place with some condescension by superiors and fear and caution by subordinates. While the control process is still concentrated in top management, some is delegated to middle and lower levels. An informal organization usually develops but it does not always resist formal organizational goals.

System 3 — Management is seen as having substantial but not complete confidence and trust in subordinates. While broad policy and general decisions are kept at the top, subordinates are permitted to make more specific decisions at lower levels. Communication flows both up and down the hierarchy. Rewards, occasional punishment, and some involvement are used to motivate workers. There is a moderate amount of superior-subordinate interaction, often with a fair amount of confidence and trust. Significant aspects of the control process are delegated downward with a feeling of responsibility at both higher and lower levels. An informal organization may develop but it may either support or partially resist goals of the organization.

System 4 — Management is seen as having complete confidence and trust in subordinates. Decision-making is widely dispersed throughout the organization, although well integrated. Communication flows not only up and down the hierarchy but among peers. Employees are motivated by participation and involvement in developing economic rewards, setting goals, improving methods and appraising progress toward goals. There is ex-

tensive, friendly superior-subordinate interaction with a high degree of confidence and trust. There is widespread responsibility for the control process, with lower units fully involved. The informal and formal organizations are often one and the same. Thus, all social forces support efforts to achieve stated organizational goals.

System 1 is a task-oriented, highly structured authoritarian management style, while System 4 is a relationships-oriented management style based on teamwork, mutual trust, and confidence. System 2 and 3 are intermediate stages between two extremes which approximate closely Theory X and Theory Y assumptions (see Section 2.4, page 10).

LIKERT has found that the closer the management style of an organization approaches System 4, the more likely it is to have a continuous record of high productivity. Similarly, the closer this style reflects System 1, the more likely it is to have a sustained record of low productivity.

2.8 Authoritarian vs. Democratic-Laissez Faire Leader Behavior

Past writers have felt that concern for task tends to be represented by authoritarian leader behavior while a concern for relationships is represented by democratic leader behavior. This feeling was popular because it was generally agreed that a leader influences his followers by either of two ways:

1. he can tell his followers what to do and how to do it (authoritarian style which emphasizes task concerns),
2. or he can share his leadership responsibilities with his followers by involving them in the planning and execution of the task (nondirective democratic style which stresses the concern for human relationships).

There are a wide variety of styles of leader behavior between these two extremes. Often, this continuum is extended beyond democratic leader behavior to include a laissez-faire style, which permits the members of the group to do whatever they want to do. No policies or procedures are established. Everyone is let alone. No one attempts to influence anyone else. It is often felt that in reality a laissez-faire atmosphere represents an absence of leadership.

Findings indicate that leadership styles vary considerably from leader to leader. No dominant style appears. Instead, various combinations are evident. Thus, task-orientation and relationships-orientation are not either/or leadership concerns as the preceding continuum suggests. These concerns are separate and distinct dimensions which can be plotted on two separate axes, rather than a single continuum.²

2.9 Ohio State Leadership Studies

The staff at the Bureau of Business Research at Ohio State University sought to identify independent dimensions of leader behavior. Beginning with over a thousand dimensions, they eventually narrowed the list to two categories that substantially accounted for most of the leadership behavior described by employees [7]. They defined leadership as the behavior of an individual when he is directing the activities of a group toward a goal attainment, eventually narrowed the description of leader behavior to two dimensions:

- initiating structure
- and consideration.

Initiating structure refers to “the leader’s behavior in delineating the relationship between himself and members of the work-group and in endeavoring to establish well-defined patterns of organization, channels of communication, and methods of procedure.” On the other hand, consideration refers to “behavior indicative of friendship between the leader and the members of his staff.” Initiating structure seems to be task-oriented. This dimension emphasizes the needs of the organization. At the same time consideration is relationships-oriented and tends to emphasize the needs of the individual [6].

In studying leader behavior the Ohio State staff found that initiating structure and consideration were separate and distinct dimensions. Thus, it was during these studies that leader behavior was first plotted on two separate axes, rather than a single continuum. Four quadrants were developed to show various combinations of initiating structure (task) and considerations (relationships).

2.10 Michigan Leadership Studies

Simultaneously to the Ohio State studies, the Survey Research Center at the University of Michigan attempted to approach the study of leadership by locating clusters of

²[6], P. HERSEY & K. H. BLANCHARD, “*Management of Organizational Behavior*”, 1969, page 64.

characteristics which seemed to be related to each other and tests of effectiveness. The studies identified two concepts which they called “employee orientation” and “production orientation”.

A leader who is described as employee-oriented stresses the relationships aspects of his job. He feels that every employee is important. He takes interest in everyone, accepting their individuality and personal needs. Production orientation emphasizes production and the technical aspects of the job, viewing employees as tools to accomplish the goals of the organization. These two orientations parallel the Ohio state Leadership dimensions of initiating structure and consideration (see Section 2.9).

The conclusions arrived at by the Michigan researchers strongly favored the leaders who were employee oriented in their behavior. Employee oriented leaders were associated with higher group productivity and higher job satisfaction. Production oriented leaders tended to be associated with low group productivity and lower job satisfaction.

2.11 Group Dynamics Studies

Dorwin CARTWRIGHT and Alvin ZANDER claim that all group objectives fall into one of two categories:

1. the achievement of some specific group goal, or
2. the maintenance or strengthening of the group itself.

Goal achievement seems to coincide with the task concepts discussed earlier (initiating structure and production orientation), while group maintenance parallels the relationships concepts (consideration and employee orientation).

2.12 Managerial Grid

Robert R. BLAKE and Jane S. MOUTON have popularized the previous concepts in their Managerial Grid. In the Managerial Grid, five different types of leadership based on “concern for production” (task) and “concern for people” (relationships) are located in the four quadrants identified by the Ohio State studies. Concern for production is illustrated on the horizontal axis. Production becomes more important to the leader as his rating advances on the horizontal scale. A leader with a rating of 9 on the horizontal axis has a maximum concern for production. Concern for people is illustrated on the vertical

axis. People become more important to the leader as is rating progresses up the vertical axis. A leader with a rating of 9 on the vertical axis has a maximum concern for people.

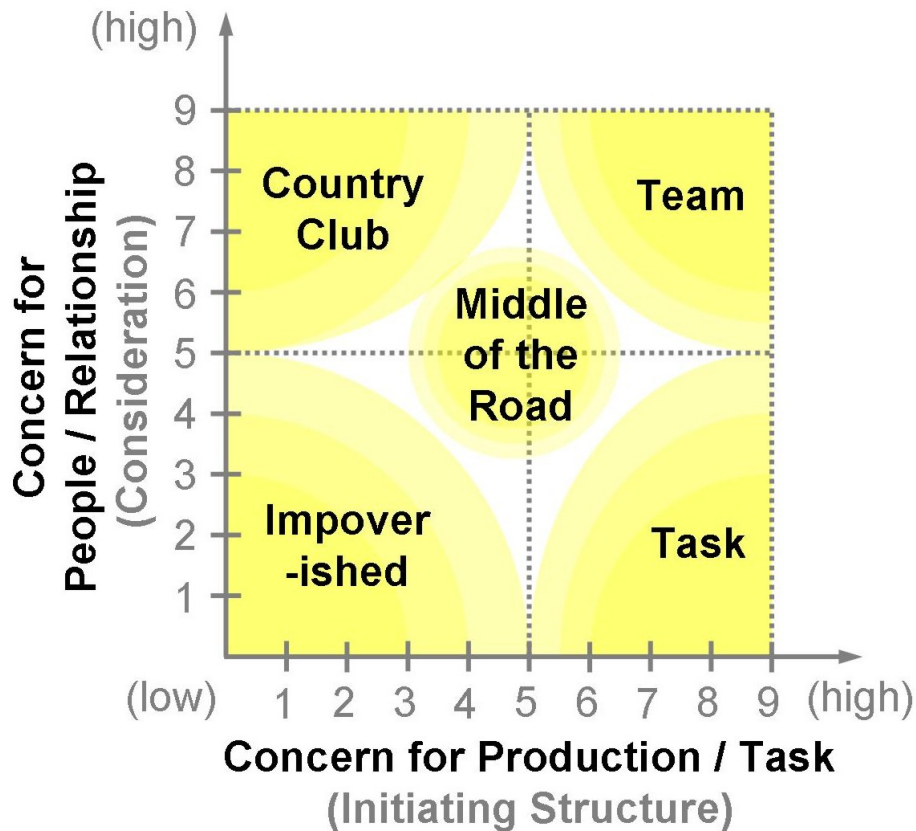


Figure 2.5: The managerial grid leadership styles.

The five leadership styles are described as follows³ :

Impoverished — Exertion of minimum effort to get required work done is appropriate to sustain organization membership.

Country Club — Thoughtful attention to needs of people for satisfying relationships leads to a comfortable friendly organization atmosphere and work tempo.

Task — Efficiency in operation results from arranging conditions of work in such a way that human elements interfere to a minimum degree.

Middle-of-the-Road — Adequate organization performance is possible through balancing the necessity to get out work while maintaining morale

³[6], P. HERSEY & K. H. BLANCHARD, "Management of Organizational Behavior", 1969, page 67–68.

of people at a satisfactory level.

Team — Work accomplishment is from committed people: interdependence through a “common stake” in organization purpose leads to relationships of trust and respect.

2.13 Is There a Best Style of Leadership?

After identifying the two central concerns of any leadership situation, task and relationships, the researchers discussed earlier have recognized the potential conflict in satisfying both concerns. They have found that effective or desirable leadership behavior is characterized by high scores on both, initiating structure and consideration, while the style low on both dimensions is theoretically the worst.

Rensis LIKERT discovered that high-producing supervisors “make clear to their subordinates what the objectives are and what needs to be accomplished and then give them freedom to do the job.” Thus he found that general, rather than close, supervision tended to be associated with high productivity.

The implication throughout LIKERT’s writings is that the ideal and most productive leader behavior for industry is employee-centered or democratic. Yet his own findings raise questions as to whether there can be an ideal of single normatively good style of leader behavior which can apply in all leadership situations. LIKERT found out, that a single normative leadership style does not take into consideration cultural differences, particularly customs and traditions as well as the level of education and the standard of living. These are examples of cultural differences in the followers and the situation which are important in determining the appropriate leadership style to be used. Therefore, based on the definition of leadership process as a function of the leader, the followers, and other situational variables ($L = f(\text{leader}, \text{follower}, \text{situation})$), the desire to have a single ideal type of leader behavior seems unrealistic.⁴

2.14 Adaptive Leader Behavior

The desire to have an ideal type of leader behavior is common. Many managers appear to want to be told how to act. An effective leader is able to adapt his style of leader behavior to the needs of the situation and the followers. Since these are not constants,

⁴[6], P. HERSEY & K. H. BLANCHARD, “*Management of Organizational Behavior*”, 1969, page 70–71.

the use of an appropriate style of leader behavior is a challenge to the effective leader. The concept of adaptive leader behavior might be stated as follows: The more a manager adapts his style of leader behavior to meet the particular situation and the needs of his followers, the more effective he will tend to be in reaching personal and organizational goals.

2.15 Leadership Contingency Model

Therefore, it is not a matter of the best style, but of the most effective style for a particular situation. The suggestion is that a number of leader behavior styles may be effective or ineffective depending on the important elements of the situation.⁵

According to a Leadership Contingency Model developed by Fred. E. FIEDLER, there are three major situational variables which seem to determine whether a given situation is favorable or unfavorable to a leader:

Leader-member relations — His personal relations with the members of his group.

Task structure — The degree of structure in the task which the group has been assigned to perform.

Position power — The power and authority which his position provides.

Leader-member relations seems to parallel the relationships concepts discussed earlier, while task structure and position power, which measure very closely related aspects of a situation, seem to be related to task concepts. FIEDLER defines the favorableness of a situation as “the degree to which the situation enables the leader to exert his influence over his group”.

In this model, there are eight possible combinations of these three situational variables that can occur. As a leadership situation varies from high to low on these variables, it will fall into one of the eight combinations (situations). The most favorable situation for a leader to influence his group is one in which he is well liked by the members (good leader-member relations), has a powerful position (high position power), and is directing a well-defined job (high task structure). On the other hand, the most unfavorable situation is one in which the leader is disliked, has little position power, and faces an unstructured task.

⁵[6], P. HERSEY & K. H. BLANCHARD, “*Management of Organizational Behavior*”, 1969, page 72.

FIEDLER has attempted to determine what the most effective leadership style — task-oriented or relationships-oriented — seems to be for each of the eight situations and has concluded that⁶

- 1.) **Task-oriented leaders** tend to perform best in group situations which are either very favorable or very unfavorable to the leader.
- 2.) **Relationships-oriented leaders** tend to perform best in situations which are intermediate in favorableness.

2.16 The Tri-Dimensional Leader Effectiveness Model

The four basic leader behavior styles depict essentially leader personalities: high task, high task and relationships, high relationships, and low task and relationships behavior. As an individual matures he develops habit patterns or conditioned responses to various stimuli:

$$\text{habit 1} + \text{habit 2} + \text{habit 3} + \dots + \text{habit } n = \text{personality}$$

An individual begins to behave in a similar fashion under similar conditions. This behavior is what others learn to recognize as that person, as his *personality*. They expect and can even predict certain kinds of behavior from him. This is what some authors refer to as *style*. The leader personality or style of an individual is the behavior pattern he exhibits when he is involved in directing the activities of others. The pattern generally involves either task-oriented behavior or relationships-oriented behavior or some combination of both:⁷

Task-Oriented Behavior — The extent to which a leader is likely to organize and define the relationships between himself and the members of his group (followers): characterized by a tendency to define the role which he expects each member of the group to assume, endeavoring to establish well-defined patterns of organization, channels of communication, and ways of getting jobs done.

Relationships-Oriented Behavior — The extent to which a leader is likely to maintain personal relationships between himself and the members of his group (followers): characterized by socio-emotional support such as friendship, mutual trust, respect for followers' ideas, consideration for their feelings.

⁶[6], P. HERSEY & K. H. BLANCHARD, "Management of Organizational Behavior", 1969, page 73.

⁷[6], P. HERSEY & K. H. BLANCHARD, "Management of Organizational Behavior", 1969, page 74–75.

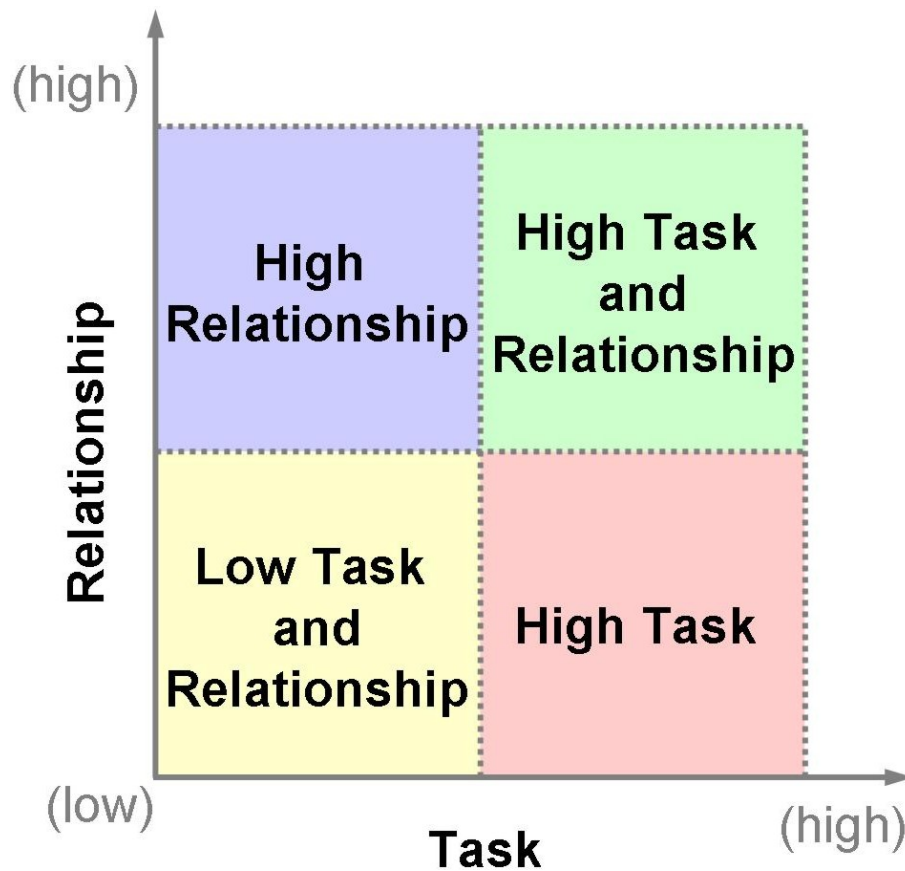


Figure 2.6: *The basic leader behavior styles.*

In brief, task-oriented behavior consists of structuring the relationships and activities in a group situation in terms of task accomplishment, while relationships-oriented behavior stresses building and maintaining good personal relations between himself and his followers. These styles, derived from the task and relationships dimensions (see Figure 2.6), can be described as follows:⁸

- 1.) **High Task** — With this leader personality, an individual is seen by others as high on task but low on relationships. He seems to be more concerned about the task at hand than he is about the personal feelings and satisfactions of his followers. He appears to emphasize the task aspects of productivity viewing members as tools to accomplish his own personal goals or the goals of his organization.
- 2.) **High Task and Relationships** — With this leader personality, an individual is seen by others as high on both task and relationships. He appears

⁸[6], P. HERSEY & K. H. BLANCHARD, “*Management of Organizational Behavior*”, 1969, page 75–76.

to emphasize getting the task done, but not at the expense of the individuals in his group. He seems to set high standards but takes interest in everyone, accepting their individuality, personal needs, and ideas.

- 3.) High Relationships** — With this leader personality, an individual is seen by others as high on relationships but low on task. He appears to have a more overt concern for the needs of the individuals in the group than the task to be accomplished. He seems to feel that every individual is a human being and therefore treats everyone as if he were important. He tends to emphasize maximizing the support and development of his subordinates' potentials rather than maximizing productivity.
- 4.) Low Task and Relationships** — With this leader personality, an individual is seen by others as low on both task and relationships. He appears as a leader who allows his followers to direct their own activities and does not spend much time in developing personal relationships with them.

2.16.1 Effectiveness Dimension

By adding an effectiveness dimension to the task and relationships dimension of earlier leadership models, we are attempting to integrate the concerns of leader style with situational demands of a specific environment. When the style of a leader is appropriate to a given situation, it is termed *effective*; when his style is inappropriate to a given situation, it is termed *ineffective*. If the effectiveness of a leader behavior style depends upon the situation in which it is used, it follows that any of the basic styles may be effective or ineffective depending on the situation. The difference between the effective and ineffective styles is often not the actual behavior of the leader, but the appropriateness of his behavior to the situation in which it is used, as seen by his followers, superiors or his associates. Table 2.4 (on page 26) describes briefly how each style might be perceived by others.⁹

While effectiveness appears to be an either/or situation in this model, in reality, it should be represented as continuum. Any given style in a particular situation could fall somewhere on this continuum from extremely effective to extremely ineffective. Effectiveness, therefore, is a matter of degree.¹⁰

While high concern for both production and people is desirable in organizations, managers

⁹[6], P. HERSEY & K. H. BLANCHARD, "Management of Organizational Behavior", 1969, page 78, Table 4.1.

¹⁰[6], P. HERSEY & K. H. BLANCHARD, "Management of Organizational Behavior", 1969, page 76–77.

Basic Styles	Effective	Ineffective
High Task	Often seen as knowing what he wants and imposing his methods for accomplishing this without creating resentment.	Often seen as having no confidence in others, unpleasant, and interested only in short-run output.
High Task and Relationships	Often seen as a good motivator who sets high standards, treats everyone differently, and prefers team management.	Often seen as a person who tries to please everyone and, therefore, vacillates back and forth to avoid pressures in a situation.
High Relationships	Often seen as having implicit trust in people and as being primarily concerned with developing their talents.	Often seen as primarily interested in harmony and being seen as “a good person”, and being unwilling to risk disruption of a relationship to accomplish a task.
Low Task and Relationships	Often seen as appropriately permitting his subordinates to decide how the work should be done and playing only a minor part in their social interaction.	Often seen as uninvolved and passive, as a “paper shuffler”, who cares little about the task at hand or the people involved.

Table 2.4: How the basic leader behavior styles are seen by others when they are effective or ineffective.

having a high concern for both people and production do not always find it appropriate in all situations to initiate a high degree of structure and provide a high degree of socio-emotional support. For example, if a manager's subordinates are emotionally mature and can take responsibility for themselves, his appropriate style of leadership may be low task and low relationships. The manager permits these subordinates to participate in the planning, organizing and controlling of their own operations. He plays a background role, providing socio-emotional support only when necessary.¹¹

In summary, empirical studies tend to show that there is no normative (best) style of leadership. Successful leaders can adapt their leader behavior to meet the needs of the group and of the particular situation. Effectiveness or productivity depends upon the

¹¹[6], P. HERSEY & K. H. BLANCHARD, “*Management of Organizational Behavior*”, 1969, page 79.

leader, the followers, and other situational elements:¹²

$$\text{Effectiveness } E = f(\text{leader}, \text{follower}, \text{situation})$$

¹²[6], P. HERSEY & K. H. BLANCHARD, “*Management of Organizational Behavior*”, 1969, page 79–80.

3

Objectives of the Study

3.1 Overview

The basic goal of the underlying work is to develop a leadership questionnaire for a project leader in an international scientific research laboratory and verify statistically the independency of the individual questions from each other (ensure low overlap in content and meaning) by achieving low correlation coefficients.

3.2 Scientific Research Environment

The following description of the scientific research environment describes the work within scientific research teams and emphasizes the team leader's tasks and responsibilities. It is not meant to be a complete and detailed description of the global work environment in international scientific research laboratories.

The underlying study was carried out in two different international scientific research laboratories providing a multi-cultural environment of physicists, engineers, and technicians of different nationalities. International scientific research laboratories consist of several thousand full-time employees and visiting scientists of the research facility. Examples for

such a research laboratory are CERN¹, PSI², or GSI³. Several nations contribute to each of these research facilities and either send or have already their researchers working locally in these institutions on various research projects. This creates a multi-cultural environment demanding from their team members a certain amount of mutual respect and understanding of different cultural traits.

Scientific research teams are formed in “task-force style” within those research facilities to perform specific tasks, projects, or experiments. The background knowledge level of each individual — either a team leader or a team member — varies considerably. Team leaders or senior physicists have to be considered as specialists in their chosen work or research topic, where she/he has worked for more than five years on a professional basis. Team leaders should be capable of innovation, formulating and presenting new ideas, and they should have an well-founded overall view of their research topic. The team structure consists of one or two senior physicist leading a team of physicists, master or PhD students of physics or another engineering field, engineers, and technicians.

Research projects in international research laboratories have in most cases the same structure⁴, only the number of involved team members varies considerably. A specific project is chosen by a physicist out of her/his work-field because of a need to either verify parts of a theoretical model or to introduce a new measurement technique to obtain new insights in a specific research field. The physicist proposing the experiment is also the “spokesperson” (team leader) of the project and builds a team consisting of senior-colleagues, colleagues of the same professional level, PhD and/or master students, engineers, and technicians. The team leader defines and formulates — together with this chosen team — a research proposal and presents and defends it in front of a research committee. The research committee, consisting of up to ten senior professors and senior researchers, decides about the relevance of the scientific content and propose for an approval of the research project to the director of the international scientific research laboratory.

When the project is approved, the team leader starts with the coordination of the preparation for the experiment. Typically, a preparation of one year is required, but, depending on the project size and the availability of technical and human resources, those preparations

¹CERN — European Organization for Nuclear Research (Conseil Européen pour la Recherche Nucléaire), Geneva, Switzerland, [10]

²PSI — Paul SCHERRER Institut, Villigen, Switzerland [11]

³GSI — Gesellschaft für Schwerionenforschung mbH, Darmstadt, Germany, [12]

⁴see Figure 3.1

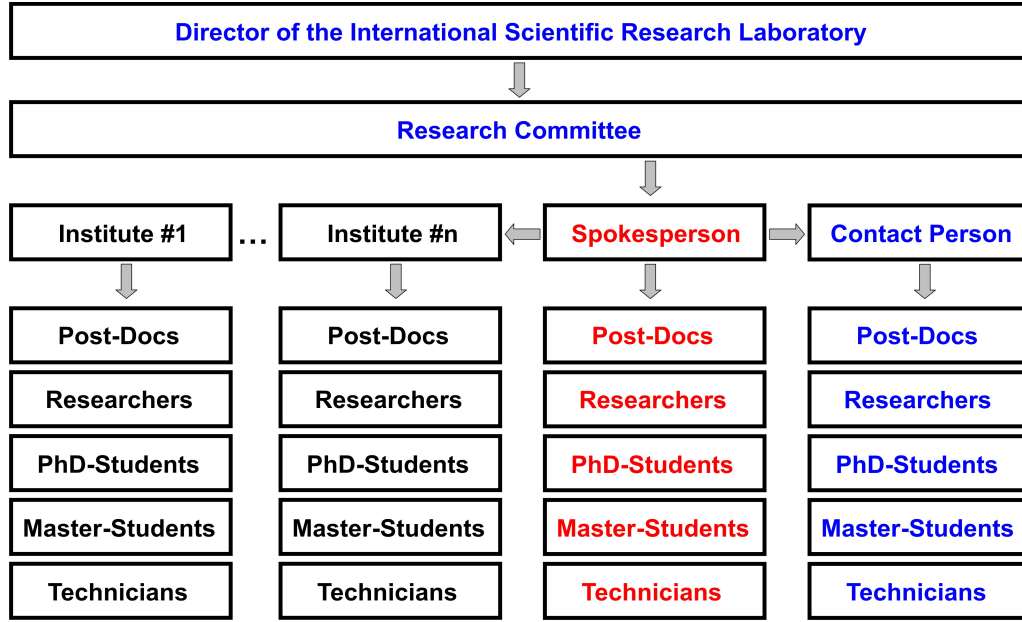


Figure 3.1: Schematic illustration of the organizational structure for research projects in international scientific research laboratories. Several university institutes or research laboratories might contribute to the research project (illustrated by “institute 1” to “institute n”). If the experiment is performed at a different research facility than the project leader’s home-institute, then a contact person has to be appointed to facilitate the communication with the local staff personnel and the spokesperson.

may take several years. During the preparation time, specific tasks are assigned to the team members who might be located in different research laboratories spread all over the world⁵. The implementation of those tasks is coordinated and supervised by the team leader and representatives of university institutes and research facilities. Therefore, the team leader has to possess a certain degree of communication skills to motivate and guide the team members.

If the experiment has to be installed at a different laboratory than the home institute of the spokesperson, then a so-called contact person⁶ is appointed by the team leader at the local institute where the experiment is being installed. The purpose of this contact person is to serve as some sort of “person to turn to” for the staff of the local institute to facilitate the communication process with the team leader and the team carrying out the experiment. Depending on the size of the team at the local institute, the contact person can form a parallel team, but the spokesperson remains the final decision making authority for the project.

⁵see Figure 3.1

⁶see Figure 3.1

After the preparation time⁷, the experimental setup⁸ is installed at one particular international scientific research laboratory which provides the required infrastructure to perform the research project. The setup-phase is always very crucial point of an experiment, because the various parts produced by different team members in different places of the world have to be connected at predefined interfaces in a way so that they work as one single unit. Furthermore, the setup has to be integrated in the existing infrastructure of the research facility. This requires again a certain degree of communication skills of the team leader to coordinate the setup implementation with the local staff of the research facility.

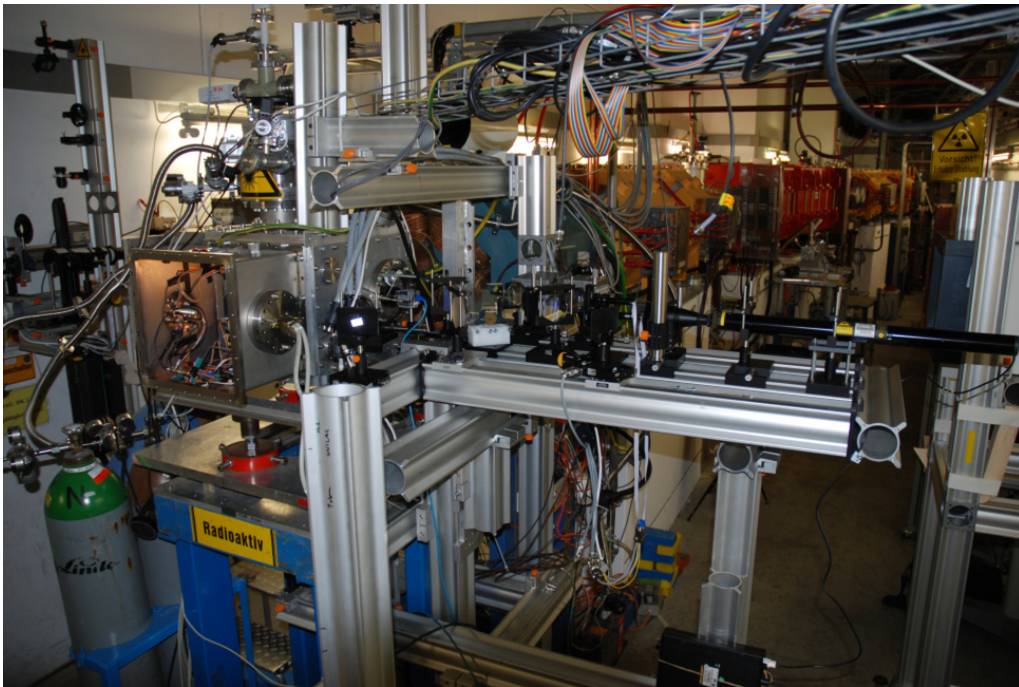


Figure 3.2: Typical experimental setup installed in an international scientific research laboratory.

After the implementation phase, the setup has to be tested and checked during an extensive testing phase immediately before the experiment. This testing phase also serves as a training for the different team members, who are individual specialists in their particular work-field, to act as a team. In this case a certain degree of relationship behavior is required by the team leader to coordinate and delegate different tasks that

⁷including the purchase of equipment, engineering of specific parts, assembly, testing, commissioning, etc.

⁸see Figure 3.2

have to be done during the actual experiment.

Another challenging aspect of the project is that experiments usually run in some sort of “single-shot sniper-mode”. This means, that there is a pre-defined time window for the experiment in which only one “shot” or trial is possible. If a specific eventuality was not considered in advance, the project may fail for any unforeseen problem. This requires a very strong task focus from all participants of the project, and in particular from the team leader. The team leader has to be aware of all details in the experimental setup so that she/he is able to intervene or improvise in the case of an unforeseen event.

Also, most of the experiments run in shift mode for 24 hours per day, ranging from a few days up to several weeks. Within this time window, the team leader has to be reachable at any time to intervene in the case of an emergency or unforeseen event. This requires also delegation style of leadership, since no one can stay alert and awake for more than a couple of days. Furthermore, team members have to be motivated to stay focused on the task even during inconvenient working times or work conditions. This might further cause frictions and conflicts among the team members and the team leader has to possess strong relationship skills to smooth out any personal conflict that might arise.

The experiment itself can be very stressful in terms of long waiting periods at full alertness. Those waiting periods might be caused by technical problems in the research facility located outside the direct experimental setup. During these waiting periods, the team leader has to motivate the team members to stay alert and keep them focused on their tasks, although this might be extremely difficult for some team members, i.e., people with families and other social interests. They might see this time as a waste of their spare free-time, which is quite short during an experiment. Again, this situation requires a high degree of relationship behavior and communication skills for the team leader.

After the experiment, the obtained data have to be analyzed and put into a scientific context. This work is either done by the team leader alone or distributed again between the various team members who might be already back again in their research facilities. Therefore, a certain degree of communication and delegation skills is required for this task.

Finally, the whole project and the obtained data have to be published as research articles in specific journals and presented in the form of posters and oral presentations at conferences. This requires task and relationship behavior since every detail of the experiment has to be known by the presenting team leader and the information has to be distributed to the

members of the scientific community.

3.3 Leadership in International Scientific Research Laboratories

The focus of this work is on behavior of individuals within organizations and not between organizations. Those individuals working in international scientific research laboratories are dealing with technical, engineering, and/or physics concerns. An example for such facility would be CERN ⁹, PSI¹⁰, or GSI¹¹, but one can find many similar facilities with the same organizational structure all over the world. Unlike typical commercial and industry projects, the project teams in these organizations exist only for a short time-span, have multi-cultural teams, and relatively empowered¹² work teams. These specifics demand typically more skills than just task focus and relationship behavior from their team leaders. Therefore, three additional dimensions (leading by example, participative behavior, and informing and coaching) were considered in the underlying work to design a leadership questionnaire and analyze behavior and traits of a team leader working in international scientific research laboratory.

3.4 Objectives

The specific objective of the study is to create a leadership questionnaire and to examine the behavior, personality, and character attributes of a project or experiment team leader in an international scientific research laboratory as perceived by her/his team members during the planning, design, implementation, and execution of the project or experiment itself.

Standard leadership questionnaires [1, 2, 3] are designed for project or work teams in industry, banking, or any other sector of the economy. Those questionnaires concentrate on task focus and relationship behavior of individual team leaders. The main premise for the application of those questionnaires is that the team should consist mainly of experts with a broad overlap in knowledge and skills between individual team members, experience in achieving their goals as a team, and a solid background in their particular work field. Only a small amount of the team members should be considered as non-specialists who

⁹CERN — European Organization for Nuclear Research (Conseil Européen pour la Recherche Nucléaire), Geneva, Switzerland, [10]

¹⁰PSI — Paul SCHERRER Institut, Villigen, Switzerland [11]

¹¹GSI — Gesellschaft für Schwerionenforschung mbH, Darmstadt, Germany, [12]

¹²see Section 4.1, page 39

are either still in a training phase or have not a solid background or only little work experience in the particular work field. Furthermore, most of the team members have been working with their colleagues already for a longer period of time and know each other very well.

Scientific research projects, on the other hand, exist mainly for the purpose of a specific research project or experiment. Typically, teams are dissolved after a research project is finished. Hence, individual team members have only little experience in working with most of their actual colleagues. Also the motivation to develop long term work relationships between all team members is considerably lower than in typical companies because the team is formed only for the purpose of the research project. The qualification range might differ considerably between individual team members. The team leader also has to work in the absence of any strong hierarchical structure in which everyone's position and the official channels or chain of command are clearly defined. Additionally, international scientific research teams consist of team members from different countries who also vary considerably from each other in terms of culture, beliefs, habits, and work attitudes. These facts induce specific challenges for a team leader that may differ from the mentioned leadership questionnaires [1, 2, 3]. In addition to task focus and relationship behavior dimensions, also additional skills (leading by example, participative behavior, informing, and coaching) are required from a team leader to lead and manage scientific research teams with only one particular objective and a limited life-span. Therefore, a five-dimensional leadership questionnaire was designed to cover not only the two basic traits of task focus and relationship behavior, but also to account for the required skills and attributes to deal with the limited project life-span, the absence of any strong hierarchical structure supported by an organization, and the cultural differences.

As already summarized in the previous chapter¹³, leadership theories and questionnaires are evolving topics that are not static and carved in stone like mathematics, classical physics, or basic chemistry. Leadership theories evolve with the technological progress and the life changes of employees, managers, and especially that of scientists, who always stand at the edge of progress. Hence, leadership theories can be compared with evolving sciences like medicine, pharmacy, or computing, which adapt to the technological progress and to people's needs. In that sense, leadership theories were evolving with time and new theories adapted to the changes in our lives.¹⁴

The huge technological progress in international scientific research laboratories imposes

¹³see Chapter 2, page 5

¹⁴see Chapter 2, page 5

a lot of changes on work teams and compared to the “good old days” people nowadays have to “run” just to keep up with the daily challenges in their work life. Therefore, classical leadership theories and questionnaires also have to be adopted and and to be changed according to the specific situations that people all over the world are confronted in interacting with their colleagues and team leaders. In that sense, a leadership questionnaire was developed to account for today’s typical challenges faced by a project leader in an international scientific research laboratory.

3.5 Limitations

The underlying study was constraint by several limitations. The first limitation was time. About 12 weeks were available to study the relevant literature, design the questionnaire, distribute it to the participants, wait until they answered them and all of questionnaires were collected again.¹⁵ Then the coding had to be done by hand, the data processing, establishing the plots, analyzing the collected data, and finally writing the report. Typically, one to two years of research are required to establish a new leadership questionnaire¹⁶ instead of the three month available for this study.

The second limitation was a desperate lack of manpower. Typically, a team of more than 10 experienced psychologists are employed to design a new leadership questionnaire.¹⁷ These teams of psychologist conduct hundreds of interviews, take careful notes and even record the interviews. For these procedures, a written legal consents from all the interviewed persons and the company’s or institute’s CEO is required. Also at least more than three different companies or institutes should be investigated in detail.¹⁸ All these tasks require a team of psychologist and experienced researchers in the establishment of leadership and management questionnaires. For the underlying study only one master student was available to design the leadership questionnaire and distribute it to the participants.

The third limitation a sufficient number of participants. Typically, several hundred

¹⁵The sealed box was not opened until all questionnaires had been collected. This was done to guarantee absolute confidentiality to all participants and that nobody could track back any of the questionnaires to a particular candidate.

¹⁶see J. A. ARNOLD *et al.*, *The empowering leadership questionnaire*, 2000, [13]

¹⁷see J. A. ARNOLD *et al.*, *The empowering leadership questionnaire*, 2000, [13]

¹⁸see J. A. ARNOLD *et al.*, *The empowering leadership questionnaire*, 2000, [13]

employees are being interviewed¹⁹ before a new leadership questionnaire is designed and tested. Only a limited number of team members participated in the testing of the established questionnaire due to the lack of time and a fixed time window in the middle of the holiday season.

Most of those limitations and restricting circumstances could be accounted for and compensated by slight variations from the typical procedure of establishing and testing a new leadership questionnaire.²⁰

¹⁹see J. A. ARNOLD *et al.*, *The empowering leadership questionnaire*, 2000, [13]

²⁰see Chapter 4, page 39: “Designed Questionnaire and Applied Research Methods”

4

Designed Questionnaire and Applied Research Methods

4.1 Design of a Five-Dimensional Leadership Questionnaire

A leadership questionnaire for an international scientific research laboratory was developed. This leadership questionnaire can also be used in industrial situations with so-called “empowered teams” that deal rather independently from the basic company structure. The questionnaire consists of five dimensions with a total of 65 questions that are almost equally distributed. This principle follows the work of J. A. ARNOLD *et al.* [13] who constructed with his co-authors an Empowering Leadership Questionnaire (ELQ). ARNOLD states that

...many companies have replaced their traditional hierarchical management structures with empowered (semi-autonomous or self-managing) work teams. Duties that were once performed by managers, such as directing and controlling work, are now performed by empowered teams. The managers that remain, in turn, have been asked to take on a new set of roles and responsibilities in order

*to lead these teams ...*¹

This situation described by ARNOLD is similar to team leaders of scientific research projects, which are also more or less semi-autonomous and self-managing work teams. Therefore, three additional dimensions (leading by example, participative behavior, and informing and coaching) were added to the two classic dimensions of task focus and relationship behavior to account for the task-force style of research teams and the multi-cultural environment in international scientific research laboratories.

The purpose of the present work is to design a leadership questionnaire that allows to examine the behavior of team leaders managing scientific research projects (i.e., managers who are still team members, but who are also responsible for providing leadership). The goal is to establish an empirical basis for understanding their behavior in today's international scientific research laboratories by using the following 65 questions that are almost equally distributed over five dimensions:

1.) Task Focus: Task focus, directing, and achievement orientation.

The first dimension deals with the team leader's task focus and her/his achievement orientation. The dimension investigates the team leader's readiness to develop and suggest a plan of action for the group. This behavior is required to start a research project and also to progress quickly during the planning, design, and implementation of the experiment. It is also being investigated if team leaders let team members know what they are supposed to do: defining detailed tasks or organizing shifts. The team leader's ability to make suggestions about how to solve problems and if she/he sets clear standards of performance for group members is being analyzed. Both characteristics are required to lead the project to the expected outcome and to avoid getting stuck on the way. The dimension also studies the team leader's focus on accomplishing a goal or task in time and if she/he defines milestones and monitors progress closely. These attributes are especially important for larger projects which last for several years.

The team leader's managerial capabilities and if she/he ensures that large and complicated projects are broken into small manageable tasks

¹see J. A. ARNOLD *et al.*, *The empowering leadership questionnaire*, 2000, page 249–250, [13]

and that every detail is accounted for is being explored. Recognizing what needs to be done and taking the initiative to make it happen is essential in scientific research projects to avoid long waiting periods and discussions of small details. The first dimension also looks into the team leader's capability of identifying and prioritizing key objectives and if she/he focuses the groups activity on them and allocates effectively available resources. These attributes are essential in scientific research project where optimization of time, money, and human resources has reached already its saturation and where the speed of changes increases steadily.

The team leader's tendency to give vague or misleading explanations to team members or if she/he takes the time to study a topic and explains it properly to her/his team members is being examined. Also the team leader's technical knowledge and skills and if she/he makes technical relevant suggestions during meetings or discussions is tested. Team leaders tend to shift their direct involvement in the project to delegation of subtasks due to the size and complexity of research projects. Therefore they do not contribute their suggestions at all during meetings and discussions just to avoid any embarrassment or exposure of a lack of knowledge and technical background. The task focus dimension checks the team leader's thoroughness and if she/he enjoys getting into the details of how things work or if she/he tends rather to be superficial. Also the team leader's persistence to solve even difficult tasks and if she/he is good at making things work and completing the assigned tasks are essential for the work of a team leader in international scientific research laboratories. Finally, the team leader knowledge and understanding of how to do basic things is being analyzed, because some people try to skip basic training programs or courses during their early career and therefore miss the opportunity to learn the job from the bottom up just to make less mistakes and to have a faster career. All those leadership traits of task focus, directing, and achievement orientation are summarized in the first dimension of the leadership questionnaire.

1. Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).
2. Makes suggestions about how to solve problems and sets standards of performance for group members.

3. Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.
4. Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.
5. Recognizes what needs to be done and takes the initiative to make it happen.
6. Prioritizes key objectives and focuses the groups activity on them.
7. Effectively allocates available resources, e.g., time, people, money.
8. Gives vague or misleading explanations to team members.
9. Makes NO suggestions (because she/he has no clue at all).
10. Enjoys getting into the details of how things work.
11. Is good at making things work and completing the assigned tasks.
12. Knows and understands how to do basic things.

2.) Relationship Behavior: Relationship behavior, showing concern, interaction with the team.

The second dimension analyzes the team leader's relationship behavior, her/his interaction with the team, and the efforts and motivation to show concern about the relationships within the team. The relationship behavior dimension explores if the team leader cares for the personal problems and well being of others and if she/he helps others — and especially newcomers — to feel comfortable in the group. This strong concern for team members is important for the work in scientific research project in which most of the team members just joined the team and have no experience how the rest of their team members behave. The dimension also analyzes if the team leader is aware and knows exactly and in detail what work is being done in the team. The team leader's motivation to communicate actively and her/his readiness to treat people as equals, fairly and consistently is being studied. The multi-cultural environment and the different work attitudes create a potential for stress, conflicts, and resistance. Therefore, the team leader has to communicate with individual team members before problems arise.

It is also being tested if the team leader acknowledges her/his own mistakes and takes corrective action and if she/he discloses thoughts and feelings to group members. The task focus dimension determines

if the team leader gives team members honest and fair answers and if she/he worries about jeopardizing relationships when correcting mistakes. Scientific research projects are composed of many different and rather complex tasks and most of them have never been done before in a similar project context. Thus, acknowledging, discussing, and correcting mistakes should be considered as part of the project itself and the learning process of the team.

The team leader's awareness of other people's personal boundaries and if she/he honors those boundaries is being investigated. This is important for the work in the multi-cultural environment of international scientific research teams. Achieving "win-win" outcomes and the team leader's ability to identify and promote opportunities for collaboration is also addressed by the second leadership dimension. Finally, the team leader's awareness of the consequences of her/his managerial decisions and if she/he is concerned with how her/his decisions affect the lives of others is being explored. All those leadership attributes in interacting with the team members are summarized in the second dimension and studied by the questions 13 to 24 of the leadership questionnaire.

1. Shows concern for the personal problems and well being of others.
Helps others (especially newcomers) feel comfortable in the group.
2. Knows (exactly and in detail) what work is being done in the team.
3. Treats people as equals, fairly and consistently (behaves predictably).
4. Communicates actively (i.e., starts conversations) with team members.
5. Acknowledges her/his own mistakes and takes corrective action.
6. Discloses thoughts and feelings to group members.
7. Gives team members honest and fair answers.
8. Does not worry about jeopardizing relationships when correcting mistakes.
9. Honors other people's (personal) boundaries.
10. Regularly achieves "win-win" outcomes.
11. Identifies and promotes opportunities for collaboration.
12. Is concerned with how her/his decisions affect the lives of others.

3.) **Leading by Example:** Integrity and “leading by example”.

The third dimension explores the team leader’s integrity and if she/he is “leading by example”, i.e., motivating team members by exercising personally the expected behavior and desired attitudes. Leading by example is an effective instrument in the absence of any hierarchical structure with a clear chain of command or official channels. The third dimension studies if the team leader sets high and clear standards for others by her/his own behavior. It is being examined if the team leader works at least as hard as anyone else in the work group and if she/he is thereby motivating others to achieve and stretch their performance. Modeling positive team attributes such as mutual respect, open communication, and full participation are also investigated. The leading by example dimension explores if the team leader has high moral standards, if she/he would try to take credit for other people’s ideas, and if she/he shows favoritism in an unfair amount towards some people within the team. All these attributes would affect the team’s moral and work performance considerably.

The team leader’s engagement in establishing challenging goals for herself/himself and going above and beyond of what is the project’s expected outcome is also examined. Being aware of one’s own strengths & weaknesses and being open to feedback from others is essential for a team leader of a scientific research project. The third dimension also addresses the team leader’s willingness to learn from her/his own experiences — and also those of others — and if she/he seeks opportunities for self-development. Speaking up even when the team leader’s own opinion is in the minority and being capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions are essential for the work of a team leader in international scientific research laboratories. All those leadership traits of integrity and leading by example are summarized in the third dimension of the leadership questionnaire.

1. Sets high and clear standards for others by her/his own behavior.
2. Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.
3. Models positive team attributes such as mutual respect, open com-

- munication, and full participation.
4. Has high moral standards. Can be trusted with confidential information.
 5. Would never try to take credit for other people's ideas.
 6. Shows favoritism (in an unfair amount) towards some people.
 7. Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.
 8. Possesses awareness of her/his own strengths and weaknesses.
 9. Is open to feedback from others. Encourages others to give feedback.
 10. Learns from own experiences and also those of others. Seeks opportunities for self-development.
 11. Speaks up even when her/his opinion is in the minority.
 12. Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.

4.) Participative Behavior: Participative behavior and democratic decision-making.

The fourth dimension analyzes the team leader's participative behavior and democratic decision-making characteristics. These attributes are essential for collaborations and research projects involving several research or university institutes. Team members from different institutes must have the opportunity to participate actively and to be part of any decision-making process. Ignoring these facts might affect the overall performance of the team. The participative behavior dimension asks if the team leader encourages team members to express their ideas and suggestions and if she/he gives all team members a chance to voice their opinions. Listening receptively to team members ideas and suggestions and considering the team's ideas even when the team leader herself/himself disagrees with them is being examined by this dimension. It also has to be checked if the team leader makes decisions that are based only on his/her own ideas and if she/he consults with team members when facing an upcoming task or problem. A team leader's main concern should be to fix problems and not to lay blame when things go wrong and she/he should also be capable of juggling multiple demands.

The participative behavior also studies the team leader's abilities to shift priorities when the situation calls for it and if she/he deals with rapid change easily and effectively. Team leaders should allow their team members to determine what needs to be done and how to do it, because team members are specialists in their topics and know best how to do their specific tasks. A team leader should also be able to share her/his leadership power with subordinates and create a real feeling of teamwork in the team so that the team members feel that they are part of the project or organization. Motivating team members so that they feel a real responsibility to make things work and acknowledging others for their contributions and celebrating in their successes are essential for the work of a team leader in international scientific research laboratories. All those leadership attributes of participative behavior towards team members and democratic decision-making characteristics are summarized in the fourth dimension of the leadership questionnaire.

1. Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.
2. Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.
3. Makes decisions that are based only on his/her own ideas.
4. Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.
5. When things go wrong, the main concern is to fix it, not to lay blame.
6. Is capable of juggling multiple demands.
7. Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.
8. Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).
9. Likes to share her/his leadership power with subordinates.
10. There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.
11. The team members feel a real responsibility to make things work.
12. Acknowledges others for their contributions and celebrates in their successes.

5.) Informing and Coaching: Team leaders in international scientific research laboratories must teach, coach, and inform their team members, because most of them have never worked together as the same team or on the same project. Therefore, all participants have to go through a certain learning period to learn how to work and act as a single team. This period can be reduced considerably by coaching and informing team members effectively.

(a) Coaching, developing others, and intellectual stimulation.

The first part of the fifth dimension examines the team leader's competencies to coach team members, develop others, and to initiate intellectual stimulation. The informing and coaching dimension asks if the team leader recognizes the potential of her/his team members and if she/he pays attention to team's performance. Supporting and giving feedback to team members using leadership power to help them grow is an essential leadership trait in international scientific research laboratories. The team leader's readiness to develop others by explaining or demonstrating relevant skills and by encouraging team members to solve problems on their own is being studied by the fifth dimension.

Scientific research projects are composed of many different and rather complex tasks that are interconnected with each other. Therefore, it is essential that team leaders help their team's to focus on goals and objectives and to get team members to look at problems from many different angles. The team leader's ability to identify causes of resistance and to find ways to overcome them is a necessary trait for the multi-cultural teams in international research projects. The informing and coaching dimension also analyzes the team leader's readiness to spend time effectively teaching or mentoring team members.

1. Recognizes the potential of her/his team members.

2. Pays attention to team's performance. Supports and gives feedback.
3. Likes to use her/his leadership power to help subordinates grow.
4. Develops others by explaining or demonstrating relevant skills.
5. Encourages team members to solve problems on their own.
6. Helps the team to focus on goals and objectives.
7. Gets team members to look at problems from many different angles.
8. Identifies causes of resistance and finds ways to overcome them.
9. Spends time effectively teaching or mentoring team members.

(b) **Informing, communication, conflict management, and leader-member exchange.**

The second part of the fifth dimension deals with the team leaders readiness to inform team members, her/his communication finesse, her/his conflict management skills, and the level of leader-member exchange. The informing and coaching dimension deals with the team leader's capability to explain how the team fits into the project or company objectives so that team members understand their positions, tasks, and goals in a better way. Also the team leader's competency to explain the purpose of the company's policies to the team and, furthermore, to explain rules and expectations is being investigated. International scientific research laboratories are big or even huge administrative institutions with many thousands of researchers and employees. Lacking direct control of their own proximate environment increases illusory pattern perceptions of team members and might lead to misunderstandings and conflicts. Thus, a team leader's willingness to explain personal and company decisions, actions, and goals is an important leadership attribute that is being examined within the context of this fifth dimension. Sharing information openly with others and dealing with issues in a straightforward manner increases the trust and

moral within the team. The team leader's ability to calm others in stressful situations and her/his aptitude to handle difficult people and situations effectively are essential for the work of a team leader in international scientific research laboratories. All those leadership of coaching and informing team members are summarized in the fifth dimension of the leadership questionnaire.

1. Explains how the team fits into the project or company objectives.
2. Explains the purpose of the company's policies to the team.
3. Explains rules and expectations.
4. Explains (personal and company) decisions, actions, and goals.
5. Openly shares information with others.
6. Deals with issues in a straightforward manner.
7. Able to calm others in stressful situations.
8. Handles difficult people and situations effectively.

The fifth dimension was split into two sub-dimensions to allow a better differentiation between "informing" and "coaching". Therefore, this last dimension contains 17 questions instead of 12 as all the other dimensions. These 65 questions were distilled out of well documented observations of behavior pattern and notes after informal interviews collected by a member of an international scientific research laboratory during conferences, meetings, experiments, etc. during a period of almost six years. This method was chosen because in absence of psychological personnel that, in a large company, would have designed such a questionnaire after a series of well defined interviews with employees of different hierarchical layers [13].

A performance key with nine categories was chosen to assign the leaders behavior to the corresponding question's content. It was found out during personal interviews after the filled-in questionnaires had been returned that this rather fine subdivision of the performance key was very appreciated by the individual participants. Almost all participants have a technical, engineering, physics, or mathematical background and therefore prefer a finer selection grid.

It was mentioned additionally on the individual questionnaire forms that the collected data would be treated absolutely confidentially and that the individual results would not be given to third persons. A copy of the distributed leadership questionnaire forms is

shown in Appendix A.²

4.1.1 Introduction of a 360-Degree/3-Fold Feedback Scheme

Each question had to be answered by the participants for three different persons: the candidate, their supervisor, and finally for themselves (self-appraisal).³ This method was chosen to increase the accuracy of the obtained results by motivating the participants to focus not only on the candidate's personality, but rather to compare her/his traits and behavior in comparison to themselves (self-appraisal) and in relation to their supervisors. This chosen 360-degree/threefold method increased the statistics and reduced the statistical variance of the outcome even for a low number of participants.

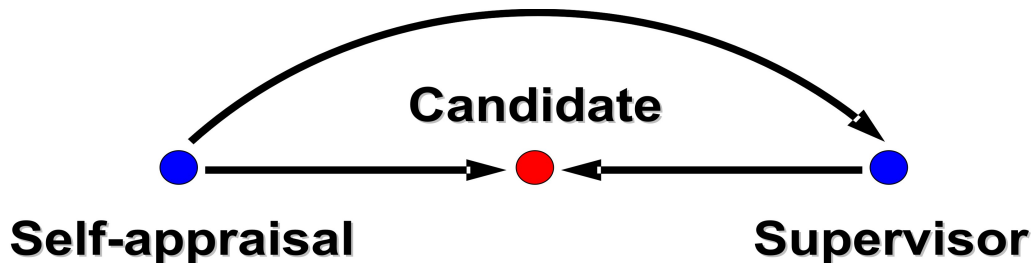


Figure 4.1: Schematic illustration of the 360-degree/threefold feedback scheme.

The names of involved persons are being kept strictly confidential to avoid any legal barriers and to facilitate the bureaucratic obstacles that may arise with the performance of such inquiries. Furthermore, any possible affect for the future careers of the involved persons should be avoided by this strict confidentiality.

4.2 Research Method

4.2.1 Participants

A total of 43 research team members and leaders volunteered to participate in this study. The participants were members of two different international scientific research organizations, but some of those participants had also worked already for various research institutes all over the world. These two research laboratories differed on several issues, including: the size of the organization, the length of time individual team members had

²see page 263

³see Figure 4.1

been part of their research teams, the typical size and function of the teams, and the type and fields of research they were performing. The participants were both male and female team members of various research groups, and ranged in age from 25–81. Nearly every educational and socio-economic background typical for international scientific research laboratories was represented, from technicians with bachelor degrees to team members with a PhD or even professors, and group leaders with approximately 150 employees.

45 questionnaires were submitted to different participants and 43 returned either their envelopes or sent an e-mail with their answers resulting in a total of 111 collected data-sets. 41 participants answered for the candidate, 37 filled in the self-appraisal category, and 33 participants judged their supervisors. The average time to fill in the whole questionnaire for all three persons under investigation was about 31 minutes. The shortest time span was 15 minutes and the longest one was 60 minutes.

4.2.2 Procedure

The leadership questionnaire was given to each participant either in paper form with an envelope or sent per e-mail as a Microsoft® Office EXCEL [14] file. Absolute confidentiality was guaranteed and emphasized in any communication during the whole procedure of distributing, answering, collecting, and processing the questionnaires. This was done for two reasons. The first reason was to put the participants at ease so that they would open up and answer the questionnaires without any pressure or fear that the given information would be used against them. It was discovered that this measure was necessary to get people listening to the purpose of the questionnaire finally to participate in the most open and honest way. The fact that the participation was voluntarily was also emphasized during the recruiting process of the participants.

It was discovered that it was necessary not just to communicate orally the purpose of the questionnaire and the procedure, but also to give every participant some sort of written document summarizing the procedure and the purpose of the study. Therefore, the following text document was sent by e-mail to all participants so that they had in a written form the purpose of the study stated. This method allowed them to read it again if they did not grasp the whole meaning the first time.

Dear participant,

I have recently done courses at the university and to get the final certificate

I have to do a research project for which I chose to construct a leadership questionnaire for an international scientific research laboratory.

Now I need to ask some people to fill-in this questionnaire so that I can do the statistical analysis and show that none of the questions are overlapping in content or have any causal correlation. The analysis will be absolutely confidentially! There is no need to be worried! It would be great if you could participate!

If you agree, then I will either send you the questionnaire as an EXCEL sheet or I will personally give you a printout with an envelope. In the first case, I will print the sheet when you return it to me, put it into an envelope and then into a sealed box, as it is done during any political election process.

If you choose to answer the questionnaires in paper form, then I will come to your place or office with the mentioned sealed box and collect your closed envelope personally. In the end I will not know who has answered which sheet. I just tell you this so that you can be very open and honest in your judgment.

The deadline would be Monday evening/night.

So, for the questionnaire:

- 1) “The candidate”: this is . . . ,⁴ so for all participants the same person.
- 2) “Yourself”: This is you, (name of the participant). You have to answer the same questions as for the candidate before, but now for yourself. Please try to see yourself how you have acted in situations where you were confronted with leadership of management tasks.
- 3) “Your team-leader”: this would be one of your former research project team-leaders. Please choose a person you know very well and try to judge her/his leadership skills in the same way as for the candidate or yourself.

Please, be very honest (and/or “tough”), otherwise it does not work! It works perfectly if you are very honest in your judgement. We have tested this fact already!

⁴The name of the candidate is kept confidentially within the framework of this research work.

I will not have a look at the answers if you choose to return them by e-mail. I will just print them, put the printout into an envelope, and then put the envelope into a sealed box with all the other questionnaires! So it will be absolutely confidentially if you want to have it that way! I will also not know who has answered which sheet, if you should choose to send all questionnaires from you and your colleagues in one e-mail back to me.

Please try to answer all questions and note the required time to answer all the questions in the questionnaire!

Don't hesitate to contact me if you have any further questions or comments!

Thanks a lot!!!

*Kind regards,
The Author*

Also every participant was given the opportunity to give either oral feedback or to express their comments in a confidential written form at the end of the questionnaire. The content of the feedback should have been about individual questions, the questionnaire in total, or about the participants personal feelings, thoughts or ideas about the content of the questionnaire. Surprisingly, every participant wanted to give an oral feedback which sometimes resulted in a discussion of up to one hour. Some of those candidates were quite happy that they finally got a chance to speak about their feelings and relationships towards their team leaders or team members. One participant was very emotional and extremely relieved that she/he finally could speak openly about all his experiences within her/his team. One candidate did not read the e-mail and got unfortunately from another member wrong information about the purpose of the study. This resulted in a written complaint to the author and an emotional discussion in which all the misunderstandings could be corrected.

A further surprise was that the first deadline for handing in the questionnaires had to be prolonged. Unfortunately, the study was carried out at the begin of August when many people went on holidays. Some of those participants, who were already on holidays, answered the questionnaires at the holiday location and sent it back by e-mail. Others just came after their holidays and handed over a sealed envelope. It was very surprising, that additional participants showed up who were not included in the first batch and “kindly”

demanded to be part of the study. Therefore, the initial collection period of 10 days was prolonged to almost 25 days in total.

4.2.3 Solutions for the Limitations of the Study

As already described in a previous section⁵, the underlying study was constraint by several limitations. Most of those limitations could be accounted for and compensated by slight variations from the typical procedure of establishing and testing a new leadership questionnaire⁶.

The limited time issue could not be totally overcome. Only a limited collection period of 10 days was initially scheduled to collect the questionnaires. This period had to be extended to almost 25 days after additional participants demanded kindly also to fill-in a questionnaire and other participants could not return their questionnaires on time because of their holiday plans. On the other hand, the lost time for the extended collection period could be used to write and extensively test a MATLAB[®] script [15] to process the coding-matrix with the obtained data. For this purpose, dummy matrices with random values as well as matrices with well defined values were established to test the mentioned MATLAB[®] script and to prepare also the graphical processing with Microsoft[®] Office EXCEL. The coding lasted only two days and the actual data processing and graphical visualization of the obtained data could be reduced to one week.

The lack of manpower could not be accounted for. Typically, a team of more than 10 experienced psychologists are employed to design a new leadership questionnaire. These teams of psychologist conduct hundreds of interviews, take careful notes and even record the interviews. In the case of the underlying study well documented observations of behavior pattern and notes after informal interviews collected by a member of an international scientific research laboratory during conferences, meetings, experiments, etc. during a period of almost six years. This period of six years and one man is approximately equal to the invested “man-years effort” done by J. A. ARNOLD *et al.*⁷ with a team of more then 10 experienced psychologists.

Another advantage of the used method was that no legal consents were required, since no persons were directly interviewed. Two research laboratories were investigated in detail,

⁵see Section 3.5, page 36

⁶see J. A. ARNOLD *et al.*, *The empowering leadership questionnaire*, 2000, [13]

⁷see J. A. ARNOLD *et al.*, *The empowering leadership questionnaire*, 2000, [13]

which is close to the three different companies or institutes that have been studied by J. A. ARNOLD *et al.*⁸

The third limitation given by the requirement of having several hundred participants was studied in detail⁹ before the data collection process was started. The obtained figures indicate that a minimum of 100 data-sets is required to push the estimated maximum error for the correlation coefficients below 10%. This limit was considered to be reasonable and sufficient to process and analyze the obtained data for the underlying study. Thus, every question had to be answered for three different persons: the candidate, the team member (self-appraisal), and their supervisors. Thereby, the required minimum number of participants could be reduced by a factor of three down to 34 participants. An additional advantage of this method was the fact that participants were forced to focus on three different persons at the same time and compare their behaviors and attributes for each single question. This method unintentionally increased the accuracy of the obtained data.

4.3 Variables and Concepts

In the following section the variables to process the collected data are being discussed. Also the concept to check the causal correlation and the content overlaps between individual questions is being introduced and discussed. The answered questionnaires had to be coded by hand¹⁰ to guarantee confidentiality and to finally obtain a coding-matrix which could be processed electronically. An example for the coding-matrix is schematically illustrated in Table 4.1. Some participants chose not to answer for a specific group, which is indicated by a “x” in Table 4.1.

A MATLAB® Script¹¹ [15] was written to process and analyze the coding-matrix. MATLAB® was chosen because the author is very familiar with the program and also because of its special design to handle huge data matrices quickly and easily. But also any other mathematics software might be used to process the obtained coding-matrix. The script contains the calculation of mean values, variances, the standard deviations¹²,

⁸see J. A. ARNOLD *et al.*, *The empowering leadership questionnaire*, 2000, [13]

⁹see Section 4.4, page 59: “Estimation of the Minimum Number of Data-Sets”

¹⁰111 data-sets $\times$ 65 questions = 7215 numbers in the overall coding-matrix.

¹¹Statistical analysis performed with MATLAB® script, see Appendix B, page 277

¹²see Section 4.3.1, page 56

P	Q	1	2	3	...	...	63	64	65
1	A	9	8	8	...	...	7	4	6
	B	7	7	6	...	...	6	6	6
	C	3	7	3	...	...	4	4	4
2	A	8	8	7	...	...	7	5	3
	B	x	x	x	...	...	x	x	x
...	...	...							
42	B	7	7	7	...	...	7	7	7
	C	x	x	x	...	...	x	x	x
43	A	8	8	8	...	...	6	3	6
	B	7	7	7	...	...	7	7	7
	C	6	8	6	...	...	8	8	8

Table 4.1: Example for an established coding table used to process the collected raw data. Abbreviations: *P* ... participant number, *Q* ... question number, *A* ... Candidate, *B* ... Self-Appraisal, and *C* ... Supervisor. Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always. *x* ... no answers were given for this specific group.

correlation coefficients¹³, gaussian fits, and occurrence spectra¹⁴. The obtained data tables were written into various files and graphically processed with Microsoft® Office EXCEL [14].

4.3.1 Mean Value, Variance, and Standard Deviation

The arithmetic mean value (Equation (4.1)¹⁵), the variance (Equation (4.2)¹⁶), and the standard deviation (Equation (4.3)¹⁷) were calculated for the obtained occurrence values for all individual questions within the questionnaire.¹⁸

¹³see Section 4.3.2, page 57

¹⁴Occurrence spectra are tables in which the occurrence values had been sorted into the various performance key categories: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always. Examples for different occurrence spectra are given in Appendix C, page 297.

¹⁵for Equation 4.1 see [16], page 6, Equation 2.1

¹⁶for Equation 4.2 see [16], page 9, Equation 2.5

¹⁷for Equation 4.3 see [16], page 9, Equation 2.8a, and page 10, Equation 2.8d

¹⁸The results are given in Chapter 5, page 61 and Appendix C, page 297

$$\bar{x} = \frac{1}{N} \cdot \sum_{i=1}^N x_i \quad (4.1)$$

$$V(x) = \frac{1}{N} \cdot \sum_{i=1}^N (x_i - \bar{x})^2 \quad (4.2)$$

$$\sigma_x = \sqrt{V(x)} = \sqrt{\frac{1}{N} \cdot \sum_{i=1}^N (x_i - \bar{x})^2} \quad (4.3)$$

$\bar{x}$	...	mean value of x
x_i	...	value of sample i
N	...	total number of elements in the sample (within this work: individual/total number of collected data-sets)
$V(x)$	...	variance of x
σ_x	...	standard deviation of x

4.3.2 Correlations between the Individual Questions

Mutual causal correlations and content overlaps were located and estimated by calculating the correlation coefficients (Equation (4.4 or 4.5)¹⁹) between the obtained occurrence values of individual questions.²⁰

$$\rho = \frac{\overline{x \cdot y} - \bar{x} \cdot \bar{y}}{\sigma_x \cdot \sigma_y} \quad (4.4)$$

$$= \frac{\text{cov}(x, y)}{\sigma_x \cdot \sigma_y} \quad (4.5)$$

ρ	...	correlation coefficient (between Question x 's and Question y 's occurrence values)
$\bar{x}$	...	mean value of x (mean value for Question x 's occurrence values)
$\bar{y}$	...	mean value of y (mean value for Question y 's occurrence values)
$\overline{x \cdot y}$	...	mean value of $x \cdot y$
$\text{cov}(x, y)$	...	covariance of x, y
σ_x	...	standard deviation of x
σ_y	...	standard deviation of y

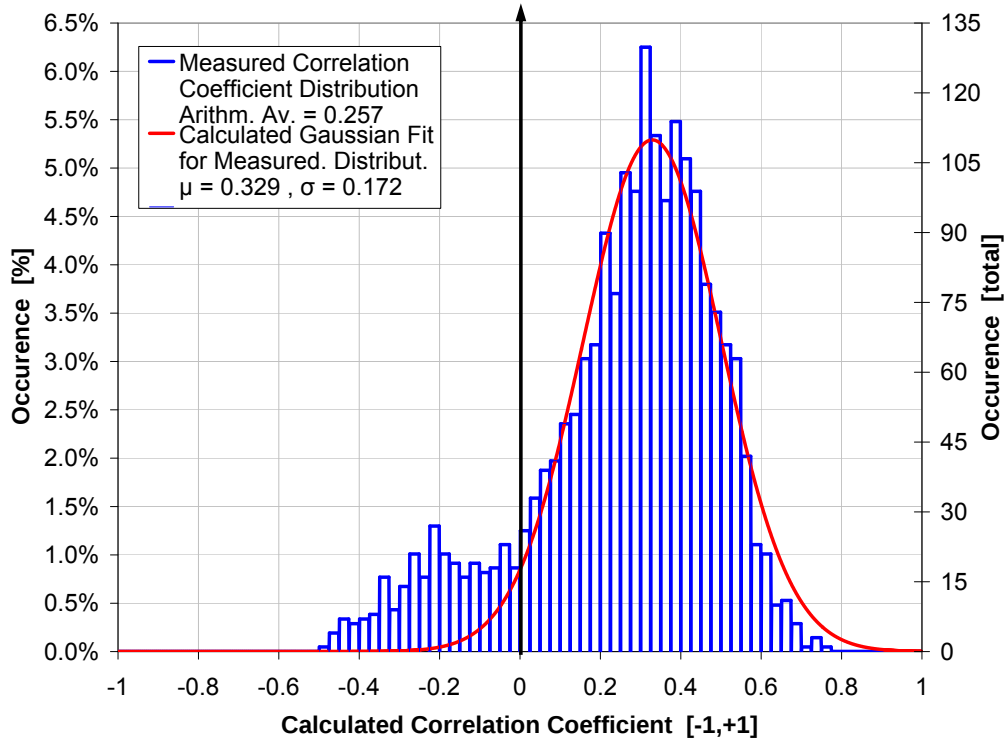


Figure 4.2: *Correlation coefficient distribution for the research environment group.*

Figure 4.2 shows the distribution of the calculated correlation coefficients for the obtained 111 data-sets of the research environment group. The calculated correlation coefficients are within the interval $[-0.475, +0.770]$ and their average value is around $+0.253$.

Questions with all their correlation coefficients within the interval $[-0.55, +0.55]$ have no content overlaps or causal correlations with any other question of the questionnaire. This criterium was obtained from the comparison of mutually completely independent questions with no content overlaps at all.²¹ Questions with correlation coefficients inside the intervals $[-1.0, -0.55[$ and $] +0.55, +1.0]$ were checked separately. If causal content overlaps were large, then the formulation of the question was modified to obtain a corrected final questionnaire with no causal correlations or content overlaps between any of its questions.²²

¹⁹for Equation 4.4 and 4.5 see [16], page 16, Equation 2.20a and 2.20b

²⁰The results are given in Chapter 5, page 61

²¹see Chapter 5, page 61

²²The final questionnaire is given in Appendix D, page 383

4.4 Estimation of the Minimum Number of Data-Sets

The statistical error of the calculated correlation coefficients between two individual questions within the questionnaire can be estimated by Equation (4.6):²³

$$\sigma_{\rho} = \frac{1 - \rho^2}{\sqrt{N - 1}} \quad (4.6)$$

σ_{ρ} ... error approximation for correlation coefficient
 ρ ... correlation coefficient
 N ... total number of elements in the sample
 (within this work: total number of collected data-sets)

The same equation was used to estimate the expected maximum error for the correlation coefficients to assess the minimum number of data-sets that should be collected to achieve a reasonable statistical error. The numerator of Equation (4.6) points out that the biggest error occurs for correlation coefficients equal to zero. Thus, maximum error approximations were calculated for a few data-sets in Table 4.2 and graphically visualized in Figure 4.3.

Based on these calculated values²⁴ it was decided that the aim should be to collect more than 100 data-sets so that the estimated maximum error for the correlation coefficients between two individual questions according to Equation (4.6) would be less than 10%.

Data-Sets	10	30	35	40	100	110	120	150	200
Max. Error	33.3%	18.6%	17.1%	16.0%	10.0%	9.6%	9.2%	8.2%	7.1%

Table 4.2: Expected (according to Equation 4.6) maximum error approximations for the correlation coefficients in relation to the number of collected data-sets (= one filled-in questionnaire for one person: either the candidate, or self-appraisal, or the supervisor).

Figure 4.3 and Table 4.2 also indicate that an increase of the total number of collected data-sets up to 200 would only decrease the maximum expected error by 2.9%. Therefore, a total of slightly more than 100 data-sets or about 35 questionnaires²⁵ should be sufficient to verify the causal independence between two individual questions with a reasonable statistical error.

²³for Equation 4.6 see [16], Chapter 5.2.4, page 80

²⁴see Figure 4.3 and Table 4.2

²⁵with answers for all three persons under investigation: the candidate, self-appraisal, and the supervisor.

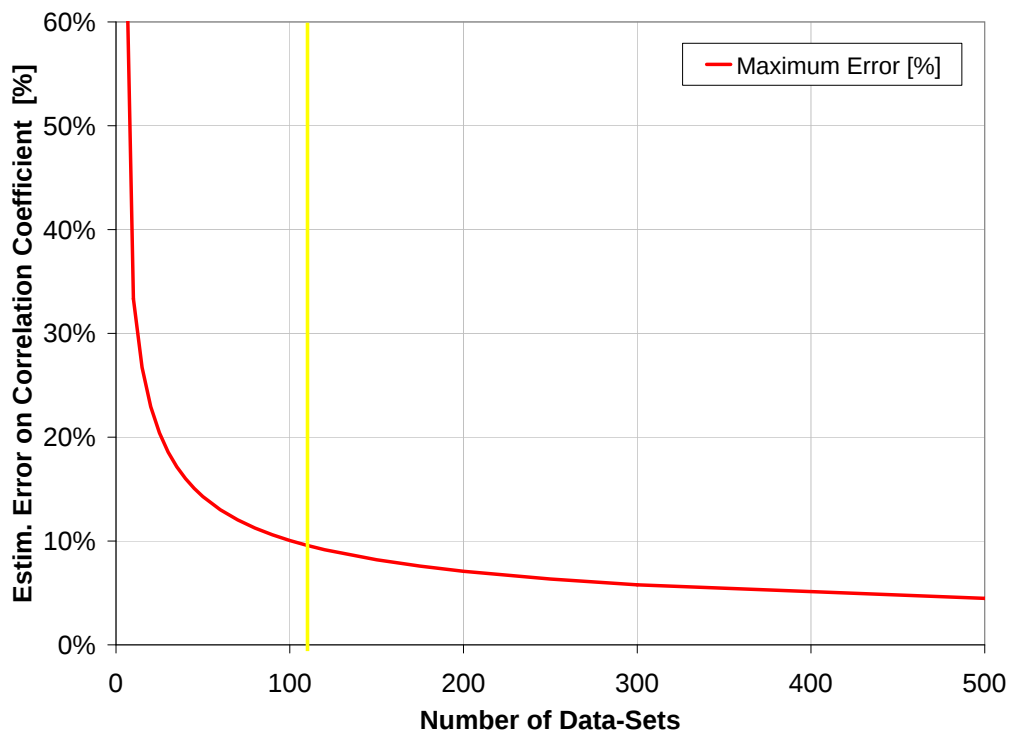


Figure 4.3: Expected (according to Equation 4.6) maximum error approximations for the correlation coefficients in relation to the number of collected data-sets (= one filled-in questionnaire for one person: either the candidate, or self-appraisal, or the supervisor). The vertical yellow line (—) at a data-set value of about 111 indicates that the maximum error on the calculated correlation coefficients between two individual questions would be less than 9.6%.

5

Evaluation & Validation of the Individual Questions

In the following sections¹, the obtained data from the questionnaires are evaluated in terms of each individual question's specific content. Furthermore, the independency between each individual question and all the other questions within the questionnaire is being validated by calculating correlation coefficients² between the individual questions for the data-sets of the research environment group. The calculated correlation coefficients are within the interval $[-0.475, +0.770]$ and their arithmetic average value is around $+0.253$.³ The average error on the calculated correlation coefficients is 8.4% and the maximum error that occurred for all correlation coefficients is 9.5%. Both values are below the estimated maximum error of 9.6%.⁴ The correlation coefficients and their corresponding errors are given in the plots of the following sections⁵.

¹from Section 5.1.1, page 63 to Section 5.5.17, page 233

²see Section 4.3.2, page 57

³see Figure 4.2, page 58

⁴see Section 4.4, page 59 and Table 4.2, page 59

⁵from Section 5.1.1, page 63 to Section 5.5.17, page 233

As already discussed in a previous section⁶, questions with all their correlation coefficients within the interval $[-0.55, +0.55]$ have no content overlaps or causal correlations with any other question of the questionnaire. On the other hand, questions with correlation coefficients inside the intervals $[-1.0, -0.55[$ and $] +0.55, +1.0]$ were checked separately. If causal content overlaps were large, then the formulation of the question was modified to obtain a corrected final questionnaire with no causal correlations or content overlaps between any of its questions.⁷

Research Environment	Self-Appraisal + Team Leader	Candidate	Self-Appraisal	Team Leader
Candidate	—	Candidate	—	—
Self-Appraisal	Self-Appraisal	—	Self-Appraisal	—
Team Leader	Team Leader	—	—	Team Leader
111	70	41	37	33

Table 5.1: Schematic illustration of the five different groups, their data content, and the number of data-sets for each group. These five groups were used for the evaluation and validation of the questionnaire.

The obtained data-sets for the candidate, the self-appraisal, and the supervisor groups are summarized in two additional groups representing the work environment: the research environment group and the self-appraisal & supervisor group. The difference between these two groups is illustrated in Table 5.1. The research environment group contains all collected data-sets, while the self-appraisal & supervisor group shows the difference if the candidate's results, which account for almost 37% of all the collected data-sets, are not included in the work environment picture. All data are normalized to their group's total number of data-sets to allow a direct comparison.⁸

The perception of the candidate's behavior, the team members self-appraisal, and the impressions they had about their supervisors were analyzed and compared for each individual question. The task of this questionnaire was to study and analyze the behavior of a project team leader in an international scientific research laboratory. It was not the mission of this questionnaire to investigate the motivation behind these identified behaviors. The reasons for these beliefs and behaviors go above the scope of this questionnaire and should be

⁶see Section 4.3.2, page 57

⁷The final questionnaire is given in Appendix D, page 383

⁸see Section 5.1.1, page 63 to Section 5.5.17, page 233

investigated in more detail by personal interviews.

5.1 Task Focus

5.1.1 Question 01

Question 01⁹ focuses on task related leadership traits. The research environment and the self-appraisal & supervisor group show an almost identical pattern¹⁰.

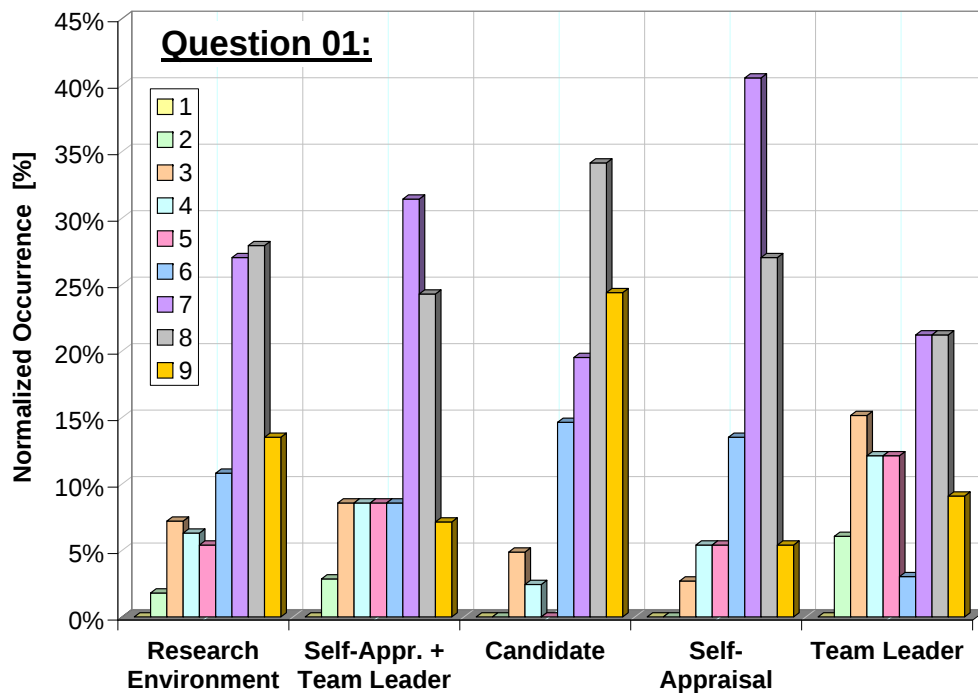


Figure 5.1: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 01: *Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).*

People working in this environment typically develop detailed work plans and schedules. They also communicate these plans effectively to their team members and peers. The candidate is seen by his team members and peers as a person who develops plans and work schedules for her-/himself and also for the group and effectively communicates these plans

⁹**Question 01:** *Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).*

¹⁰see Figure 5.1

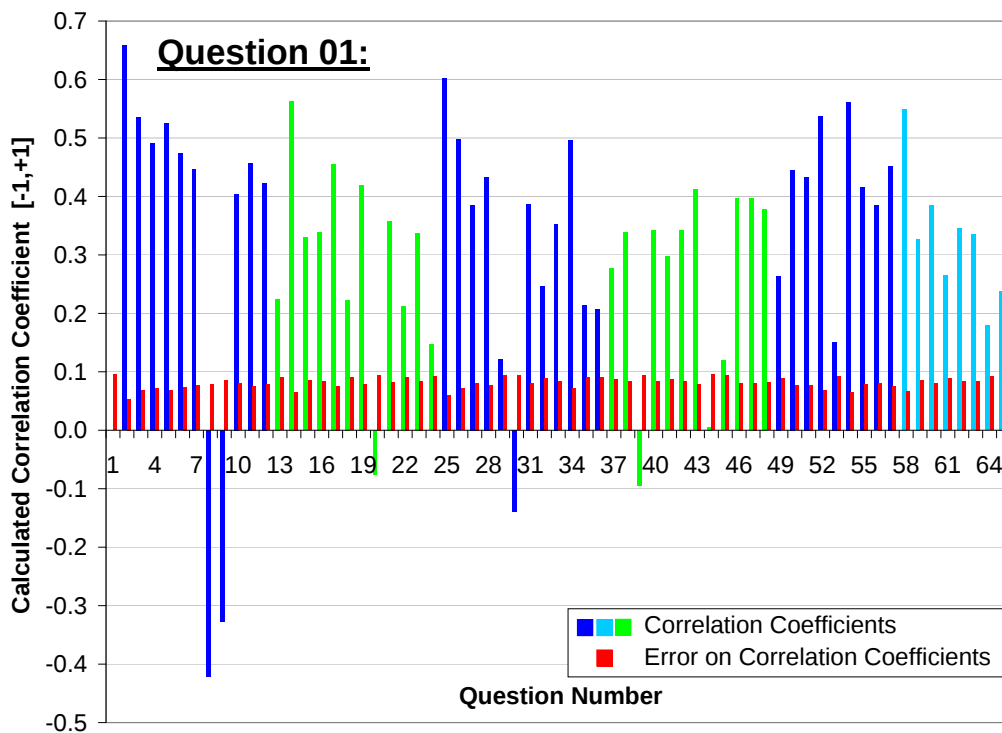


Figure 5.2: *Correlation coefficients for Question 01: Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).*

to her/his colleagues. Also the team members see themselves in the same way. On the other hand, team leaders are seen as rather less effective in telling their followers and team members what they are supposed to do. They either lack management skills — making detailed plans and schedules — or communication skills. The pattern¹¹ for the supervisor group shows two separated peaks in the occurrence distribution. One group of team members seems to be satisfied with the management and communication skills of their team leaders, while the other group — of almost the same amount of people — seems to be rather unsatisfied with their leaders in determining what each individual team member is supposed to do. A similar pattern with two distinctive peaks occurs for the candidate, but with far less (< 10%) unsatisfied people. Both, the individual supervisors and the candidate should pay special attention to these unsatisfied team members, although in the case of the candidate their number is very small compared to the supervisor group. Small groups of unsatisfied people can quickly disrupt a good team spirit and feeling of team work, especially in crisis situations. Therefore, the team leader should either

¹¹see Figure 5.1

give them stronger managerial support or improve the communication of the assigned tasks.

The calculated correlation coefficients¹² for Question 01¹³ are smaller than 0.6, except for Question 02¹⁴ and Question 25¹⁵. In the case of Question 02 a causal correlation between the explanation in the second part of Question 01 and the first part of Question 02 can explain the higher correlation coefficient compared to the rest of the questions. Therefore, Question 01 should be modified to the following formulation:

Question 01*: *Let team members know what they are supposed to do: shifts, detailed tasks, etc.*

In the case of Question 25 no correction is required because there is no causal correlation to Question 01.

5.1.2 Question 02

Question 02¹⁶ consists of two separate parts, but in the context of communicating assignments to team members these two parts become one. The leader typically makes suggestions about how to solve problems and also sets standards of performance so that the goal is reached with an optimized amount of effort and resources.

The research environment, self-appraisal & supervisor, and the self-appraisal group show¹⁷ almost identical answer occurrence patterns with a maximum at 7 (= often). The candidate group has a its maximum at 8 and no occurrence values at all from 1 to 3. This pattern emphasizes the strong task focus of the candidate. A similar pattern was obtained for the self-appraisal, but with a maximum at the lower value of 7. The candidate is seen as a person who helps the team members by making suggestions and setting clear standards more than the average supervisor or any individual team member would (or could) do. The team leader on the other hand has a striking peak at 7 (= often), but not negligible occurrence values in all the other performance categories. This pattern suggests that team

¹²see Figure 5.2

¹³**Question 01:** *Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).*

¹⁴**Question 02:** *Makes suggestions about how to solve problems and sets standards of performance for group members.*

¹⁵**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

¹⁶**Question 02:** *Makes suggestions about how to solve problems and sets standards of performance for group members.*

¹⁷see Figure 5.3

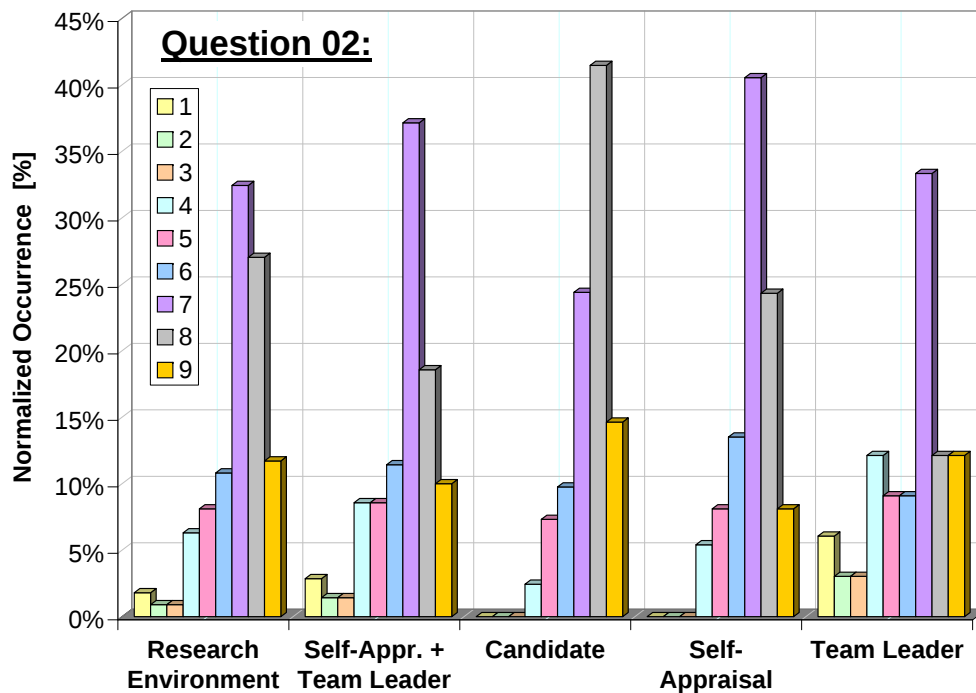


Figure 5.3: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 02: **Makes suggestions about how to solve problems and sets standards of performance for group members.**

members see themselves contributing suggestions and that they also have the feeling that their team leaders do not set clear performance standards for individual team members. Team members also feel on average that their supervisors do not contribute to problem solving as much as they do themselves.

The calculated correlation coefficients¹⁸ for Question 02¹⁹ are smaller than 0.6, except for Question 52²⁰ (0.637), and Question 54²¹ (0.684). Question 05²² (0.583), Question 25²³

¹⁸see Figure 5.4

¹⁹**Question 02:** *Makes suggestions about how to solve problems and sets standards of performance for group members.*

²⁰**Question 52:** *Develops others by explaining or demonstrating relevant skills.*

²¹**Question 54:** *Helps the team to focus on goals and objectives.*

²²**Question 05:** *Recognizes what needs to be done and takes the initiative to make it happen.*

²³**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

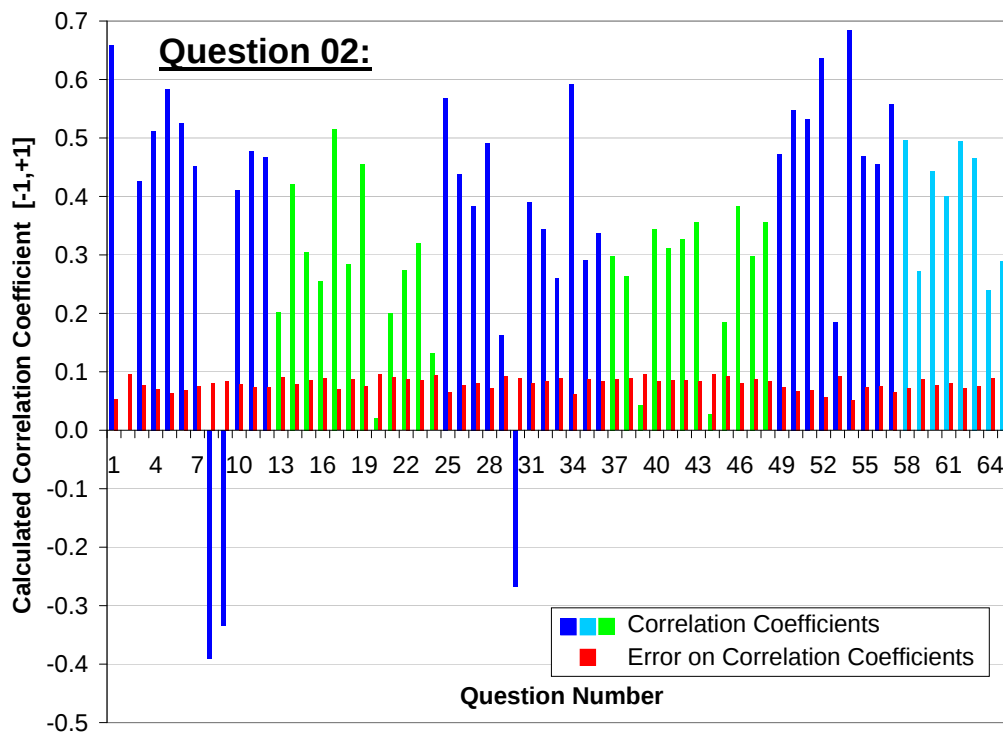


Figure 5.4: *Correlation coefficients for Question 02: Makes suggestions about how to solve problems and sets standards of performance for group members.*

(0.568), and Question 34²⁴ (0.568) have a correlation coefficient close to 0.6.

Question 54 has the highest correlation coefficient, but it has only a very weak causal connection to Question 02. All the other questions do not have any causal correlation to Question 02 and therefore do not have to be changed or deleted from the questionnaire.

²⁴**Question 34:** *Learns from own experiences and also those of others. Seeks opportunities for self-development.*

5.1.3 Question 03

Question 03²⁵ asks about the leaders attitude and capability of accomplishing a task on time. The research environment and self-appraisal & supervisor group have their maximum occurrence value²⁶ around 6 and 7 (= Often), but with a broad tail towards lower values.

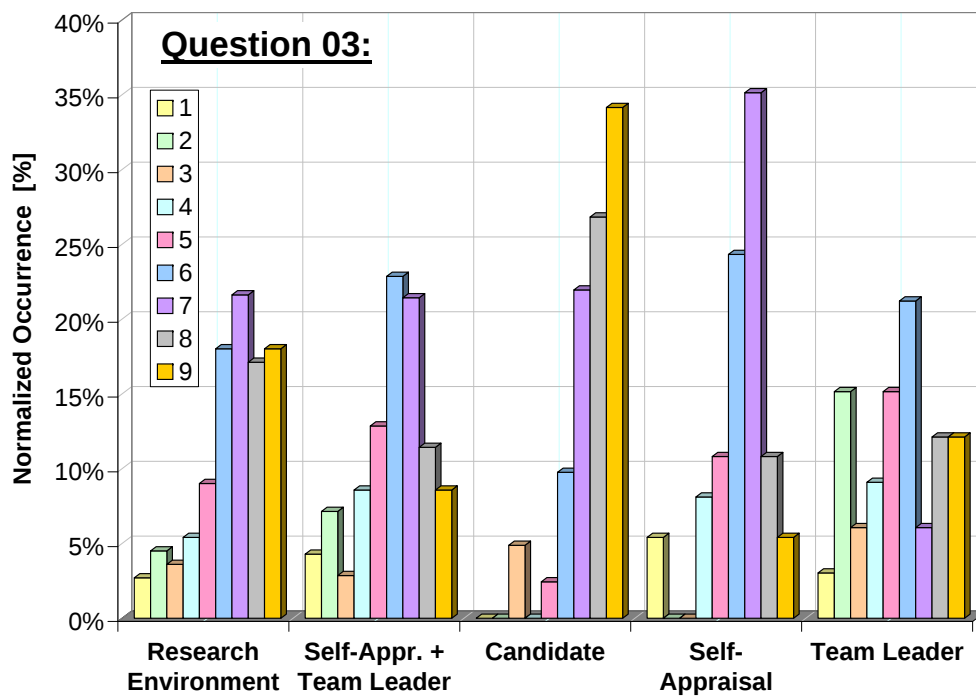


Figure 5.5: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 03: *Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.*

The candidate shows a very strong peak at 9 (= Always) and only one single peak at 3 (= Occasionally) with an amplitude below 5%. This single peak might result from a group or project where the goal was either not reached or the motivation within the group was very low. The same singular peak is observed for the self-appraisal group for an occurrence value of 1 (= Never), which confirms that there has been a project where the

²⁵**Question 03:** *Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.*

²⁶see Figure 5.5

motivation or the resources to finish this project at all or on time have been low. This result does not disturb the overall picture, since both values are lower than 5%. On the other hand, the supervisor group shows three almost equal peaks (2, 6, and 8/9) distributed over the whole spectrum. This pattern indicates that in the investigated research environment about 30% of the team leaders have a very low motivation to accomplish goals in time.

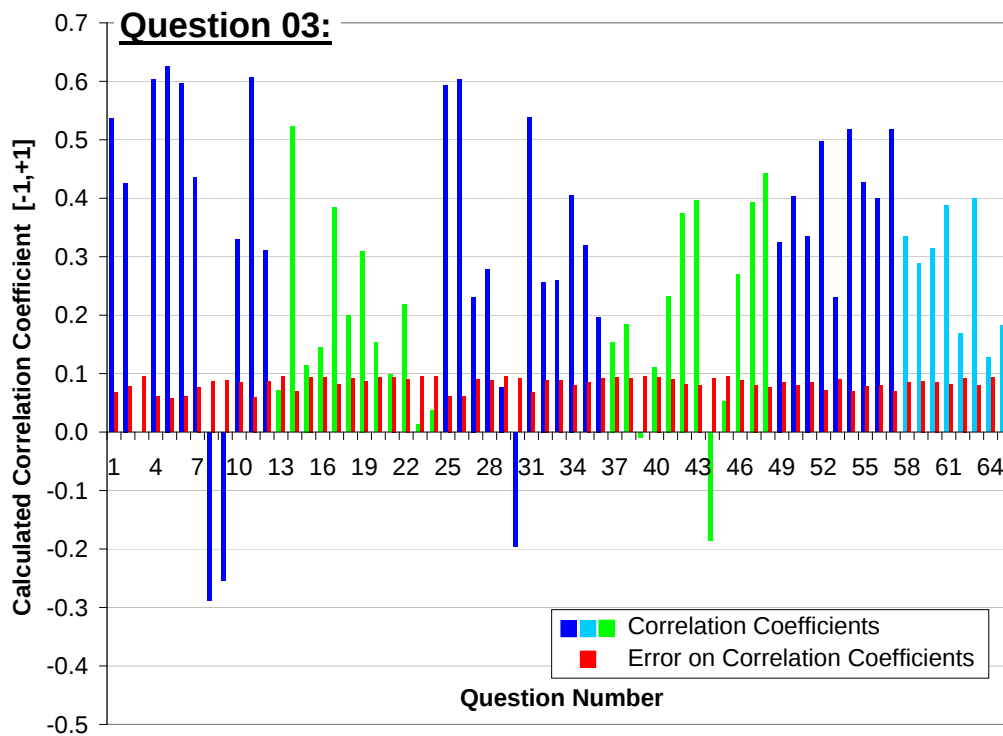


Figure 5.6: *Correlation coefficients for Question 03: Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.*

The calculated correlation coefficients²⁷ for Question 03²⁸ are smaller than 0.6, except for

²⁷see Figure 5.6

²⁸**Question 03:** *Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.*

Question 04²⁹ (0.603), Question 05³⁰ (0.627), Question 11³¹ (0.607), and Question 26³² (0.603). Question 06³³ (0.5967) and Question 25³⁴ (0.593) have a correlation coefficient close to 0.6.

In the case of Question 11 a causal correlation between the the second part of Question 11 and the content of Question 03 explains the higher correlation coefficient compared to the rest of the questions. Therefore, Question 11 should be modified to the following formulation:

Question 11*: *Is good at making things work.*

In the case of Question 04, 05, 06, 25, and 26 no modification is required because there is no causal correlation or content overlap with Question 03.

²⁹**Question 04:** *Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.*

³⁰**Question 05:** *Recognizes what needs to be done and takes the initiative to make it happen.*

³¹**Question 11:** *Is good at making things work and completing the assigned tasks.*

³²**Question 26:** *Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.*

³³**Question 06:** *Prioritizes key objectives and focuses the groups activity on them.*

³⁴**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

5.1.4 Question 04

Question 04³⁵ asks about the leaders management skills and task focus. The research environment and self-appraisal & supervisor group have a similar pattern with maximum occurrence values around 6 and 7 (= Often), which is characteristic of an engineering and physics research environment.³⁶ Both patterns have the same spread around the maximum value and a tail (< 5%) towards lower values (Never, Seldom). The candidate pattern has two striking peaks at 6 and 8/9 with small peaks (< 3%) up to a performance value of 5 (= Occasionally). The maximum value at 9 (= Always) which almost outreaches all the other maxima in the other categories is remarkable. The team members see the candidate as an excellent manager with very strong task related skills.

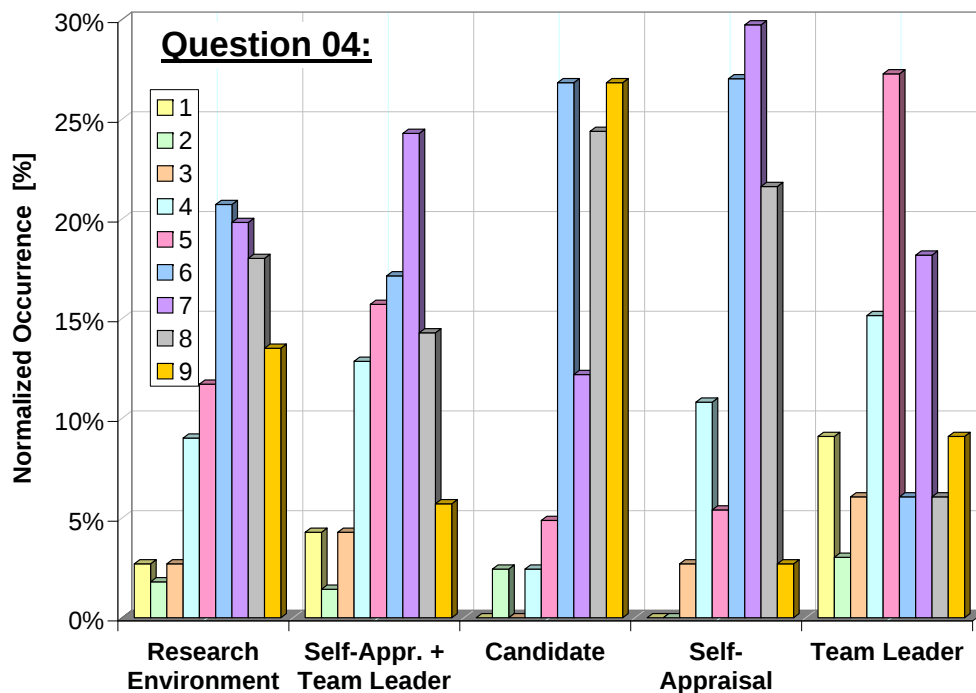


Figure 5.7: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 04: *Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.*

³⁵Question 04: Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.

³⁶see Figure 5.7

The team members believe that they “Often” (= 7) ensure that complicated projects are broken into small tasks and that they accounted for every detail. The supervisor pattern shows several peaks with varying amplitude over the whole spectrum. It has to be mentioned that more than 15% of the team members believe that their team leader “Never/Seldom” ensures that complicated projects are broken into manageable tasks and that they do not account for every detail. The maximum occurrence value for the supervisor group is around 5 (= Occasionally), which is even below the research environment maximum.

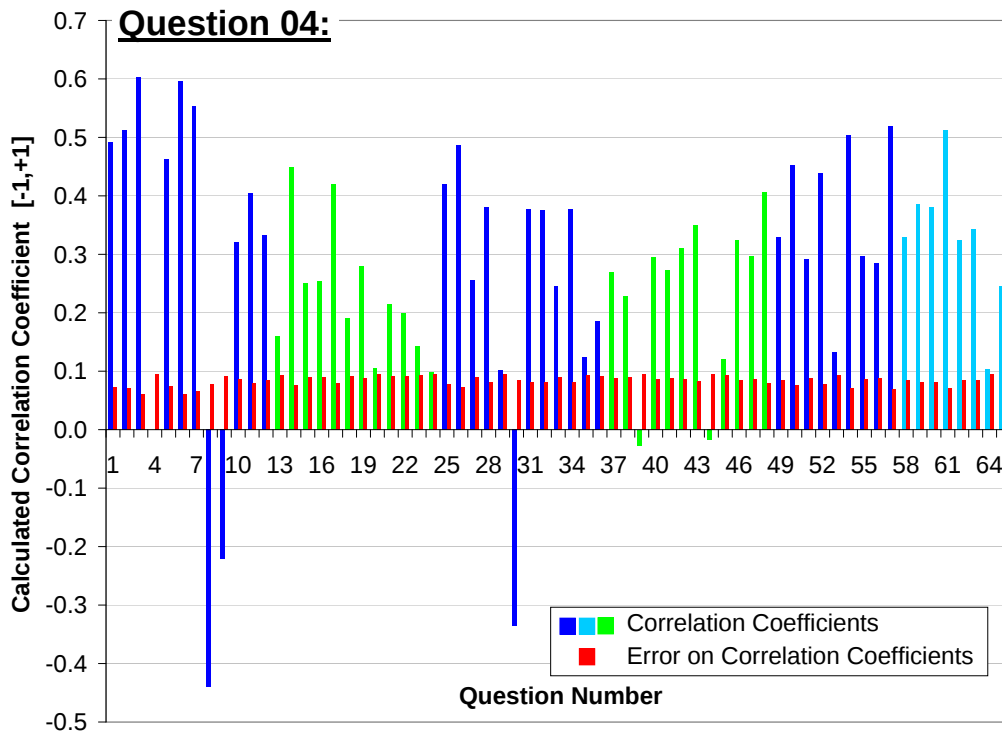


Figure 5.8: *Correlation coefficients for Question 04: Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.*

The calculated correlation coefficients³⁷ for Question 04³⁸ are smaller than 0.6, except for

³⁷see Figure 5.8

³⁸**Question 04:** *Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.*

Question 03³⁹ (0.603). Question 06⁴⁰ (0.597) and Question 07⁴¹ (0.553) have a correlation coefficient close to 0.6. None of these questions requires any modification because there is no causal correlation to Question 04.

5.1.5 Question 05

Question 05⁴² asks about a team leaders capability to recognize the technical requirements and about her/his initiative to solve those task issues.

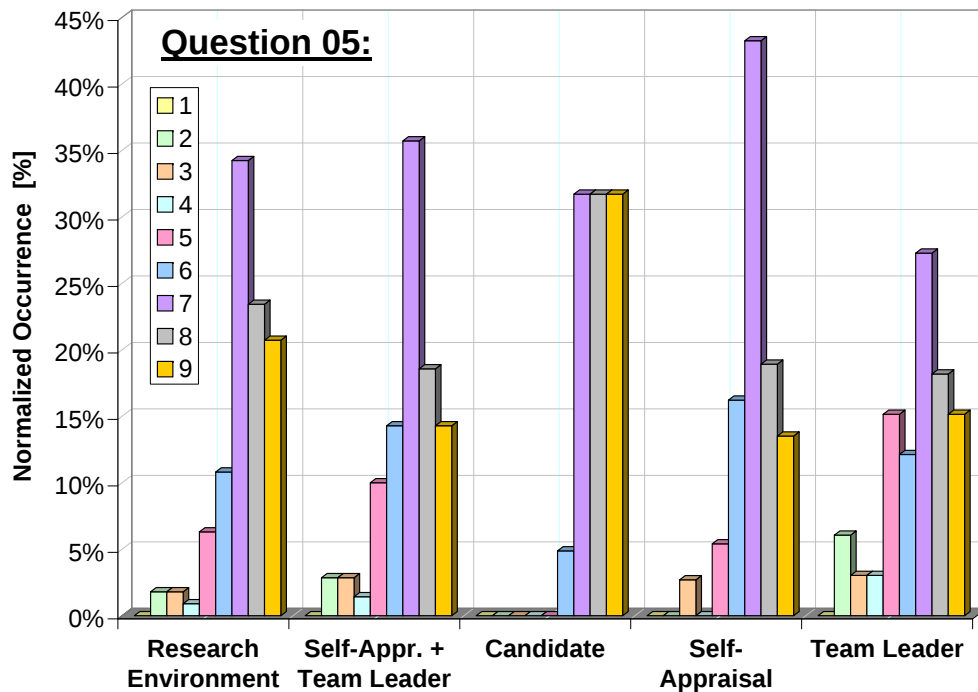


Figure 5.9: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 05: *Recognizes what needs to be done and takes the initiative to make it happen.*

The research environment, self-appraisal & supervisor, and self-appraisal groups show

³⁹**Question 03:** Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.

⁴⁰**Question 06:** Prioritizes key objectives and focuses the groups activity on them.

⁴¹**Question 07:** Effectively allocates available resources, e.g., time, people, money.

⁴²**Question 05:** Recognizes what needs to be done and takes the initiative to make it happen.

almost identical patterns⁴³ with a maximum value at 7 (= Often) and same spread around the maximum value. The tail (< 3%) towards lower values (Never, Seldom) results only from the supervisor group. This pattern indicates that the mentioned groups know about the technical requirements within their teams but not all of the participants take the initiative to make task related changes happen. In particular, the low values for the supervisor group indicate that team members believe that either their supervisors are not capable of recognizing needs within their team or that they don't take the initiative to make changes happen.

The candidate shows a very distinctive pattern with identical peaks for 7/8/9 (Often, Always) and an occurrence value of 31.7%. The candidate knows exactly what needs to be done and also (often or even always) takes the initiative to make it happen. None of the participants believe that the candidate would wait for things to change after she/he recognized that this is needed in order to proceed with the project.

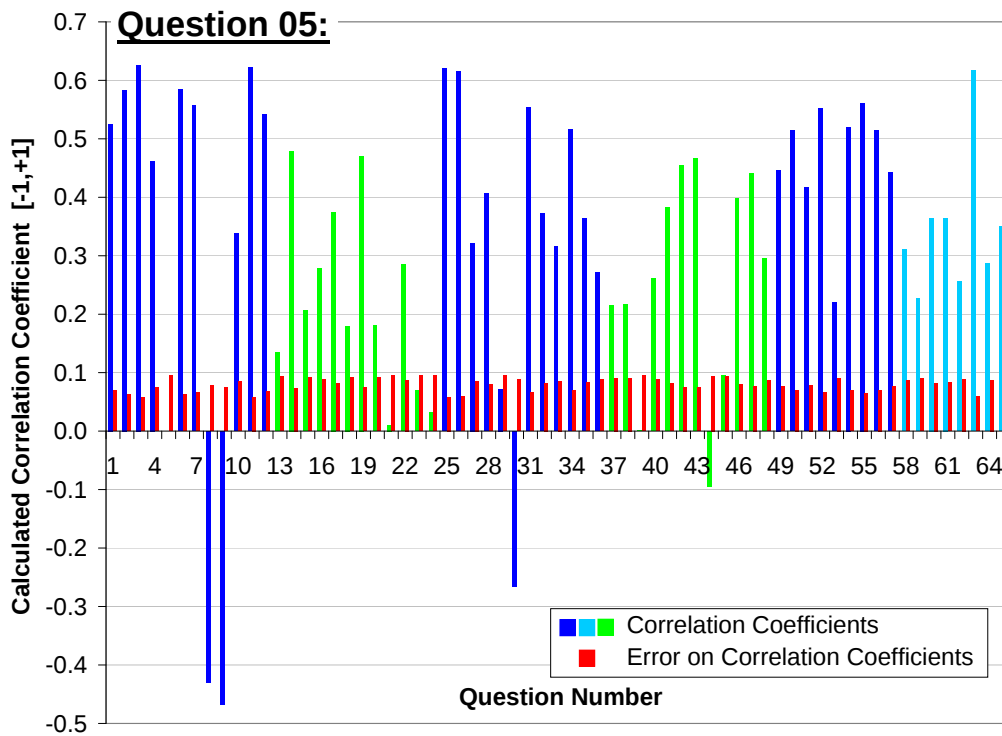


Figure 5.10: *Correlation coefficients for Question 05: Recognizes what needs to be done and takes the initiative to make it happen.*

⁴³see Figure 5.9

The calculated correlation coefficients⁴⁴ for Question 05⁴⁵ are smaller than 0.6, except for Question 03⁴⁶ (0.627), Question 11⁴⁷ (0.622), Question 25⁴⁸ (0.621), Question 26⁴⁹ (0.616), and Question 63⁵⁰ (0.617). Question 02⁵¹ (0.583) and Question 06⁵² (0.584) have a correlation coefficient close to 0.6.

Question 02, 03, 06, and 11 have a weak causal connection to Question 05, which is indicated by the slightly higher correlation coefficients compared to the rest of the questions. Judging from the content of Question 05 compared to the aforementioned questions, no modification or reformulation is required. Similarly, no modification is required for Question 25, 26, and 63, because there is no causal correlation at all to Question 05.

⁴⁴see Figure 5.10

⁴⁵**Question 05:** *Recognizes what needs to be done and takes the initiative to make it happen.*

⁴⁶**Question 03:** *Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.*

⁴⁷**Question 11:** *Is good at making things work and completing the assigned tasks.*

⁴⁸**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

⁴⁹**Question 26:** *Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.*

⁵⁰**Question 63:** *Deals with issues in a straightforward manner.*

⁵¹**Question 02:** *Makes suggestions about how to solve problems and sets standards of performance for group members.*

⁵²**Question 06:** *Prioritizes key objectives and focuses the groups activity on them.*

5.1.6 Question 06

Question 06⁵³ asks about the team leader's capabilities to set priorities and focus the groups activities on them.

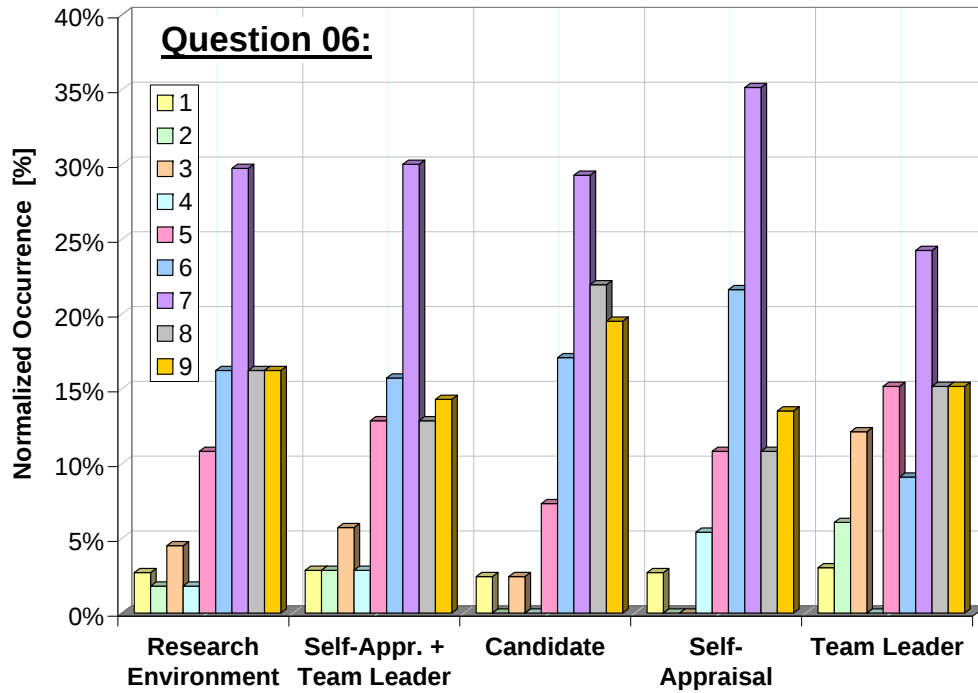


Figure 5.11: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 06: *Prioritizes key objectives and focuses the groups activity on them.*

All groups under investigation⁵⁴ have their peak values⁵⁵ at 7 (= Often). Also the spread around the peak value is similar for all peaks, except for the supervisor group, which has a broader spread even down to low values (Seldom/Never). The candidate has almost 5% higher occurrence values for 8/9 (= Always) than the self-appraisal & supervisor or research environment groups, indicating a strong capability to prioritize key objectives and focus the groups activity on them. The supervisor, on the other hand, also has rather high peaks (~ 8%) at low values (Never/Seldom). Team members believe that their supervisors are not as capable as they see themselves in prioritizing key objectives.

⁵³ **Question 06:** *Prioritizes key objectives and focuses the groups activity on them.*

⁵⁴ Research Environment, Self-Appraisal & Supervisor, Candidate, Self-Appraisal, and Supervisor

⁵⁵ see Figure 5.11

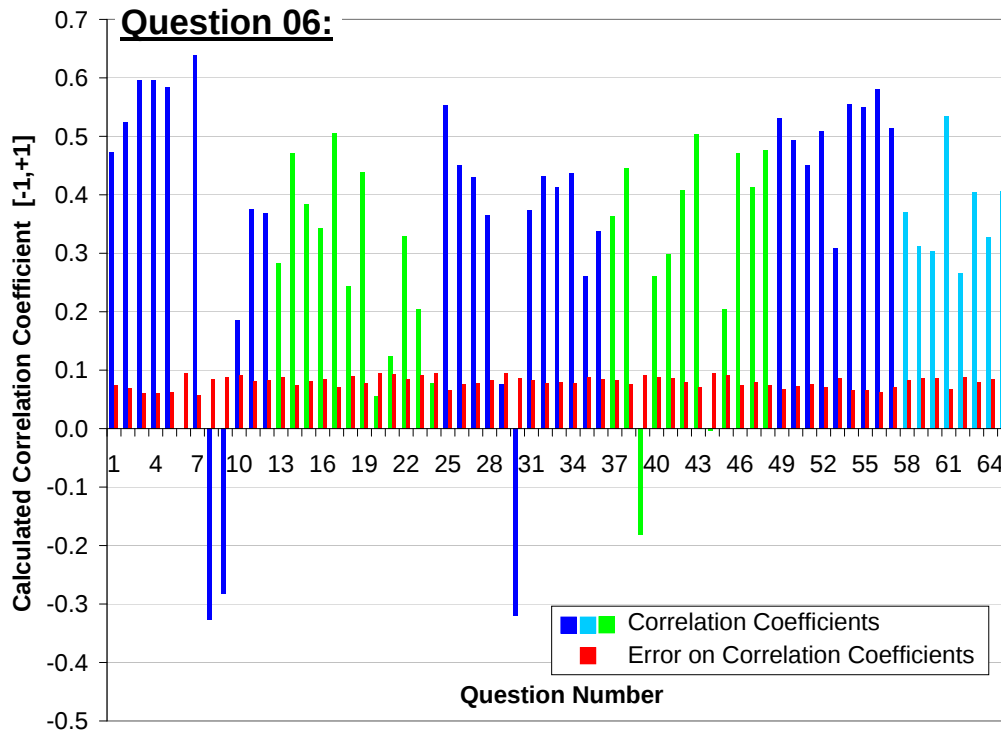


Figure 5.12: *Correlation coefficients for Question 06: Prioritizes key objectives and focuses the groups activity on them.*

The calculated correlation coefficients⁵⁶ for Question 06⁵⁷ are smaller than 0.6, except for Question 07⁵⁸ (0.639). Question 03⁵⁹ (0.597), Question 04⁶⁰ (0.597), Question 05⁶¹ (0.584), Question 56⁶² (0.581), have a correlation coefficient close to 0.6.

There is a causal correlation between the content of Question 06 and the content of Question 07 that explains the higher correlation coefficient compared to the rest of the questions. Question 06 describes the leaders skills to select the most important tasks

⁵⁶see Figure 5.12

⁵⁷**Question 06:** *Prioritizes key objectives and focuses the groups activity on them.*

⁵⁸**Question 07:** *Effectively allocates available resources, e.g., time, people, money.*

⁵⁹**Question 03:** *Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.*

⁶⁰**Question 04:** *Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.*

⁶¹**Question 05:** *Recognizes what needs to be done and takes the initiative to make it happen.*

⁶²**Question 56:** *Identifies causes of resistance and finds ways to overcome them.*

within a project and to make team members aware that those tasks have to be prioritized. Question 07, on the other hand, asks about the skills to allocate the right amount of — sometimes scarce — available resources (time, people, money, etc.) within a project. Since both questions describe different but related issues, the questions will not be merged into one question. The correlation coefficient (0.639) is also just slightly higher than 0.6 indicating only a weak correlation. Therefore, both questions will remain in the questionnaire as they are.

In the case of Question 03, 04, and 05 no modification is required because the causal correlation to Question 06 is very weak. Question 56 also requires no modification, because there is no content overlap with Question 06.

5.1.7 Question 07

Question 07⁶³ asks for the team leader's managerial skills to effectively allocate available resources within a project.

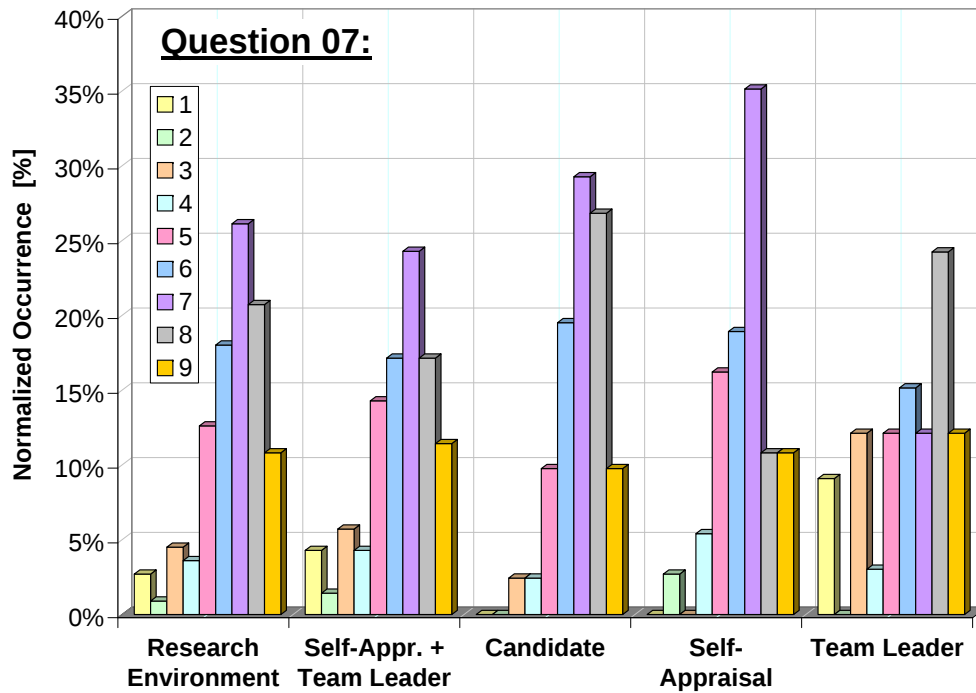


Figure 5.13: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 07: *Effectively allocates available resources, e.g., time, people, money.*

The research environment, self-appraisal & supervisor, candidate, and self-appraisal groups have their peak value⁶⁴ at 7 (= Often), while the supervisor group has its peak at 8 (= Often/Always). However, the distribution of the occurrence values around these peaks varies considerably. The research environment and self-appraisal & supervisor groups show gaussian shaped distributions with a tail (below 6%) towards lower values (Never/Seldom). The candidate has no occurrence values at 1/2 (= Never) and only small peaks (< 2.5%) at 3 and 4 (Seldom/Occasionally). The peak for the candidate at 7 is supported by a second peak of almost the same magnitude at 8 (Often/Always). The peaks at 9 (= Always) have the same height (~ 10%) for all groups. These patterns indicate

⁶³Question 07: *Effectively allocates available resources, e.g., time, people, money.*

⁶⁴see Figure 5.13

that resources are effectively allocated by almost all team members and team leaders in the whole research environment. About 20% of the participants believe that their team leaders (excluding the candidate) never or seldom allocates resources effectively. This behavior should be investigated in more detail to avoid budgets being misplaced or even wasted.

The calculated correlation coefficients⁶⁵ for Question 07⁶⁶ are smaller than 0.6, except for Question 06⁶⁷ (0.639). This fact was already discussed in the previous section.⁶⁸

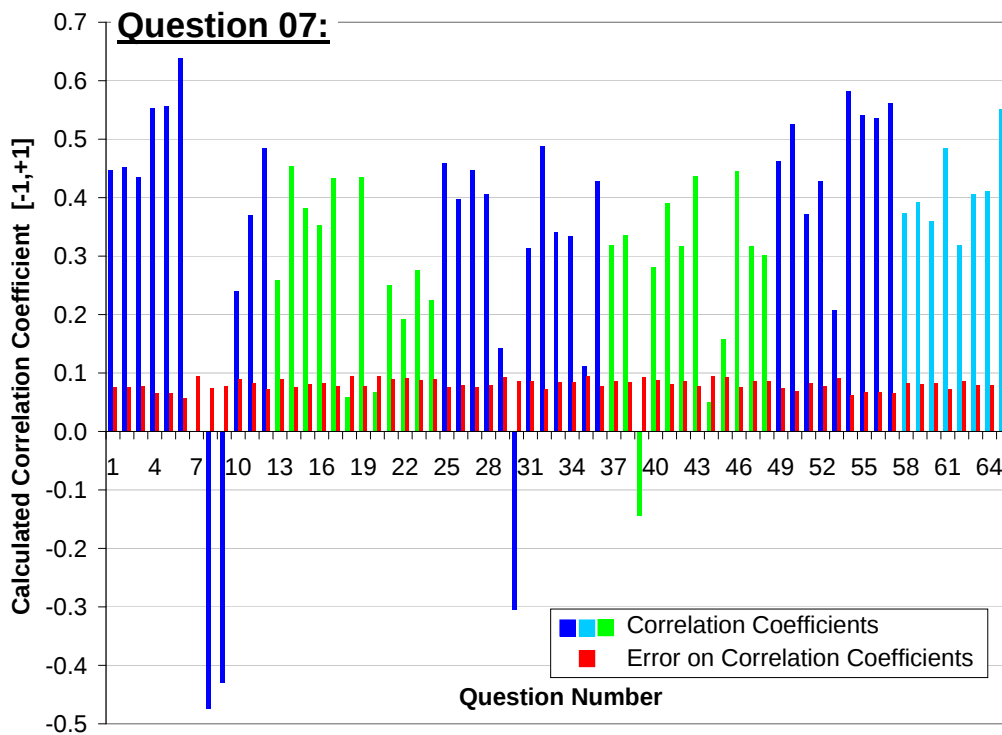


Figure 5.14: Correlation coefficients for Question 07: *Effectively allocates available resources, e.g., time, people, money.*

Question 54⁶⁹ (0.583) has a correlation coefficient close to 0.6, but it requires no modification because there is no causal correlation to Question 07. Question 54 emphasizes the

⁶⁵see Figure 5.14

⁶⁶**Question 07:** *Effectively allocates available resources, e.g., time, people, money.*

⁶⁷**Question 06:** *Prioritizes key objectives and focuses the groups activity on them.*

⁶⁸see Section 5.1.6, page 76

⁶⁹**Question 54:** *Helps the team to focus on goals and objectives.*

leaders willingness to personally help team members to focus on their goals. Question 07 on the other hand describes how the technical assets are allocated effectively. Therefore, no causal correlation is apparent between both questions.

5.1.8 Question 08

Question 08⁷⁰ investigates a serious and very common phenomenon in many research laboratories: giving vague or misleading explanations to team members. This phenomenon occurs for several reasons, which are not being investigated within the scope of this questionnaire. Only the occurrence of this phenomenon in various groups is being captured by the content of Question 08.

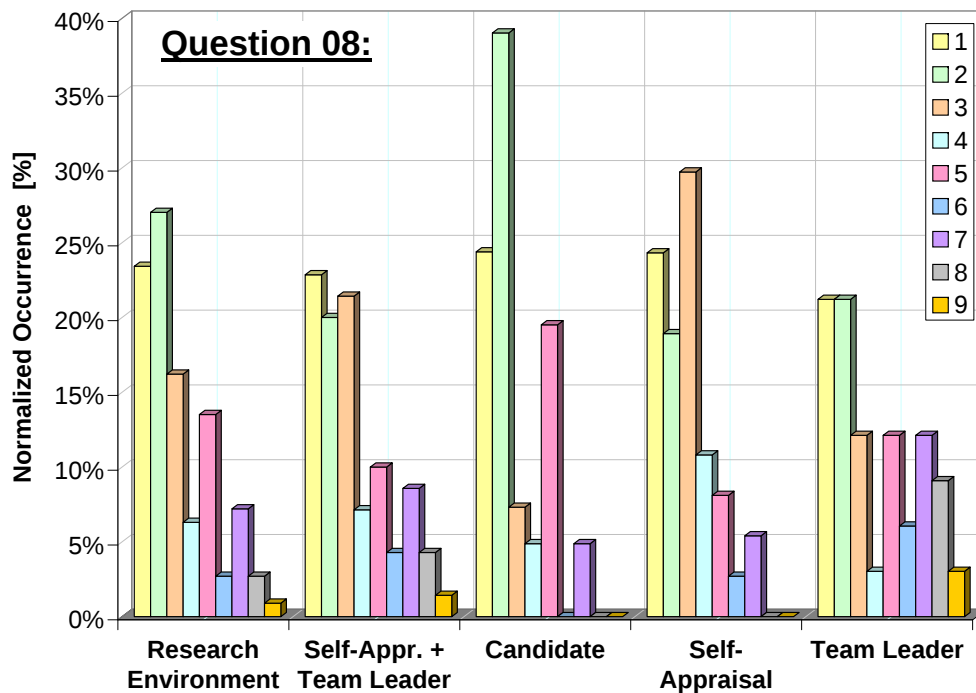


Figure 5.15: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 08: *Gives vague or misleading explanations to team members.*

The formulation of Question 08 and the “reverse” order of the occurrence values (“Never” = positive, “Always” = negative) allows to test the concentration of the participants

⁷⁰Question 08: Gives vague or misleading explanations to team members.

when they were answering the questionnaire. The obtained pattern⁷¹ with no values 8 or 9 (= Always) for (almost) all groups indicates a high level of participant concentration during the filling in of the questionnaire. The one person who judged her/his team leader with 9 (= Always) must have done it knowingly.

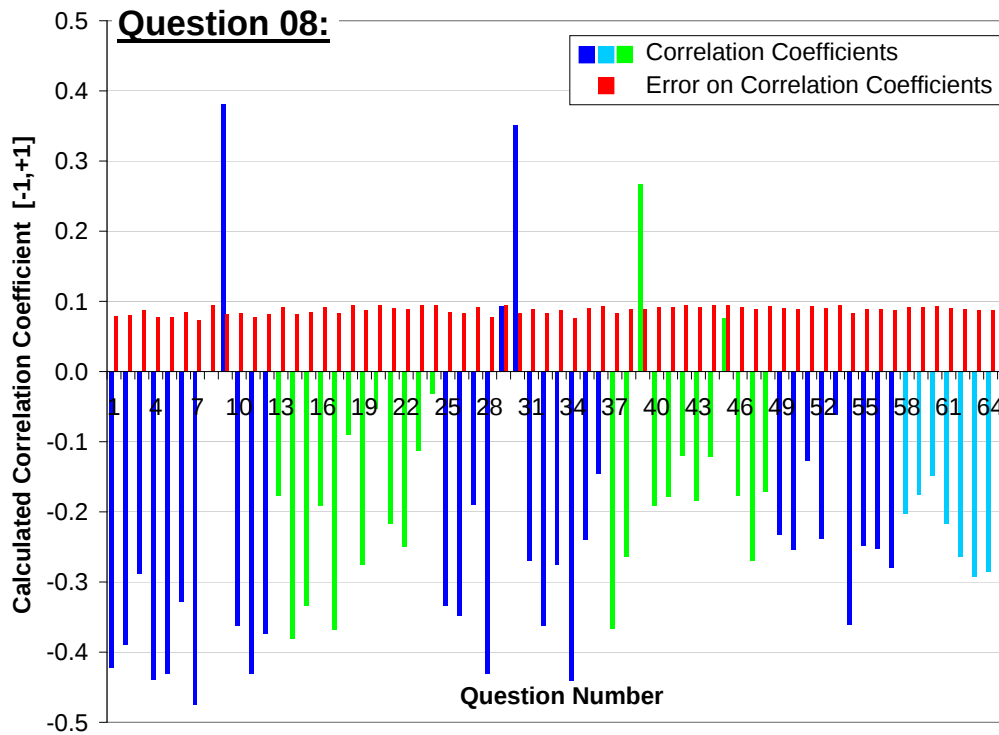


Figure 5.16: Correlation coefficients for Question 08: *Gives vague or misleading explanations to team members.*

Almost 25% of the participants believe that their supervisors (the candidate excluded) gives Often/Always vague or misleading explanations to team members. This either means that the supervisor is not capable of dealing with her/his task or lack of communication skills or the team members are not skilled enough to understand either their field or the team leader's explanations. Either way, the reason for this fact should be investigated in more detail, because it can cause conflicts, frustration, or lack of trust within the individual teams. Also 5% of the participants stated that they would give "Often" vague or misleading explanations by themselves to their team members, which should also be investigated in more detail.

⁷¹see Figure 5.15

The candidate, on the other hand, was seen by 70% of the participants as “Never/Seldom” giving vague or misleading explanations. Furthermore, 25% stated that the candidate would “Occasionally” give vague or misleading explanations.

The calculated correlation coefficients⁷² for Question 08⁷³ are within the interval $[-0.5, +0.5]$. Therefore, no causal correlation at all exists between Question 08 and any other question within the questionnaire.

⁷²see Figure 5.16

⁷³**Question 08:** *Gives vague or misleading explanations to team members.*

5.1.9 Question 09

Question 09⁷⁴ also investigates a serious and very common phenomenon in many research laboratories: making no suggestions because of having no clue at all. This phenomenon occurs for several reasons, which might seem to be very obvious for some readers, but those reasons are not being investigated within the scope of this questionnaire. Only the occurrence of this phenomenon in various groups is being captured by the content of Question 09.

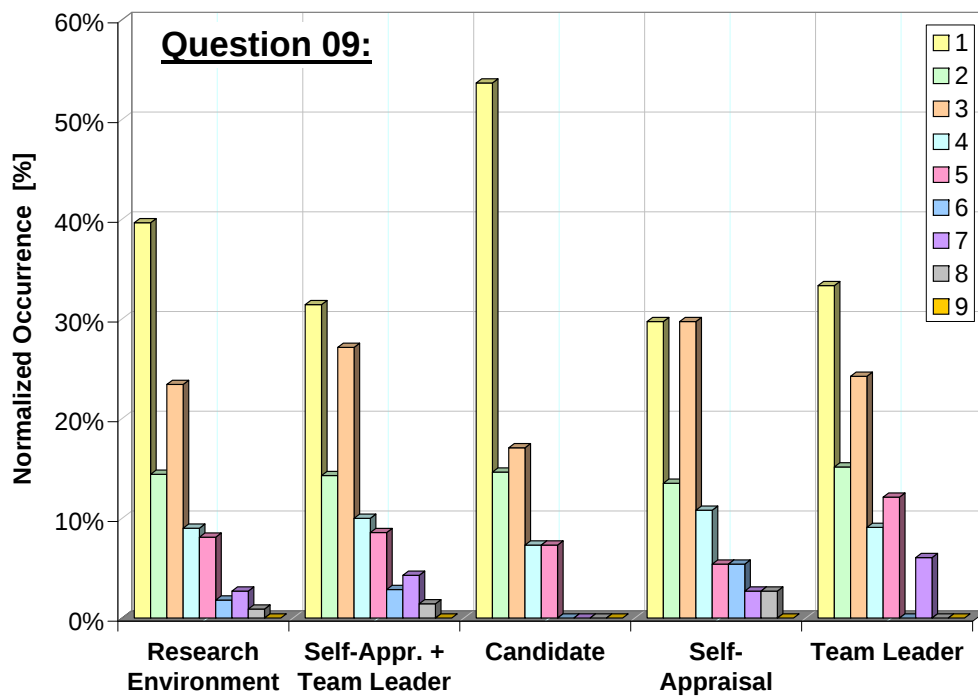


Figure 5.17: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 09: *Makes NO suggestions (because she/he has no clue at all).*

The formulation of Question 09 and the “reverse” order of the occurrence values (“Never” = positive, “Always” = negative) test again the concentration of the participants while they were answering the questionnaire. The obtained pattern⁷⁵ with no 9 (= Always) values for all groups indicates a high level of participant concentration during the filling in of the questionnaire.

⁷⁴**Question 09:** *Makes NO suggestions (because she/he has no clue at all).*

⁷⁵see Figure 5.17

All groups show almost identical pattern⁷⁶ with two distinctive peaks at 1 (= Never) and 3 (= Seldom) and a small tail (< 10%) towards higher values (Often/Always). Only the candidate shows a different picture. A 22% higher peak for 1 (= Never) compared to the self-appraisal & supervisor group and no occurrence values above 5 (= Occasionally). This means that the participants believe that the candidate either makes no suggestions when she/he is not an expert in the field or that she/he has a very broad theoretical & practical background and is capable of contributing to many/all fields within her/his work-field.

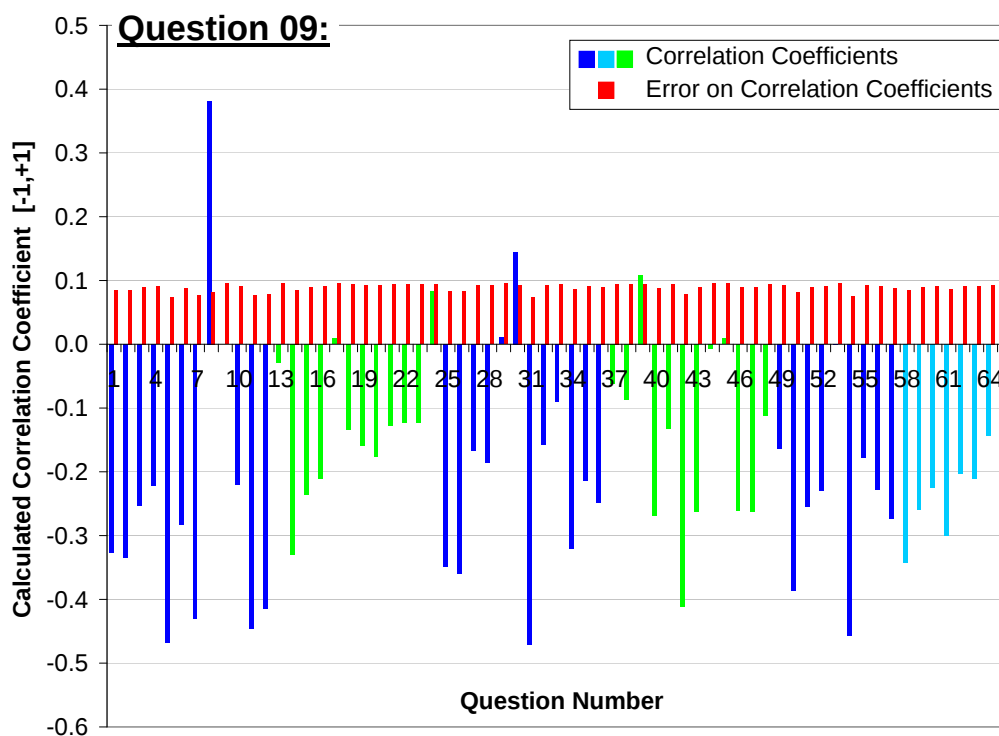


Figure 5.18: *Correlation coefficients for Question 09: Makes NO suggestions (because she/he has no clue at all).*

Almost 20% of the participants believe that their supervisor “Occasionally/Often/Always” has no clue or does not make any suggestions and more than 16% of the team members (self-appraisal) believe that this fact applies to themselves. It is very unlikely, that almost 20% of a research team has no clue at all. Thus, this fact can either be explained for scientific research environments by a so-called “learning-curve effect”, where the whole team has to learn about the project while it is carried out.

⁷⁶see Figure 5.17

The calculated correlation coefficients⁷⁷ for Question 09⁷⁸ are within the interval $[-0.5, +0.5]$. Therefore, no causal correlation at all exists between Question 09 and any other question within the questionnaire.

5.1.10 Question 10

Question 10⁷⁹ asks for the team leader's attitude about getting into the details of how things work. This fact is essential for any project within a scientific research environment, because these projects are very strongly task related and technically sophisticated.

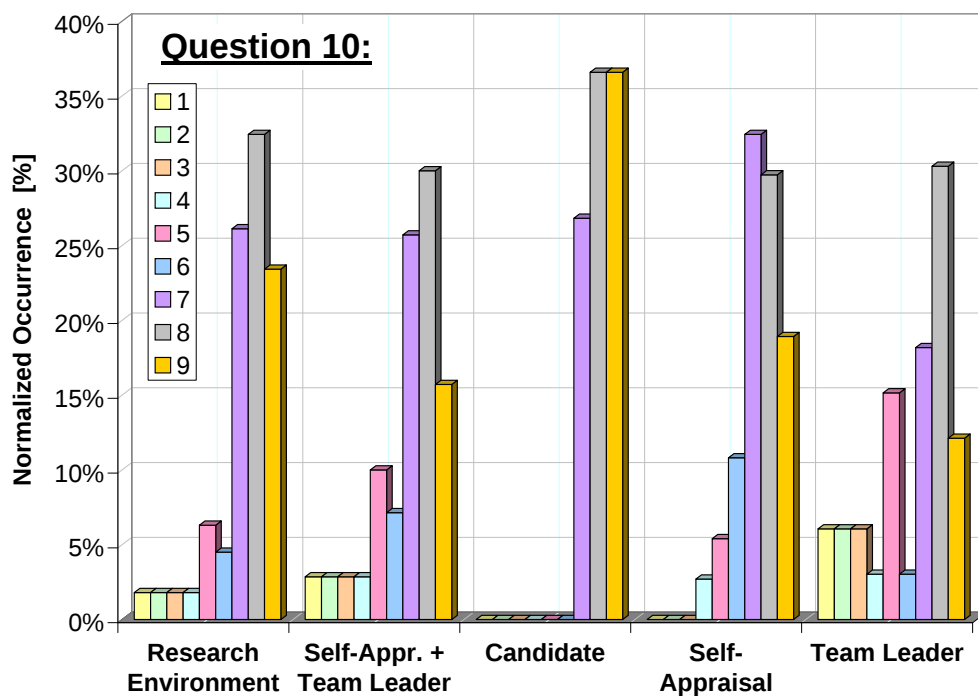


Figure 5.19: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 10: *Enjoys getting into the details of how things work.*

⁷⁷see Figure 5.18

⁷⁸**Question 09:** *Makes NO suggestions (because she/he has no clue at all).*

⁷⁹**Question 10:** *Enjoys getting into the details of how things work.*

The obtained occurrence distributions⁸⁰ show a similar pattern for all groups, except for the supervisor: narrow peaks around “Often/Always”. However the candidate is again an exception from this pattern in the sense that her/his occurrence pattern has only values between “Often/Always” and no values at all in the other categories.

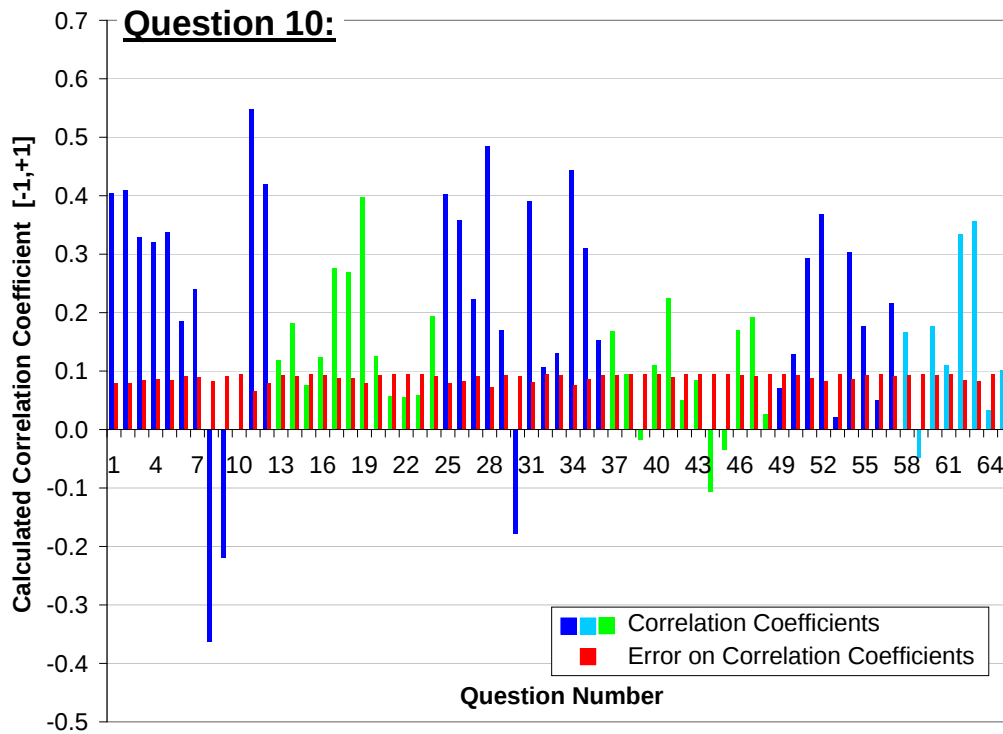


Figure 5.20: *Correlation coefficients for Question 10: Enjoys getting into the details of how things work.*

These pattern mean that all participants believe that the candidate really enjoys to get into details and wants to know how things work. This should make her/him an ideal candidate for working in scientific research projects at the “front-line” management level, where she/he is directly involved with building, implementing, or running tasks. Also as a technical advisor for a project leader in big or huge projects where the leader has to focus on delegation and relationships within the team, her/his strong task focus would be very useful to supply the project leader with the necessary task related information. This fact also explains the low values (Never/Seldom) for the team leader. In large scientific projects the project leader cannot focus on technical details. Delegation or collaboration and assuring good relationships within the team are the main tasks about such a team

⁸⁰see Figure 5.19

leader. But a basic trust in her/his technological capabilities should still remain. This fact is nicely represented by the distribution for the supervisor in Figure 5.19. The team members (self-appraisal) believe that they have the necessary interest to get into the details of how things work, which is very relevant for a scientific research environment.

The calculated correlation coefficients⁸¹ for Question 10⁸² are within the interval $[-0.5, +0.5]$, except for Question 11⁸³ (0.549), which is still below 0.6. This slightly higher value can be explained by the similarity of both questions. Question 10 asks about the leaders skills to understand the assigned tasks and projects down to every single detail, while Question 11 focuses on the technical skills of making things work and completing the assigned tasks. Therefore, no causal correlation exists between Question 10 and any other question within the questionnaire.

5.1.11 Question 11

Question 11⁸⁴ asks about basic team leader traits to make things work and to complete assigned tasks, which are essential in scientific research projects.

The obtained occurrence distributions⁸⁵ show a similar pattern for all groups with a peak maximum for category 8 (= above Often), except for the candidate, which has its distinctive maximum at category 9 (= Always). Another interesting fact is that the candidate has no occurrence values at all in the categories 1 to 6 (= “Never” to “Often”). This means that the participants believe that the candidate is very good at making things work and completing the assigned tasks and that she/he almost never fails in this aspect. Also the self-appraisal group shows that the participants have a strong self-confidence in their capabilities of completing the assigned tasks. But the participants believe that their team leaders have a lower capability to complete tasks or make things work.

The calculated correlation coefficients⁸⁶ for Question 11⁸⁷ are smaller than 0.6, except for

⁸¹see Figure 5.20

⁸²**Question 10:** *Enjoys getting into the details of how things work.*

⁸³**Question 11:** *Is good at making things work and completing the assigned tasks.*

⁸⁴**Question 11:** *Is good at making things work and completing the assigned tasks.*

⁸⁵see Figure 5.21

⁸⁶see Figure 5.22

⁸⁷**Question 11:** *Is good at making things work and completing the assigned tasks.*

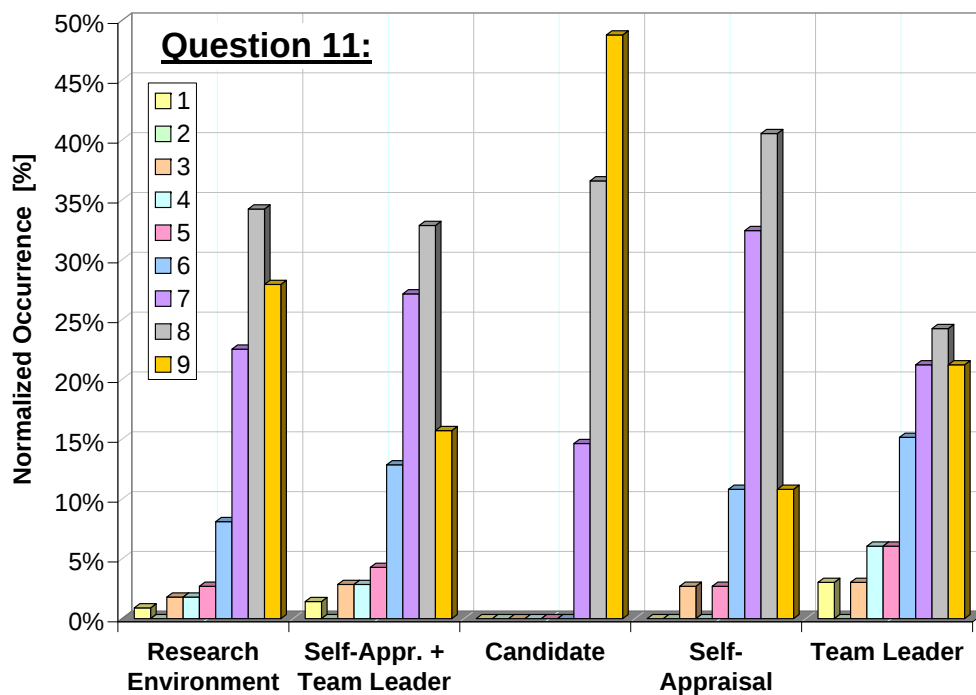


Figure 5.21: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 11: *Is good at making things work and completing the assigned tasks.*

Question 03⁸⁸ (0.607), Question 05⁸⁹ (0.622), Question 26⁹⁰ (0.687), and Question 31⁹¹ (0.611). Question 25⁹² (0.593) has a correlation coefficient close to 0.6.

There is a high correlation coefficient (0.687) between Question 11 and Question 26, although there is no causal correlation between both questions. This high correlation coefficient can be explained by the underlying leadership traits and their effects within project management. Question 11 focuses on the technical skills of making things work and completing the assigned tasks, while Question 26 concentrates on leading by example

⁸⁸**Question 03:** *Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.*

⁸⁹**Question 05:** *Recognizes what needs to be done and takes the initiative to make it happen.*

⁹⁰**Question 26:** *Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.*

⁹¹**Question 31:** *Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.*

⁹²**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

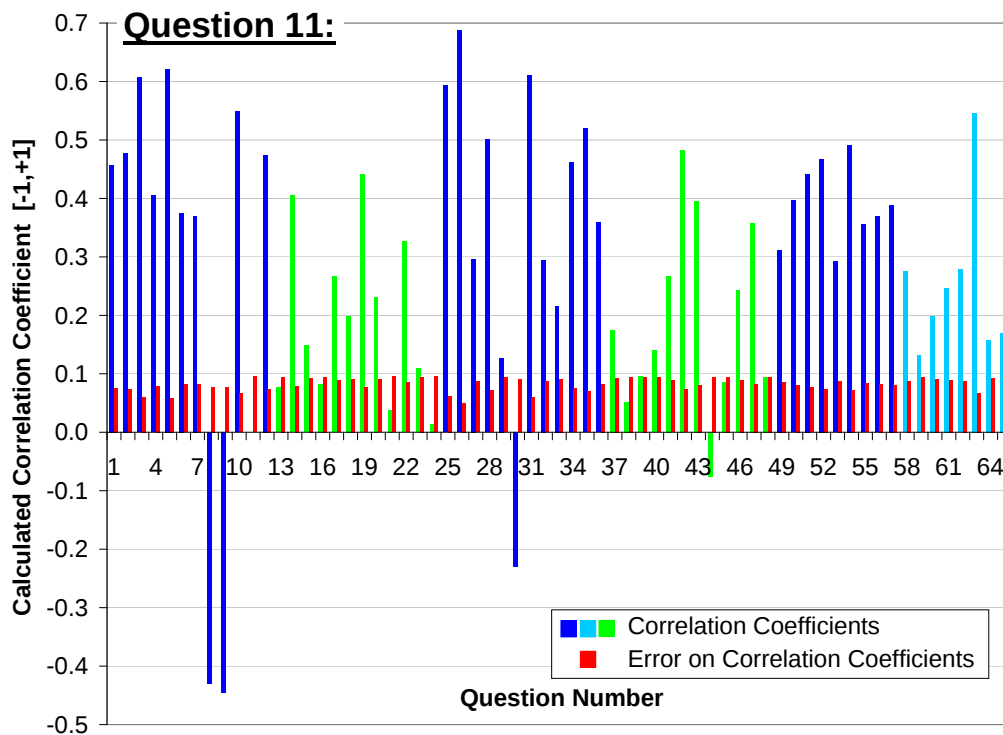


Figure 5.22: *Correlation coefficients for Question 11: Is good at making things work and completing the assigned tasks.*

and the effect that the team leader is working at least as hard as anyone else within the team. The outcome is in both cases the same: goals are being accomplished. In the case of Question 11 the task focus is cause for this result, while in the case of Question 26 the hard working leader achieves the objectives. Therefore, no modification is required because there is no causal correlation between these questions.

Question 03, 05, 25, and 31 require also no modification because there is no causal correlation to Question 11.

5.1.12 Question 12

Question 12⁹³ asks for the team leader's knowledge and understanding of how to do basic things. These traits can be very useful for any level of management, because it improves the trust of team members in their leader and also facilitates the communication between the leader and the team members.

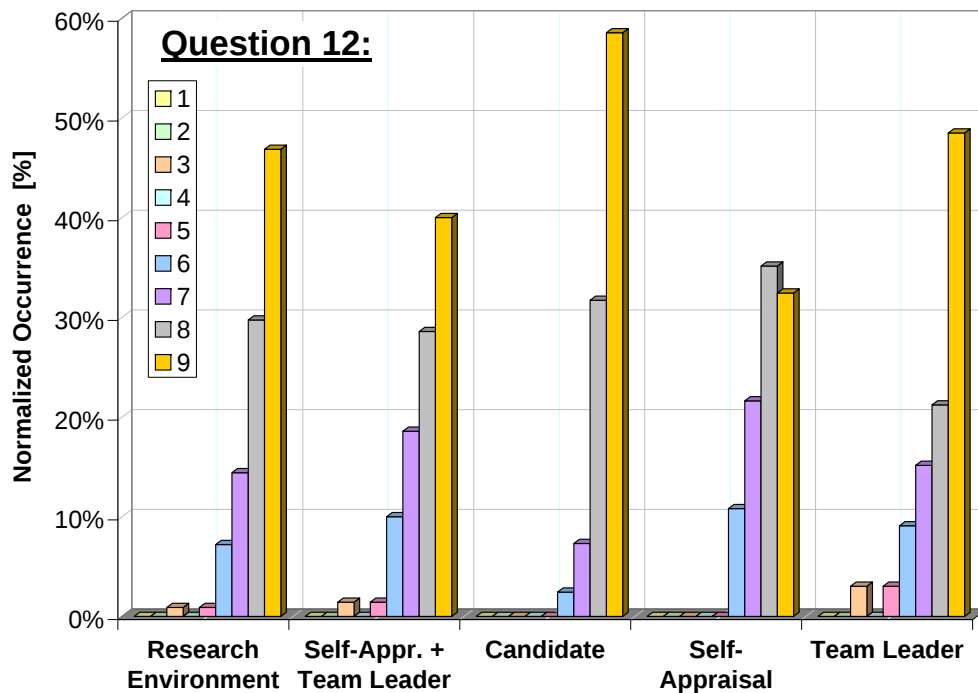


Figure 5.23: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 12: ***Knows and understands how to do basic things.***

The obtained distributions⁹⁴ have an almost identical pattern, except for a small variation for the self-appraisal. Most of the participants believe that within their environment almost everyone knows and understands how to do basic things, even the supervisor, and especially the candidate. It can be very dangerous for a team leader to believe that everyone is skilled enough to do basic things and then to have a team member who either does not feel confident enough or does not have the necessary know-how and understanding of how to complete basic tasks.⁹⁵ This latent threat is sometimes the starting point of huge conflicts

⁹³ **Question 12:** *Knows and understands how to do basic things.*

⁹⁴ see Figure 5.23

⁹⁵ see self-appraisal group in Figure 5.23.

that arise when the team leader either overestimates one of her/his team members or the team member tries to hide her/his lack of knowledge. In both cases, it is very difficult to find the reason in an early stage that might lead to a huge conflict or resistance to carry out basic tasks, which everybody assumes the team member is capable of doing, while she/he actually is not. The reason for this fact is that it is always very embarrassing for someone to admit that she/he is not capable of knowing or understanding basic things although some team members are aware of their lack of knowledge⁹⁶.

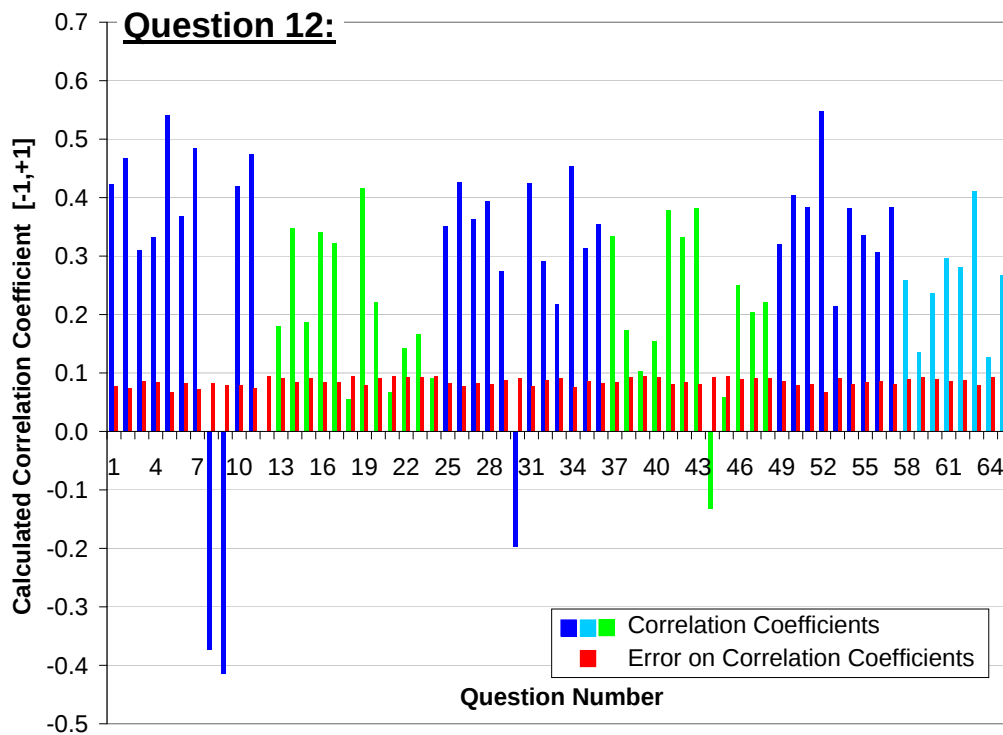


Figure 5.24: Correlation coefficients for Question 12: *Knows and understands how to do basic things*.

The calculated correlation coefficients⁹⁷ for Question 12⁹⁸ are within the interval $[-0.5, +0.5]$, except for Question 05⁹⁹ (0.541) and Question 52¹⁰⁰ (0.548). Both questions show no causal correlation to Question 12. Therefore, no causal correlation at all exists between Question 12 and any other question within the questionnaire.

⁹⁶again, see self-appraisal group in Figure 5.23.

⁹⁷see Figure 5.24

⁹⁸**Question 12:** *Knows and understands how to do basic things*.

⁹⁹**Question 05:** *Recognizes what needs to be done and takes the initiative to make it happen*.

¹⁰⁰**Question 52:** *Develops others by explaining or demonstrating relevant skills*.

5.2 Relationship Behavior

5.2.1 Question 13

Question 13¹⁰¹ asks about the team leader's relationship behavior, if he shows concern for the personal problems and well being of others and if he helps others to feel comfortable within the group. In a scientific research environment teams are being formed for specific research projects and the team members are changing after (or even during) every project. Therefore, it is especially important to help newcomers to feel comfortable within the new group and project.

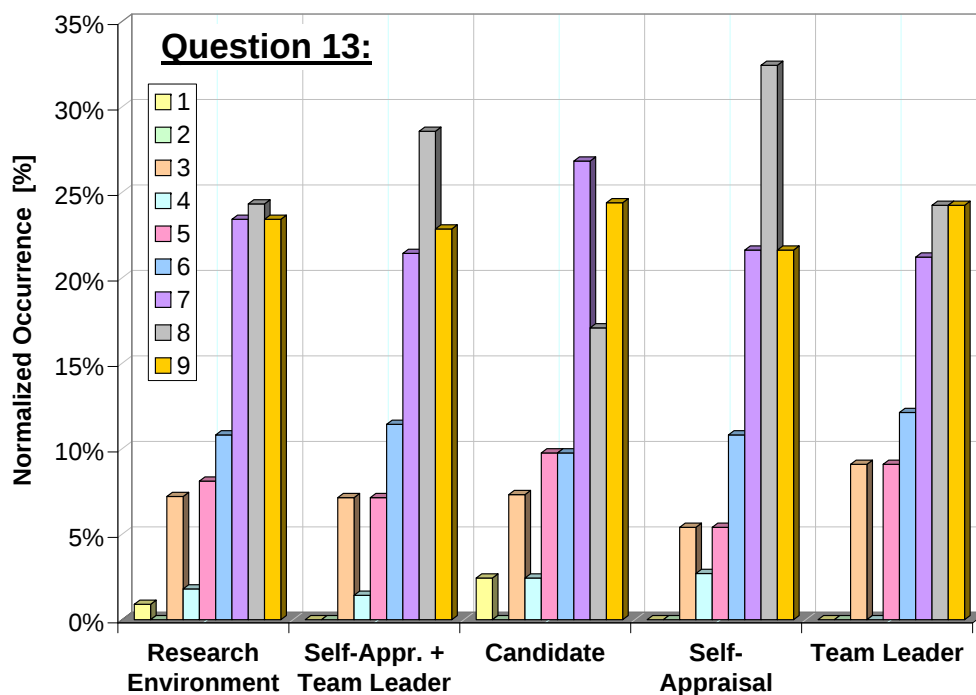


Figure 5.25: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 13: *Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.*

The obtained occurrence distributions show similar patterns¹⁰²: Distinctive peaks for

¹⁰¹**Question 13:** *Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.*

¹⁰²see Figure 5.25

categories 7 (= Often), 8, and 9 (= Always), with varying maxima between the groups for different categories. For all groups, less than 10% of the occurrence values were located in the categories “Occasionally” down to “Never”. This rather small amount of people should be investigated in more detail by interview to find the specific reason why they were not feeling comfortable within the group and to help their team leaders to improve the situation within their teams.

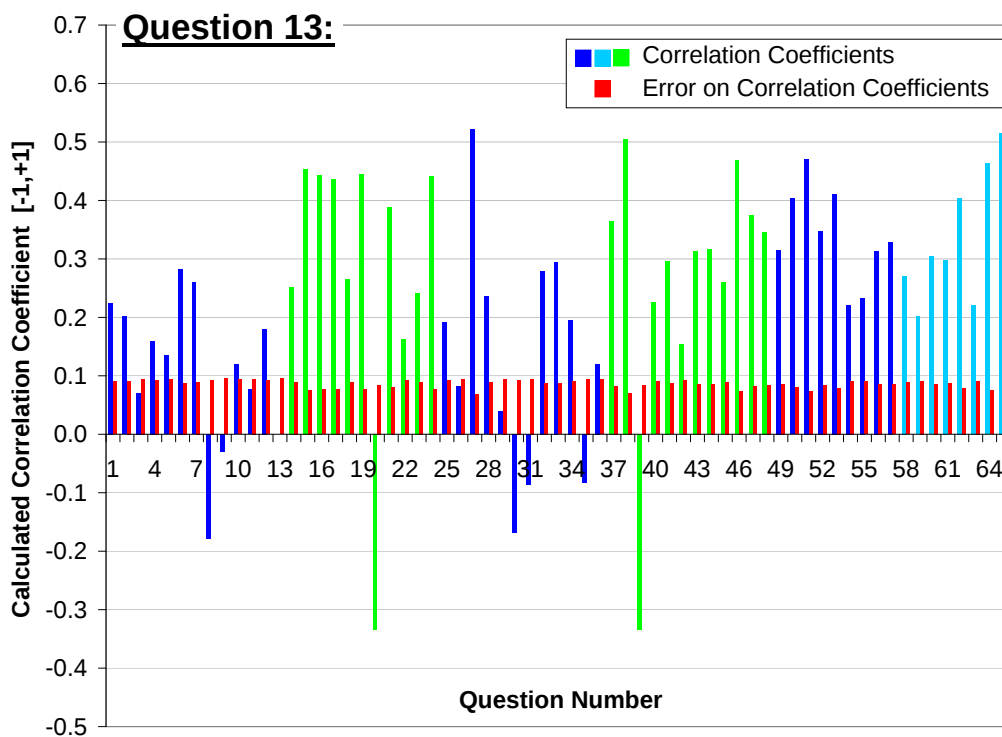


Figure 5.26: *Correlation coefficients for Question 13: Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.*

The calculated correlation coefficients¹⁰³ for Question 13¹⁰⁴ are within the interval

¹⁰³see Figure 5.26

¹⁰⁴**Question 13:** *Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.*

$[-0.5, +0.5]$, except for Question 27¹⁰⁵ (0.521), Question 38¹⁰⁶ (0.505), and Question 65¹⁰⁷ (0.516), which are still below 0.6. Therefore, no causal correlation at all exists between Question 13 and any other question within the questionnaire. Therefore, Question 13 does not need to be modified.

5.2.2 Question 14

Question 14¹⁰⁸ asks about the team leader's awareness of what work is being done in the team.

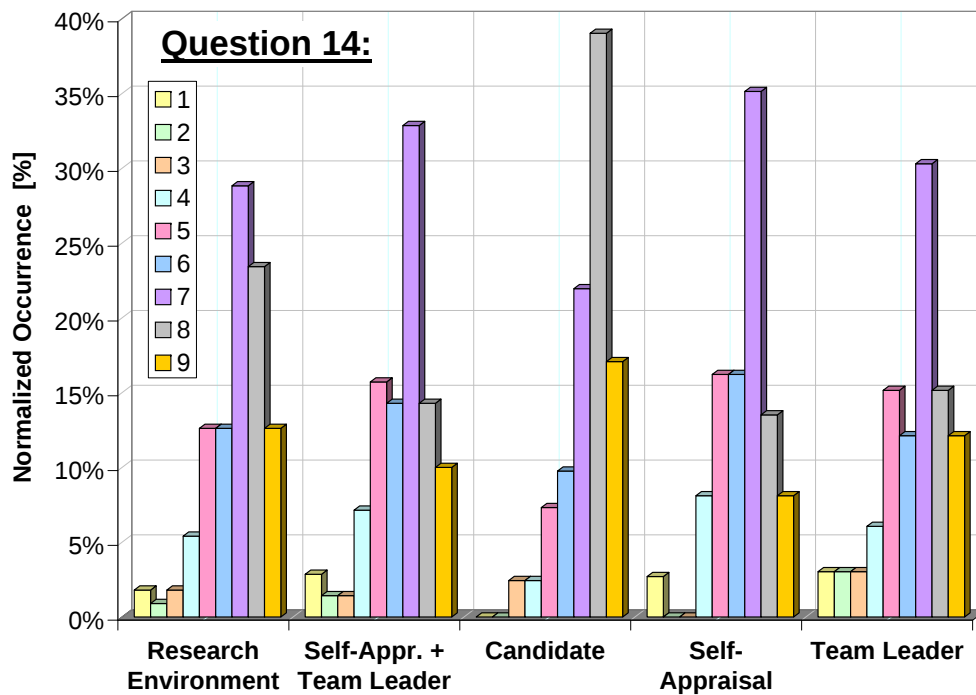


Figure 5.27: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 14: **Knows** (exactly and in detail) what work is being done in the team.

¹⁰⁵ **Question 27:** Models positive team attributes such as mutual respect, open communication, and full participation.

¹⁰⁶ **Question 38:** Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.

¹⁰⁷ **Question 65:** Handles difficult people and situations effectively.

¹⁰⁸ **Question 14:** Knows (exactly and in detail) what work is being done in the team.

The exact and detailed knowledge of the work that is being done within the team facilitates the management tasks about the leader and improves the communication and relationship between the leader and the individual team members, because it shows the members that their work is being appreciated and valued by their superior.

The obtained occurrence distributions¹⁰⁹ show a similar pattern for all groups with a maximum peak value in the category 7 (= Often), except for the candidate with a distinctive and higher maximum for category 8. 15% of the participants believe that their team leader hardly knows what work is being done within the team. This might either be a result of a lack of communication or the fact that the project is already so big, that the leader has to delegate specific tasks to subordinates and therefore does not know exactly and in detail what kind of work is being done within the team.

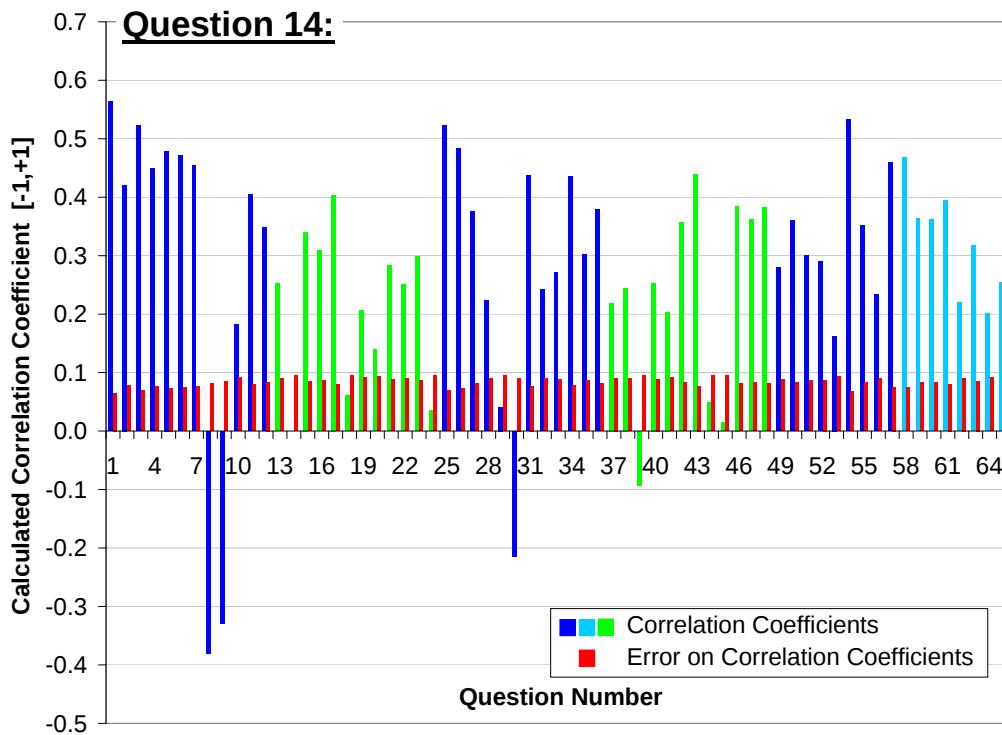


Figure 5.28: Correlation coefficients for Question 14: *Knows (exactly and in detail) what work is being done in the team.*

The calculated correlation coefficients¹¹⁰ for Question 14¹¹¹ are within the interval

¹⁰⁹see Figure 5.27

¹¹⁰see Figure 5.28

¹¹¹**Question 14:** *Knows (exactly and in detail) what work is being done in the team.*

$[-0.5, +0.5]$, except for Question 01¹¹² (0.564), Question 03¹¹³ (0.523), Question 25¹¹⁴ (0.522), and Question 54¹¹⁵ (0.533). No causal correlation at all exists between Question 14 and the mentioned questions or any other question within the questionnaire. Therefore, Question 14 does not need to be modified.

¹¹²**Question 01:** *Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).*

¹¹³**Question 03:** *Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.*

¹¹⁴**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

¹¹⁵**Question 54:** *Helps the team to focus on goals and objectives.*

5.2.3 Question 15

Question 15¹¹⁶ asks about the leader's relationship behavior regarding the treatment of her/his team members as equals, fairly and consistently and if the leader behaves (emotionally) predictably.

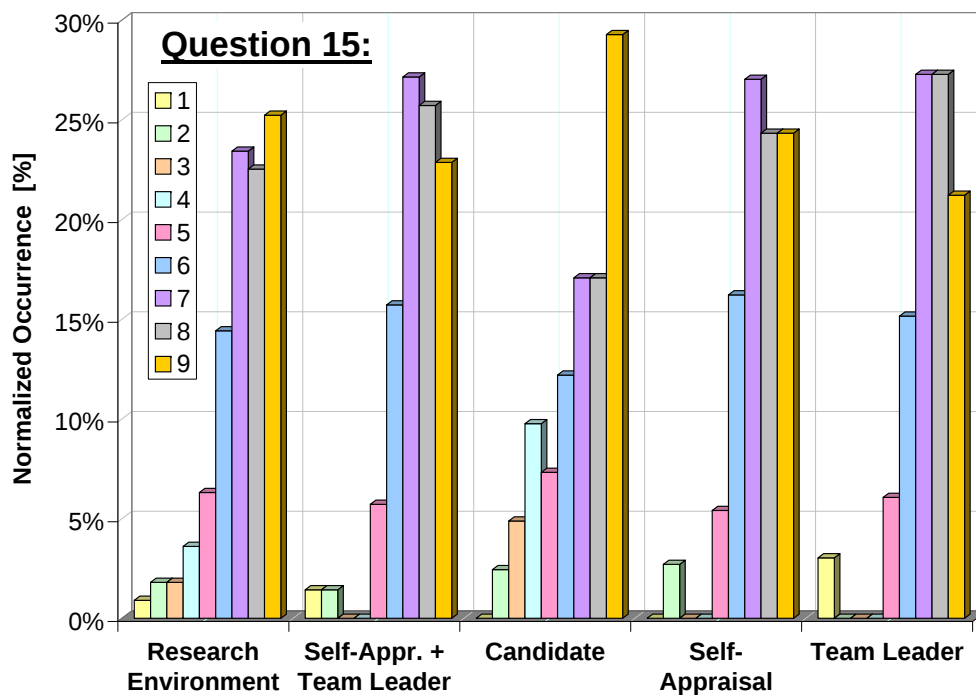


Figure 5.29: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 15: *Treats people as equals, fairly and consistently (behaves predictably)*.

The obtained occurrence distributions¹¹⁷ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). There is always a small amount (< 3%) who believe that either the team leader or they might not treat someone as equals, fairly and consistently. In the case of the candidate, about 12% of the team members believe that the candidate treats team members “Never/Occasionally” as equals, fairly and consistently. This group of people should be investigated in more detail to find out why they did not feel that they were being treated

¹¹⁶**Question 15:** *Treats people as equals, fairly and consistently (behaves predictably)*.

¹¹⁷see Figure 5.29

as equals or fairly. It was discovered in the previous section¹¹⁸, that the participants believed that the candidate possesses better task related skills as most of the other people. This strong task focus might either affect the self-confidence of some team members or the candidate has a very strong related task focus but a rather weak relationship behavior. In either case, it should be investigated by interviews what the reason might be and how the situation could be improved for this small group of participants.

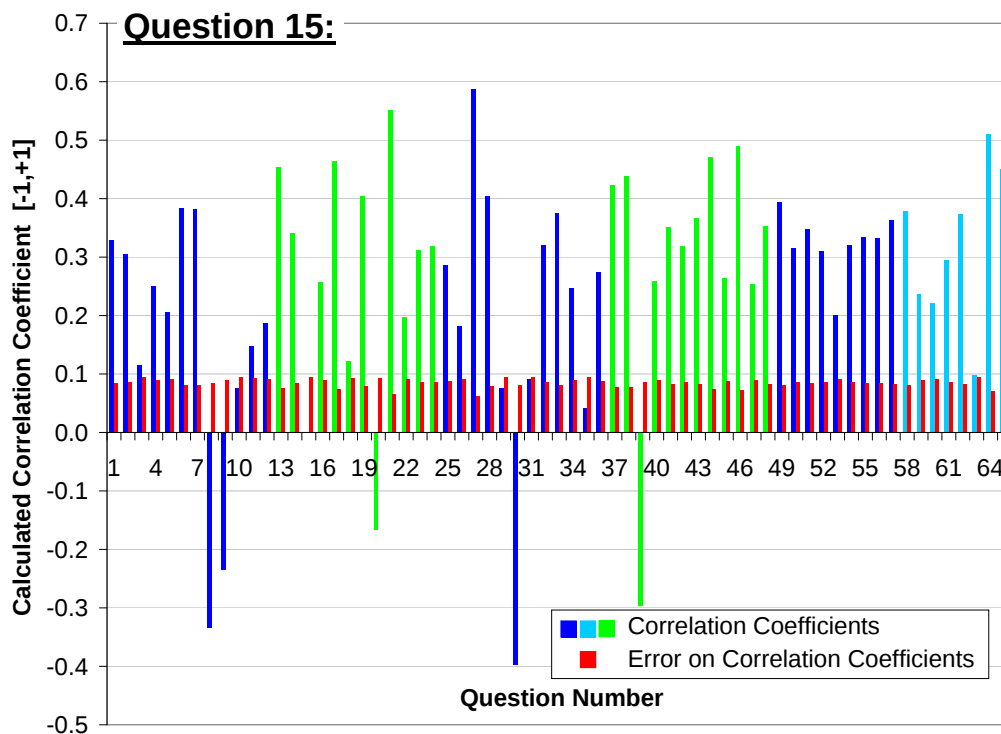


Figure 5.30: *Correlation coefficients for Question 15: Treats people as equals, fairly and consistently (behaves predictably).*

The calculated correlation coefficients¹¹⁹ for Question 15¹²⁰ are within the interval $[-0.5, +0.5]$, except for Question 21¹²¹ (0.552), Question 27¹²² (0.588), and Question 64¹²³ (0.511). No causal correlation exists between Question 15 and the mentioned questions or

¹¹⁸see Section 5.1, page 63

¹¹⁹see Figure 5.30

¹²⁰**Question 15:** *Treats people as equals, fairly and consistently (behaves predictably).*

¹²¹**Question 21:** *Honors other people's (personal) boundaries.*

¹²²**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

¹²³**Question 64:** *Able to calm others in stressful situations.*

any other question within the questionnaire. Therefore, Question 15 does not need to be modified.

5.2.4 Question 16

Question 16¹²⁴ asks about how the team leader's communication is perceived by the team members. Active communication — actually starting the conversations — is especially important for the team leader to remove or overcome the hierarchical barrier perceived or assumed by the individual team members or subordinates. The communication processes are facilitated if the team leader actively starts conversations during coffee breaks, spontaneous visits of work places, etc. and not only seals herself/himself off in her/his office behind her/his desk or even makes it harder to be reached by her/his team members by additional barriers such as being sealed off by a secretary.

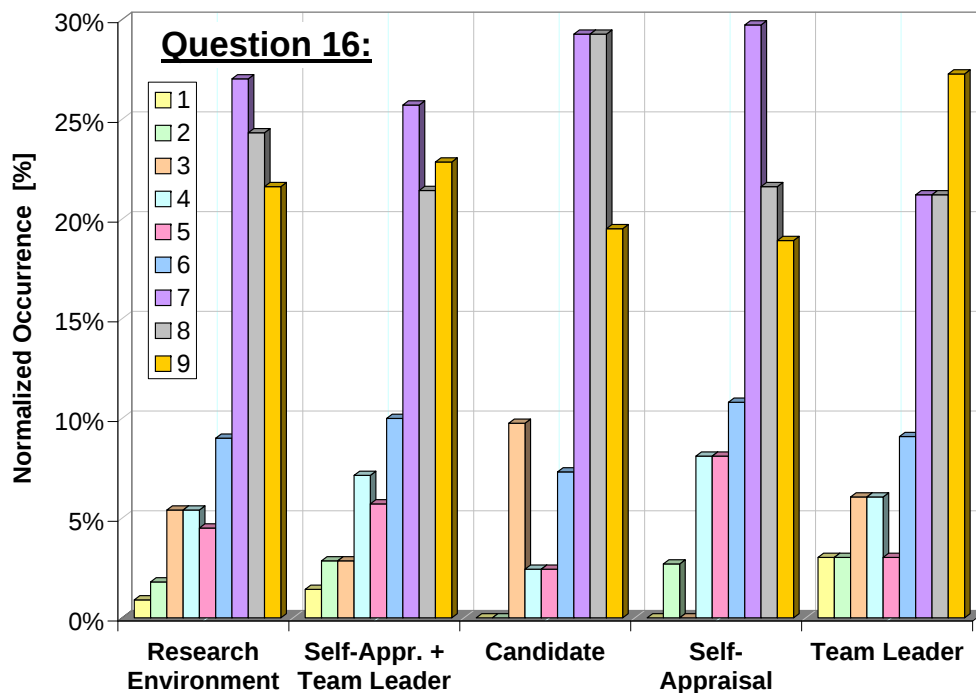


Figure 5.31: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 16: *Communicates actively (i.e., starts conversations) with team members.*

¹²⁴Question 16: *Communicates actively (i.e., starts conversations) with team members.*

The obtained occurrence distributions¹²⁵ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The supervisor and the candidate are being perceived by less than 10% of the participants as being “Seldom” the active part in starting any conversation. There were no occurrence values for 1 (= Never) or 2 (Never/Seldom) for the candidate, while the supervisor is being perceived by 3% as 1 (= Never) or 2 (Never/Seldom) actively starting any conversation. In both cases, those small groups (< 10%) should be located and interviewed to find out the reason for the perceived communication barriers.

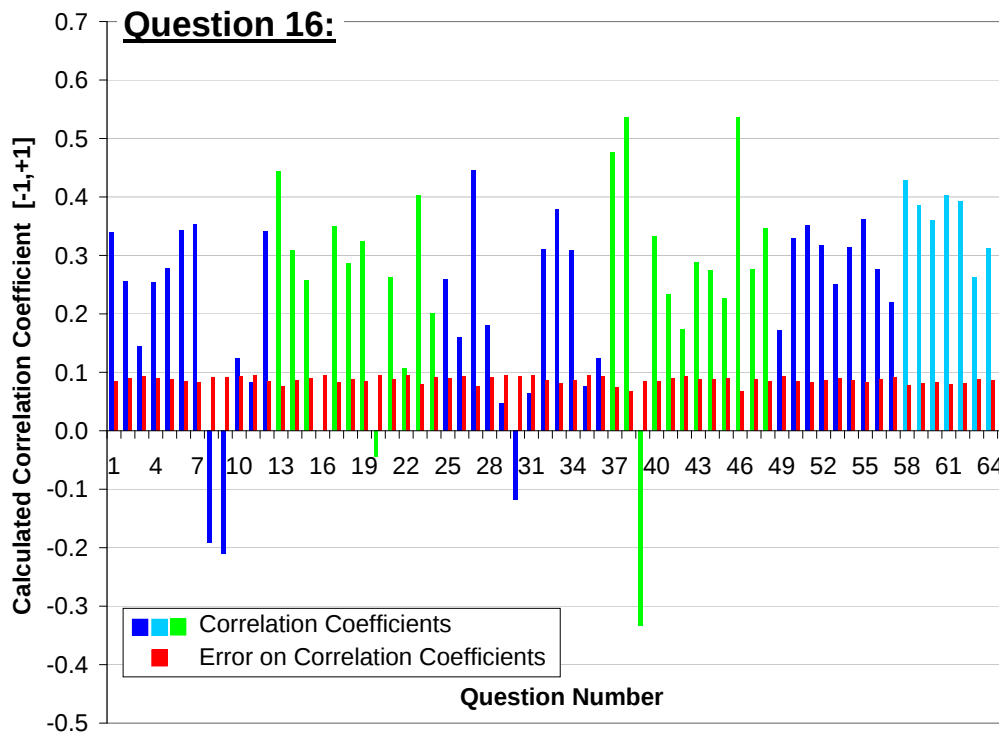


Figure 5.32: *Correlation coefficients for Question 16: Communicates actively (i.e., starts conversations) with team members.*

The calculated correlation coefficients¹²⁶ for Question 16¹²⁷ are within the inter-

¹²⁵see Figure 5.31

¹²⁶see Figure 5.32

¹²⁷**Question 16:** *Communicates actively (i.e., starts conversations) with team members.*

val $[-0.5, +0.5]$, except for Question 38¹²⁸ (0.537) and Question 46¹²⁹ (0.536). Both, Question 16 and Question 38 ask for the team leader's communication skills. Question 16 more generally describes the global daily communication between the team leader and the team members to make them feel more comfortable within the team, while Question 38 focuses on specific task related information exchanges. Question 46 asks specifically for the team spirit within the team. This feeling can be influenced by active communication, but there are many other factors (e.g., clear and defined tasks, work conditions, time pressure and other stress factors) that could have an influence on the team spirit. Therefore, no causal correlation exists between Question 16 and the mentioned questions or any other question within the questionnaire and Question 16 does not need to be modified.

¹²⁸**Question 38:** *Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.*

¹²⁹**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

5.2.5 Question 17

Question 17¹³⁰ asks about the team leader's readiness to acknowledge her/his own mistakes and take corrective action. Admitting her/his own mistakes and taking corrective action strengthens mutual trust and improves the leader-follower relationships.

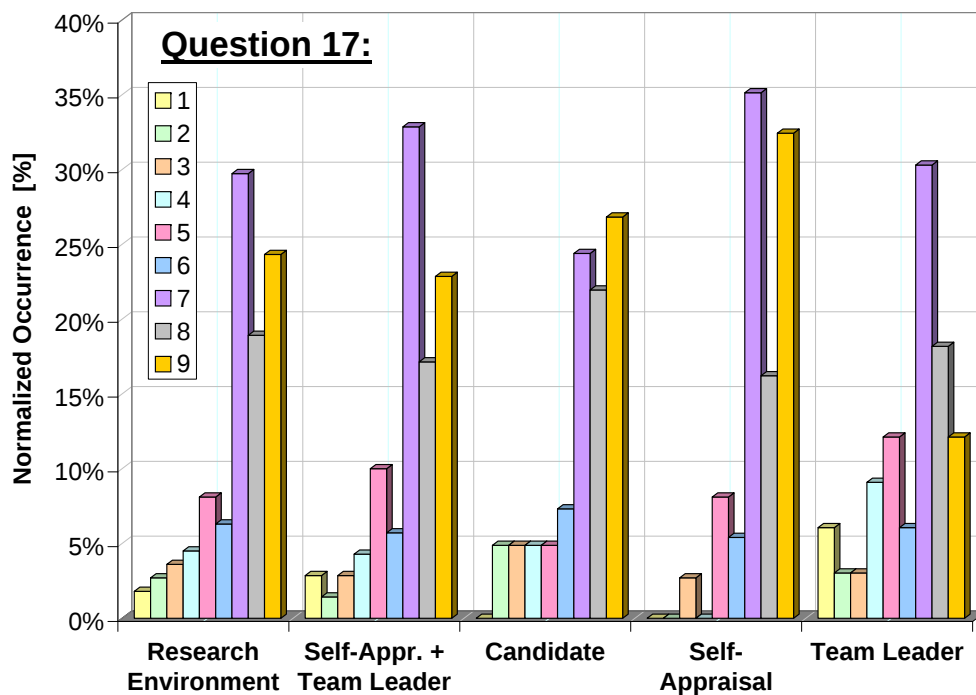


Figure 5.33: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 17: *Acknowledges her/his own mistakes and takes corrective action.*

The obtained occurrence distributions¹³¹ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants see themselves in almost 84% of the cases “Often to Always” (7 to 9) acknowledging their own mistakes (self-appraisal), while they perceive the candidate in 73% and the supervisor in only 60% acknowledging their own mistakes and taking corrective action. The reason for this perception or ignorance of their own mistakes by the supervisor or the candidate should be investigated in more detail by interviewing both

¹³⁰ **Question 17:** *Acknowledges her/his own mistakes and takes corrective action.*

¹³¹ see Figure 5.33

groups, the participants and supervisors/candidate.

The calculated correlation coefficients¹³² for Question 17¹³³ are smaller than 0.6, except for Question 27¹³⁴ (0.618) and Question 38¹³⁵ (0.642). Question 28¹³⁶ (0.589), Question 57¹³⁷ (0.586), and Question 65¹³⁸ (0.564) have a correlation coefficient close to 0.6.

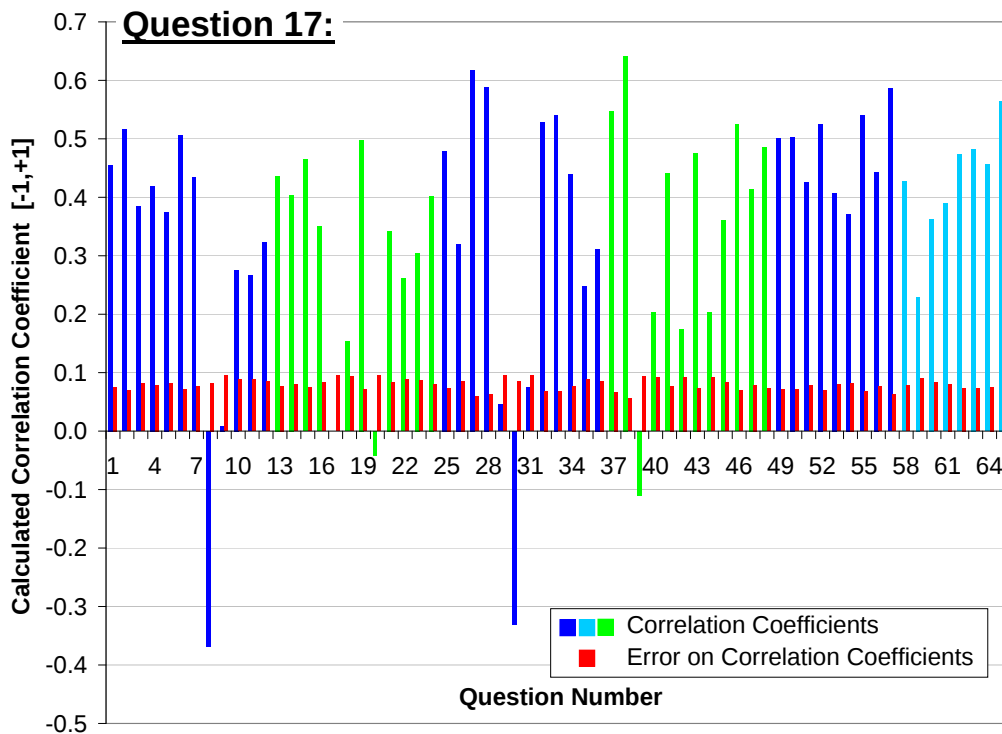


Figure 5.34: *Correlation coefficients for Question 17: Acknowledges her/his own mistakes and takes corrective action.*

The correlation coefficients for Question 27 and 38 can be explained by a weak causal connection between both questions with Question 17. Acknowledging her/his own mistakes

¹³²see Figure 5.34

¹³³**Question 17:** *Acknowledges her/his own mistakes and takes corrective action.*

¹³⁴**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

¹³⁵**Question 38:** *Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.*

¹³⁶**Question 28:** *Has high moral standards. Can be trusted with confidential information.*

¹³⁷**Question 57:** *Spends time effectively teaching or mentoring team members.*

¹³⁸**Question 65:** *Handles difficult people and situations effectively.*

reflects a part of positive team attributes, which are being addressed in Question 27. Also listening receptively to suggestions and agreeing with those suggestions even when the team leader disagrees with them has a causal correlation to acknowledging her/his own mistakes. However, the content of Question 17 only represents a small part of both questions and therefore no modification of Question 17 is required. The same facts apply to Question 65. Handling difficult people effectively also includes acknowledging her/his own mistakes, but the overlap between both questions is rather small and requires no modification of Question 17. No causal correlation at all exists between Question 17 and the rest of the questions within the questionnaire. Therefore, Question 17 does not need to be modified.

5.2.6 Question 18

Question 18¹³⁹ asks if the team leader discloses her/his thoughts and feelings to group members.

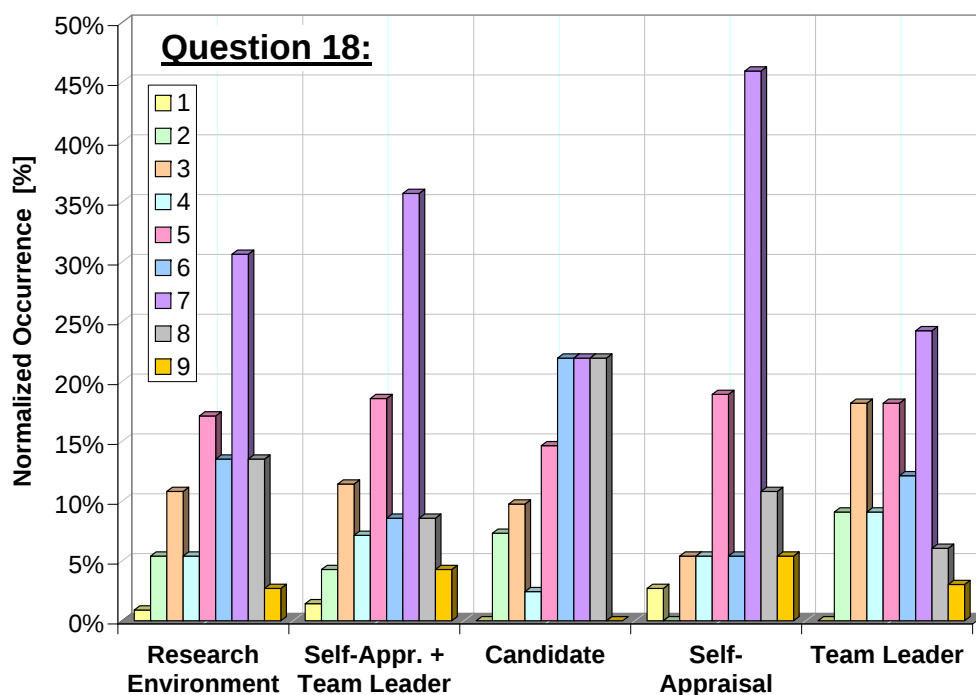


Figure 5.35: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 18: *Discloses thoughts and feelings to group members.*

¹³⁹Question 18: Discloses thoughts and feelings to group members.

Disclosing of feelings and thoughts by superiors helps their team members to put themselves at ease and to understand that they are not (always) the reason for the team leader's worries or strains. People tend to think that they are responsible for the feelings of their team members or superiors and if one of those people has a so-called "bad day", then the stress upon them might increase and affect their relationships or even the quality of their work. Therefore, it is important for a team leader to disclose to a certain degree her/his feelings towards the work group.

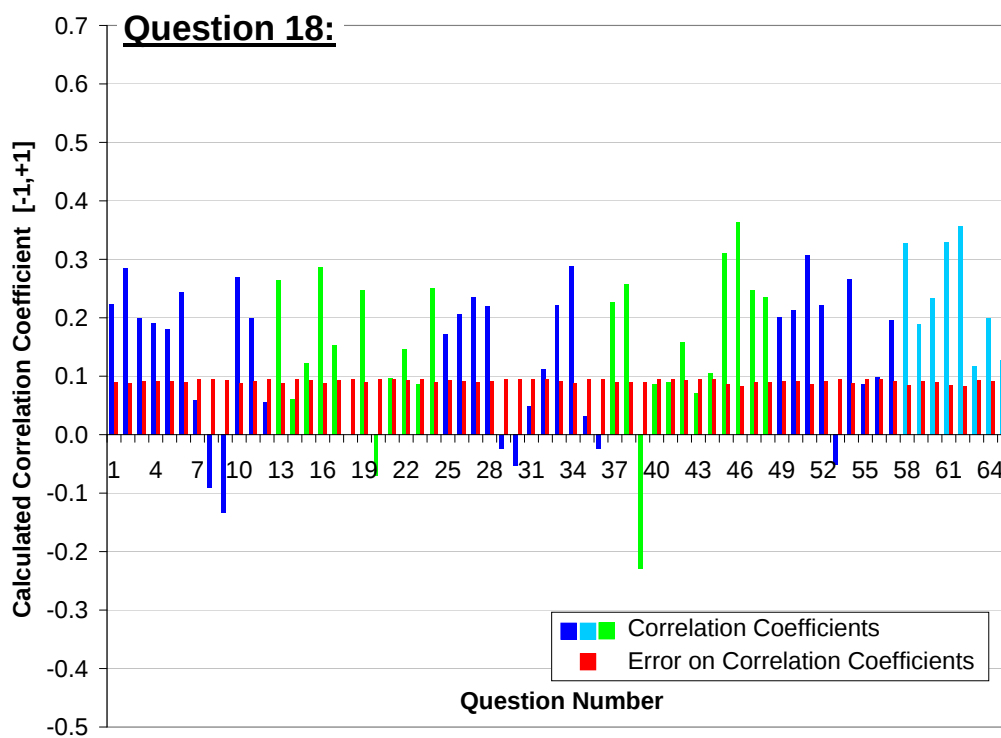


Figure 5.36: *Correlation coefficients for Question 18: Discloses thoughts and feelings to group members.*

The obtained occurrence distributions¹⁴⁰ vary considerably from each other. The participants believe that about 62% of themselves "Often" (7) to "Always" (9) disclose their thoughts and feelings towards their team members, while they perceive only 44% for the candidate and only 33% for their supervisor. On the other hand, the participants believe that they "Never" (1) to "Seldom" (3) disclose their feelings only in 8% of the cases and that the candidate in 17% and their team leader in 27% of the cases "Never" (1) to "Seldom" (3) disclose their thoughts towards their team members. The reasons for

¹⁴⁰see Figure 5.35

disclosing or hiding personal feelings and thoughts strongly depend on the personality of persons involved and are not investigated within this work. However, merely the perception of this fact by team members might already induce more or less severe effects on the relationships within the team itself or on the quality of work they might deliver.

The calculated correlation coefficients¹⁴¹ for Question 18¹⁴² are within the interval $[-0.4, +0.4]$. Therefore, no causal correlation at all exists between Question 18 and any other question within the questionnaire.

¹⁴¹see Figure 5.36

¹⁴²**Question 18:** *Discloses thoughts and feelings to group members.*

5.2.7 Question 19

Question 19¹⁴³ asks about the team leader's readiness to give honest and fair answers. Honesty and fairness are the foundations on which trust and relationships between humans (and not only work teams) are built upon. Therefore, it is essential for a leader to give honest and fair answers to her/his team members.

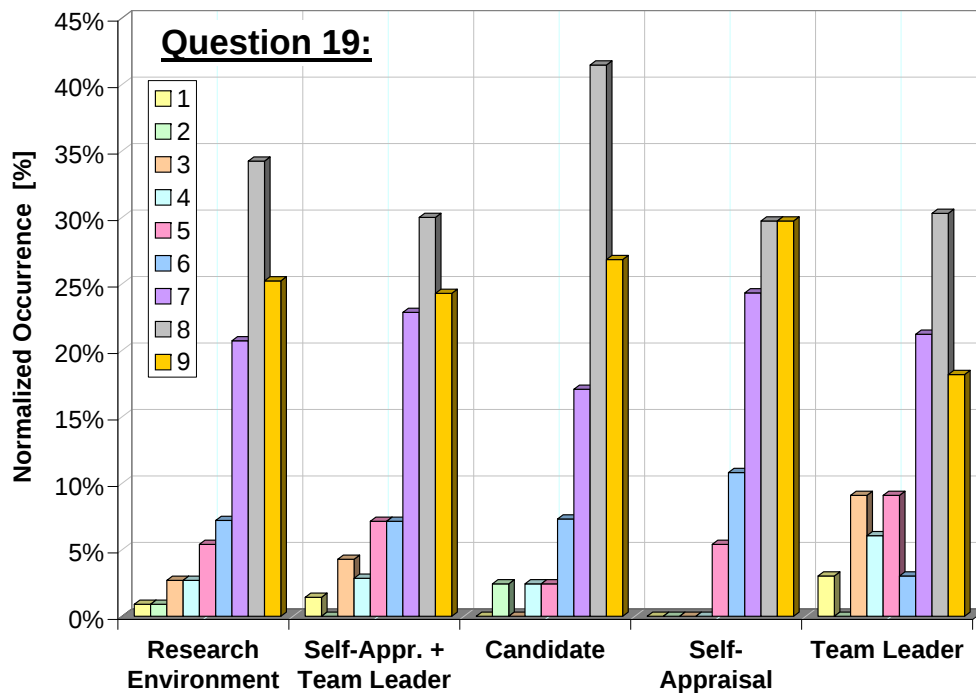


Figure 5.37: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 19: *Gives team members honest and fair answers.*

The obtained occurrence distributions¹⁴⁴ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants believe that in 84% of all the cases they give honest and fair answers. For the candidate they believe that she/he gives in almost 86% honest and fair answers and in the case of the supervisor only in 70%. The important difference between those pattern lies in the tails towards the lower values from 5 (= Occasionally) to 3 (= Seldom) to 1 (= Never). The participants believe that they themselves Occasionally (= 4 to 6)

¹⁴³Question 19: *Gives team members honest and fair answers.*

¹⁴⁴see Figure 5.37

to Never (= 1 to 3) give honest and fair answers in only 5.4% of all cases. They further believe that the candidate does the same in 7.3% of all cases and their supervisor (excluding the candidate) in 27.3%. This indicates that the trust in the team leader's answers is only given in about slightly more than two third of all cases. The reasons for this lack of trust towards the superiors lies beyond the scope of this work and should be investigated through interviews in more detail.

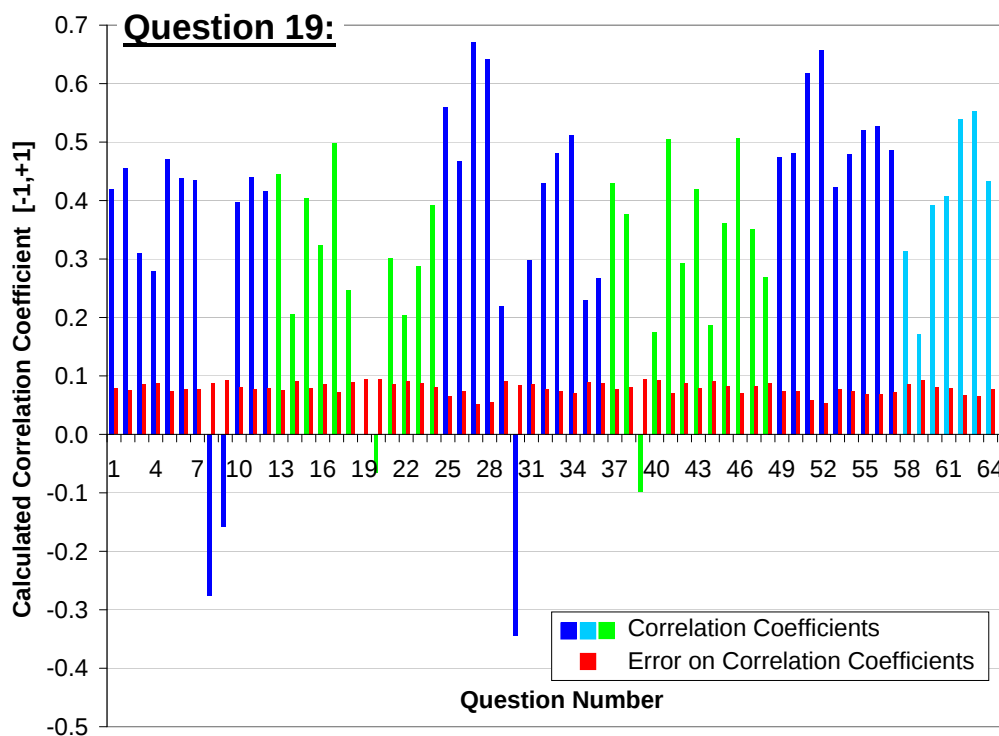


Figure 5.38: Correlation coefficients for Question 19: Gives team members honest and fair answers.

The calculated correlation coefficients¹⁴⁵ for Question 19¹⁴⁶ are smaller than 0.6, except for Question 27¹⁴⁷ (0.671), Question 28¹⁴⁸ (0.642), Question 51¹⁴⁹ (0.618), and

¹⁴⁵see Figure 5.38

¹⁴⁶**Question 19:** Gives team members honest and fair answers.

¹⁴⁷**Question 27:** Models positive team attributes such as mutual respect, open communication, and full participation.

¹⁴⁸**Question 28:** Has high moral standards. Can be trusted with confidential information.

¹⁴⁹**Question 51:** Likes to use her/his leadership power to help subordinates grow.

Question 52¹⁵⁰ (0.657). Question 25¹⁵¹ (0.560) has a correlation coefficient close to 0.6.

Question 19 has only weak causal correlations to Question 25, 27, 28, 51, and 52. Giving team members honest and fair answers can be accounted for as modeling positive team attributes, having high moral standards, helping subordinates to grow, developing others or setting high and clear standards for others by her/his own behavior. This explains the slightly elevated ($0.55 < x < 0.66$) correlation coefficients, but the causal overlap in content is rather small for all five questions. Therefore, Question 19 does not need to be modified.

5.2.8 Question 20

Question 20¹⁵² deals with a very sensitive issue: the team leader's conscience and worries about jeopardizing relationships when correcting mistakes.

International scientific research communities are rather small groups of up to a maximum of a few hundred specialists who know each other very well, at least from their publications and presentations. Therefore, it is essential to consider the consequences and effects on relationships within teams or communities when correcting mistakes. On the other hand, scientists and researchers are obliged to check and verify not only their own results, but also the results of their team members, colleagues, and superiors and correct eventual mistakes immediately.

Question 20 addresses only the perception of the team members within research communities about their team leader's (and the candidate's) conscience and inhibition threshold of jeopardizing relationships with team members and colleagues when correcting mistakes, which happens in most of the cases in public. Neither the reasons nor the effects of having rather low or high thresholds are considered within Question 20, only the perception of the threshold itself is being considered.

The obtained occurrence distributions¹⁵³ show completely different patterns for all groups. The participants perceived occurrence values are given in Table 5.2. Surprisingly, the occurrence values for the participants (self-appraisal) and the supervisor are almost identical, only the values for the candidate vary considerably from the so-called "average"

¹⁵⁰**Question 52:** *Develops others by explaining or demonstrating relevant skills.*

¹⁵¹**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

¹⁵²**Question 20:** *Does not worry about jeopardizing relationships when correcting mistakes.*

¹⁵³see Figure 5.39

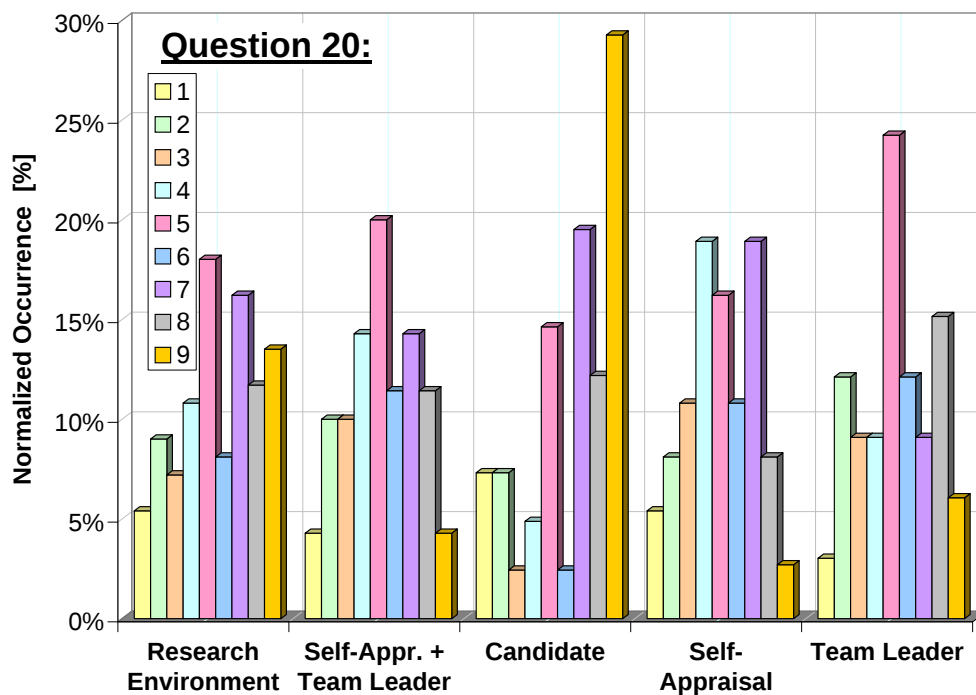


Figure 5.39: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 20: *Does not worry about jeopardizing relationships when correcting mistakes.*

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)
Candidate	17.1%	22.0%	61.0%
Self-Appraisal	24.3%	45.9%	29.7%
Supervisor	24.2%	45.5%	30.3%

Table 5.2: Obtained occurrence values for Question 20.

established by the self-appraisal and supervisor groups. The reason for this difference might be the strong commitment of the candidate towards science and research which she/he seems to value higher (almost twice as much as her/his superiors and colleagues) than the worries about jeopardizing the relationships towards team members. This attitude could maybe be changed by improved communication skills without jeopardizing her/his commitment towards science and research, which seems to have a huge importance in her/his life.

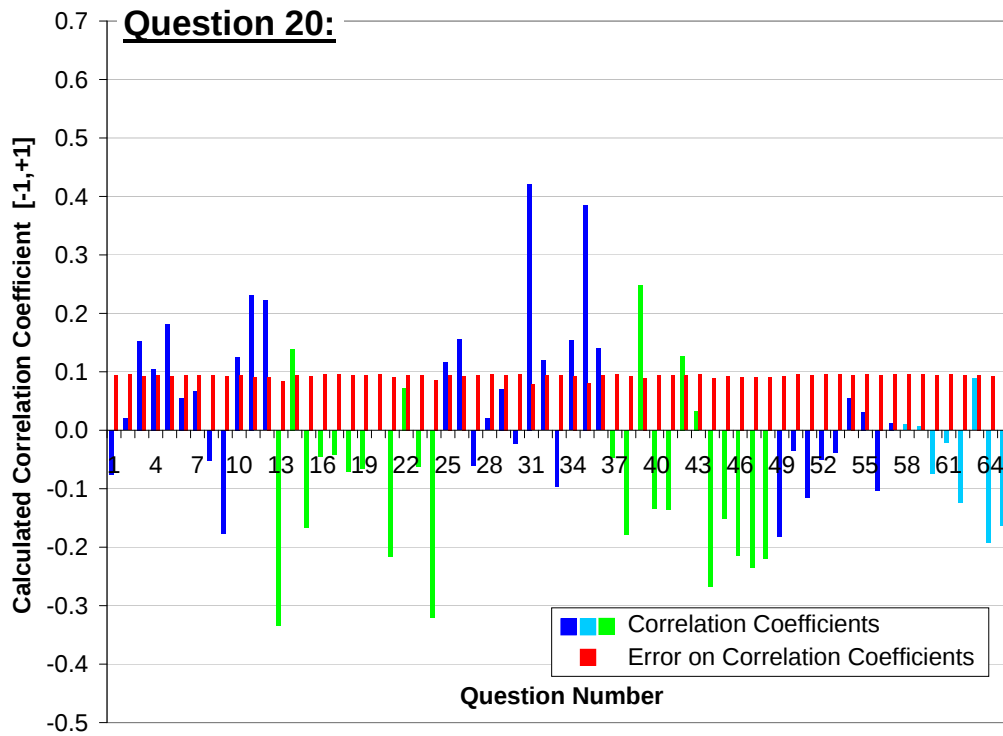


Figure 5.40: *Correlation coefficients for Question 20: Does not worry about jeopardizing relationships when correcting mistakes.*

The calculated correlation coefficients¹⁵⁴ for Question 20¹⁵⁵ are within the interval $[-0.4, +0.4]$ (except for one single value which is 0.421). Therefore, no causal correlation at all exists between Question 20 and any other question within the questionnaire.

¹⁵⁴see Figure 5.40

¹⁵⁵**Question 20:** *Does not worry about jeopardizing relationships when correcting mistakes.*

5.2.9 Question 21

Question 21¹⁵⁶ asks about the team leader's attitude towards honoring other people's (personal) boundaries.

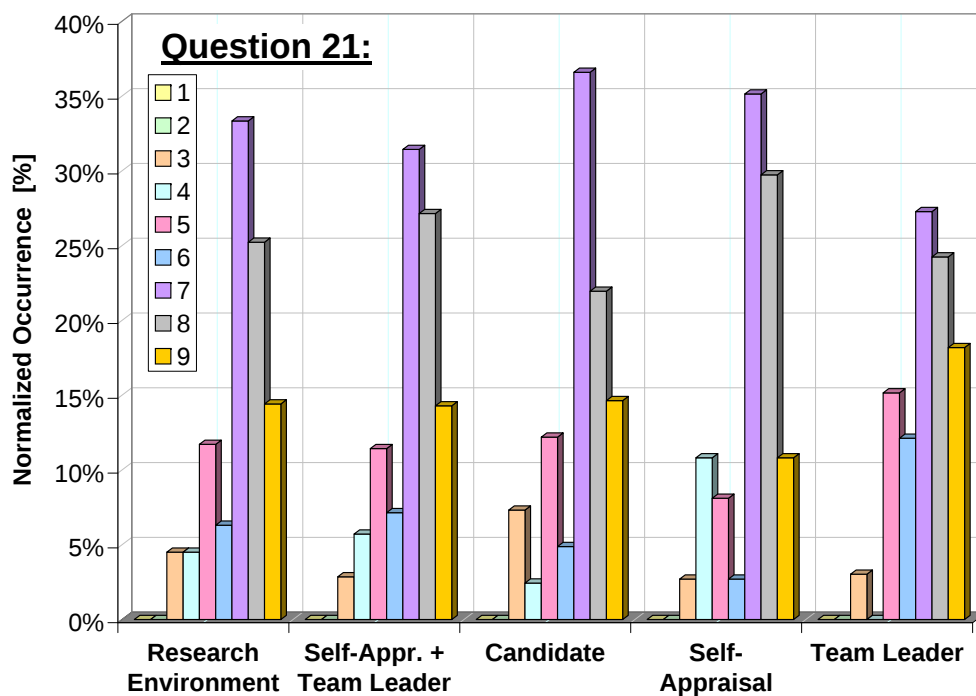


Figure 5.41: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 21: *Honors other people's (personal) boundaries.*

As already discussed in the previous section¹⁵⁷, international scientific research communities are rather small groups of up to a maximum of a few hundred specialists who know each other very well, at least from their publications and presentations. Therefore, it is also essential to consider and honor the personal boundaries of each individual team member. Those boundaries might vary by large extents between different individuals which might result on an international research “platform” from different country related habits, cultural differences, or various other reasons¹⁵⁸. Therefore, each team member has different personal boundaries and it might be difficult for a team leader in an international research environment to treat each individual's boundaries with the appropriate respect.

¹⁵⁶**Question 21:** *Honors other people's (personal) boundaries.*

¹⁵⁷see Section 5.2.8 , page 110

¹⁵⁸see [17], Geert HOFSTEDE, “Cultural Dimensions”, <http://www.geert-hofstede.com/>, September 2008.

Thus, Question 21 asks how the participants perceive the supervisors (and candidate's) respect towards other people's boundaries.

The obtained occurrence distributions¹⁵⁹ show a similar pattern for all groups: distinctive maximum peaks in the category 7 (= Often). Furthermore, all groups show only minor differences in their pattern which suggests that a so-called “international code of conduct” has been developed and which all team leaders and members respect more or less successfully — but in the same way — despite the huge cultural differences that might appear within a single research team.

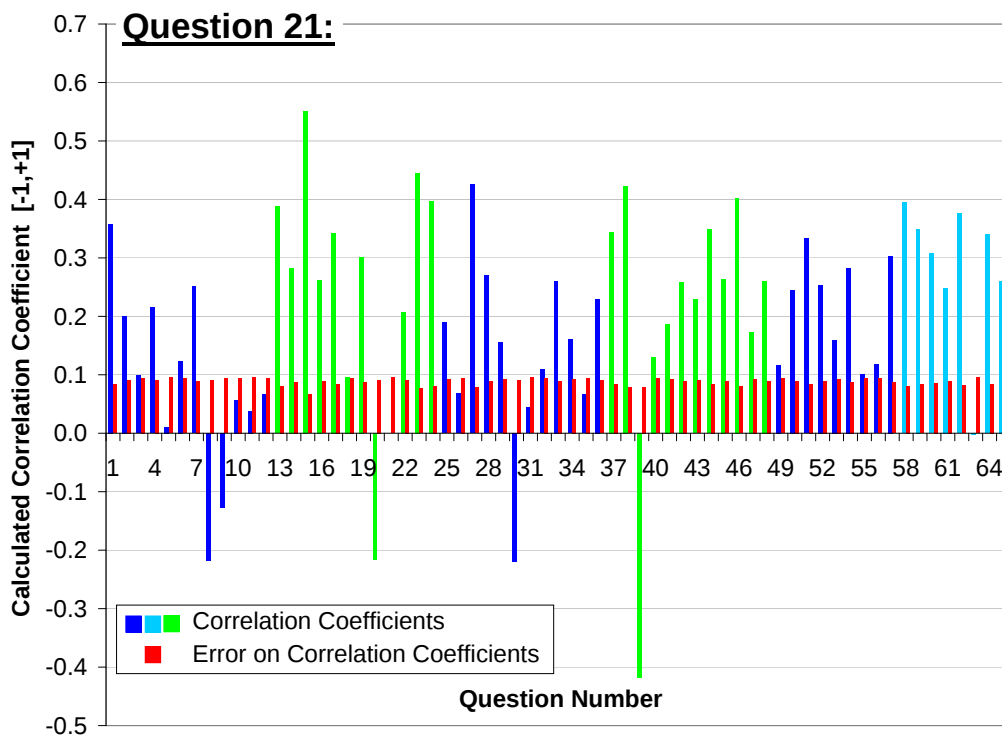


Figure 5.42: Correlation coefficients for Question 21: *Honors other people's (personal) boundaries*.

The calculated correlation coefficients¹⁶⁰ for Question 21¹⁶¹ are within the interval $[-0.5, +0.5]$, except for Question 15¹⁶² (0.552). This slightly elevated value can be

¹⁵⁹see Figure 5.41

¹⁶⁰see Figure 5.42

¹⁶¹**Question 21:** *Honors other people's (personal) boundaries*.

¹⁶²**Question 15:** *Treats people as equals, fairly and consistently (behaves predictably)*.

explained by a small causal overlap between the content of both questions. Honoring other people's (personal) boundaries and treating people as equals, fairly and consistently has small overlaps, but both questions ask for independent leadership traits. Therefore, Question 21 does not need to be modified.

5.2.10 Question 22

Question 22¹⁶³ asks about the team leader's capability to regularly achieve "win-win" outcomes.

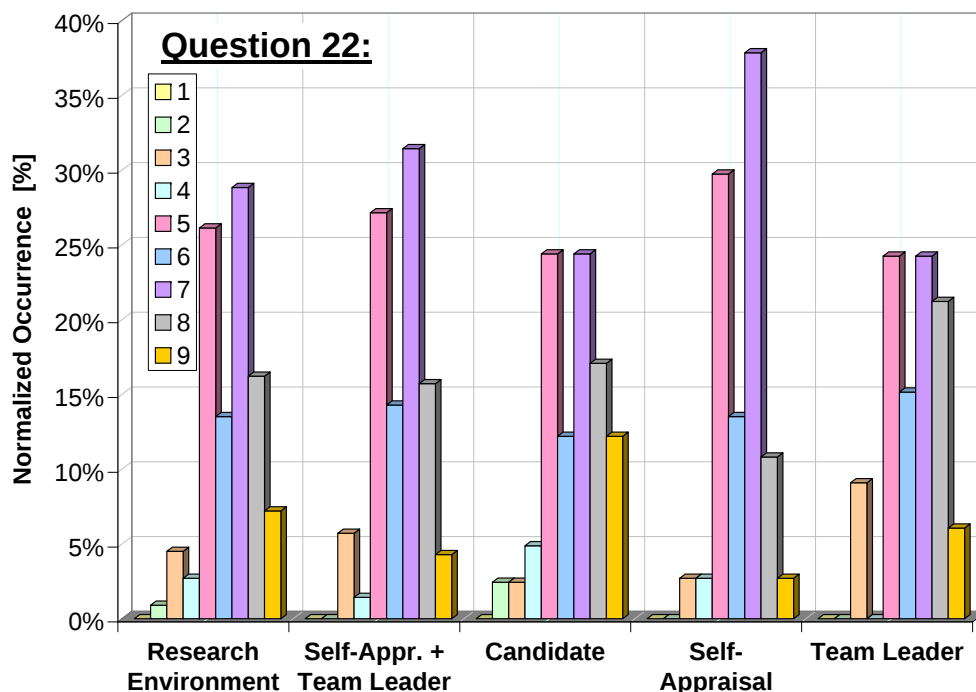


Figure 5.43: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 22: **Regularly achieves "win-win" outcomes.**

Apart from their normal regular payment, there is no additional income for scientists and researchers in international research laboratories if they — more or less "voluntarily" — participate in research projects which provide them with additional "unpaid" night-shifts, work, discussions and disputes, often very cumbersome journeys (to save money), etc. Therefore, it is an important and delicate task for a team leader in such a research

¹⁶³Question 22: Regularly achieves "win-win" outcomes.

environment to achieve “win-win” outcomes for both, herself/himself and the team members participating to her/his research projects. Question 22 addresses the team leader’s skills to recognize, establish or locate, and finally communicate “win-win” outcomes to her/his team members.

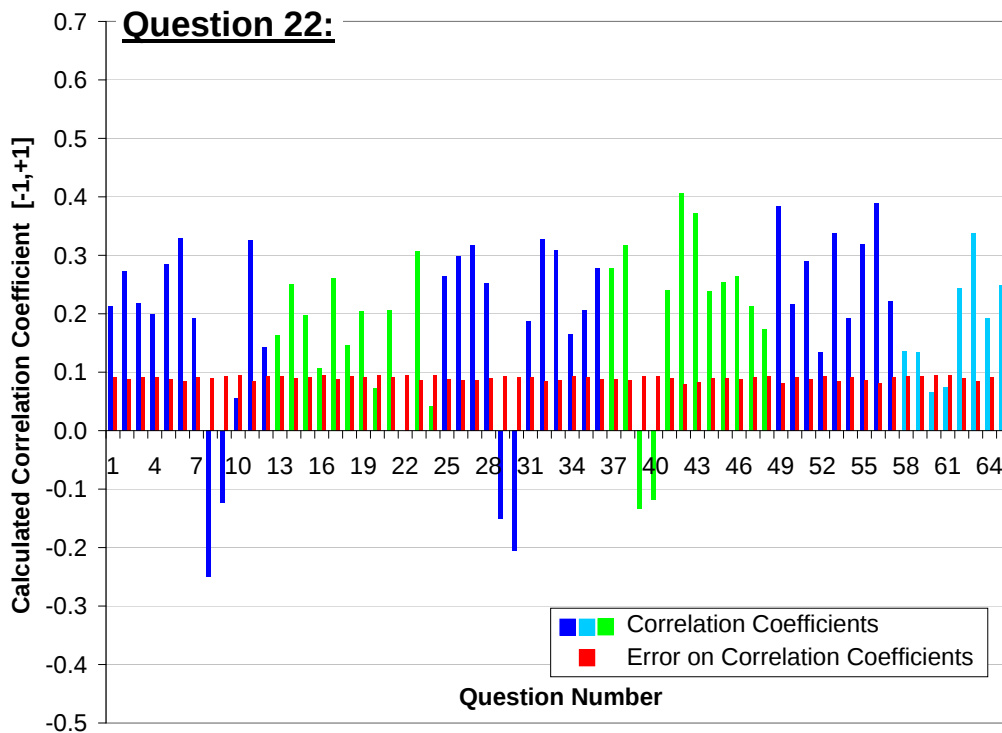


Figure 5.44: Correlation coefficients for Question 22: *Regularly achieves “win-win” outcomes.*

The obtained occurrence distributions¹⁶⁴ show a similar pattern for all groups: distinctive maximum peaks for both categories 5 (= Occasionally) and 7 (= Often). These results underline the difficulty of establishing regularly “win-win” outcomes for both the team leader and her/his team members. The participants believe that they more often achieve “win-win” outcomes compared to their supervisors. This fact might result either from a facilitated communication between peers compared to the personal distance between team leaders and team members or the “win-win” outcomes achieved by the participants do not have the same scale compared to the ones achieved by team leaders, who sometimes have to carry the responsibility for huge projects for several years. The reason for this difference is beyond the scope of this work and should be investigated in more detail by personal interviews.

¹⁶⁴see Figure 5.43

The calculated correlation coefficients¹⁶⁵ for Question 22¹⁶⁶ are within the interval $[-0.4, +0.4]$, except for Question 42¹⁶⁷ (0.406). No causal correlation exists between Question 22 and any other question within the questionnaire and Question 22 does not need to be modified.

5.2.11 Question 23

Question 23¹⁶⁸ asks about the team leader's capability to identify and promote opportunities for collaboration.

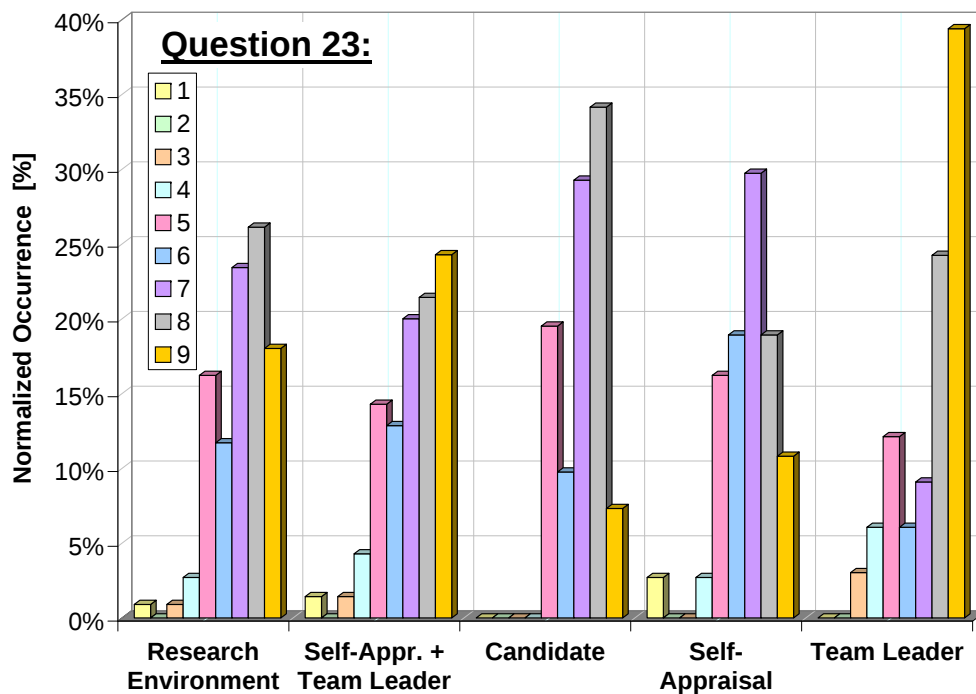


Figure 5.45: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 23: *Identifies and promotes opportunities for collaboration.*

As already discussed in the previous section¹⁶⁹, apart from their normal regular payment,

¹⁶⁵see Figure 5.44

¹⁶⁶**Question 22:** Regularly achieves “win-win” outcomes.

¹⁶⁷**Question 42:** Is capable of juggling multiple demands.

¹⁶⁸**Question 23:** Identifies and promotes opportunities for collaboration.

¹⁶⁹section see Section 5.2.10, page 115

there is no additional income for scientists and researchers in international research laboratories if they — more or less “voluntarily” — participate in research projects which provide them with additional “unpaid” night-shifts, work, discussions and disputes, often very cumbersome journeys (to save money), etc. Therefore, it is important for a team leader in such a research environment to identify and promote opportunities for collaboration. Question 23 addresses the team leader’s skills to identify and promote opportunities for collaboration.

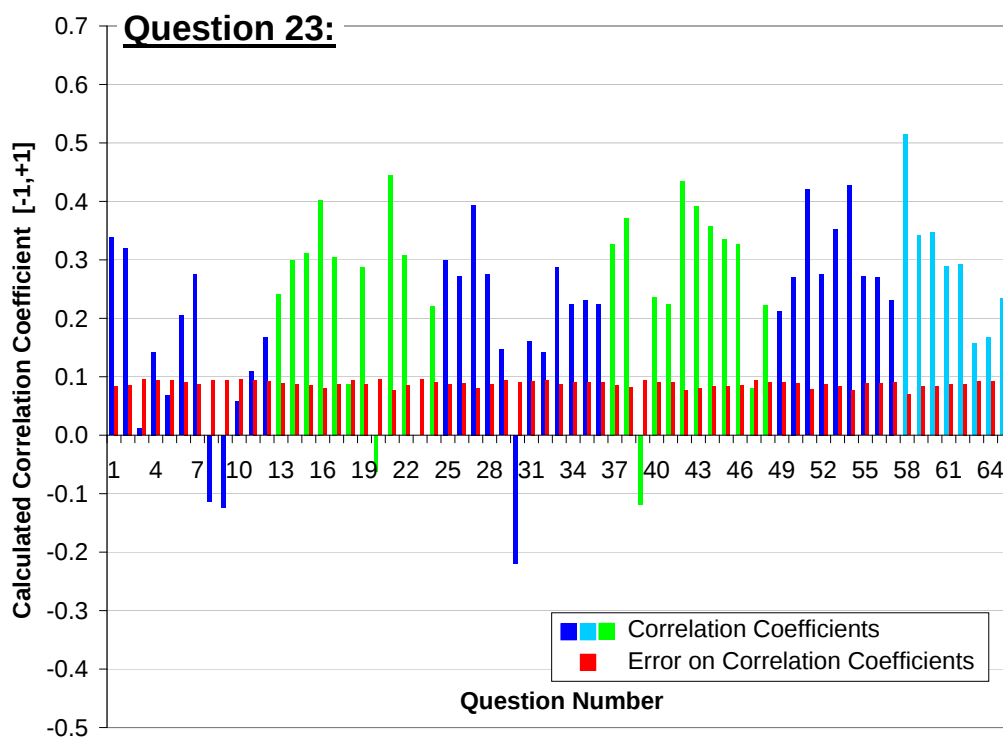


Figure 5.46: *Correlation coefficients for Question 23: Identifies and promotes opportunities for collaboration.*

The obtained occurrence distributions¹⁷⁰ show totally different patterns for all groups. The supervisor has a distinctive maximum of almost 40% in the category 9 (= Always). The candidate has a double peak at 7 (= Often) and 8 (Often/Always) with a maximum of almost 34% in the category 8. The participants see themselves with a maximum of almost 30% in the category 7 (= Often). The lower values for the candidate and self-appraisal groups might result from the fact that they do not always have the formal power within the research hierarchy to identify and promote opportunities for collaboration as

¹⁷⁰see Figure 5.45

they are available to supervisors who, through their experiments, have access to bigger circles in the higher hierarchy of other research laboratories or projects.

The calculated correlation coefficients¹⁷¹ for Question 23¹⁷² are within the interval $[-0.5, +0.5]$, except for Question 58¹⁷³ (0.515). No causal correlation exists between Question 23 and the mentioned question or any other question within the questionnaire. Therefore, Question 23 does not need to be modified.

5.2.12 Question 24

Question 24¹⁷⁴ asks about the team leader's concern of how her/his decisions affect the lives of others.

As already discussed in Section 5.2.8 (page 110), international scientific research communities are rather small groups of up to a maximum of a few hundred specialists who know each other very well, at least from their publications and presentations. Therefore, it is essential to know how her/his decisions affect the lives of others. Team leaders have to consider the consequences and effects on relationships within teams or communities when they make decisions that might affect the lives of other, e.g., changed working conditions, move for longer periods to other research laboratories which might be in other countries, more responsibility, etc.

Question 24 addresses only the perception of the team members within research communities about their team leader (and the candidate) conscience and concern of how their decisions affect the lives of others. Neither the reasons nor the effects of having rather strong or weak concerns are considered within Question 24, only the perception of the existence of such concerns is being considered.

The obtained occurrence distributions¹⁷⁵ show a similar pattern for all groups: distinctive maximum peaks for the category 7 (= Often). The participants see themselves as having rather strong concerns compared to the other groups. The supervisor group and the candidate have a lower concern about how their decisions affect other people. One reason for this lower concern might be the assumption that every researcher has at least one academic degree and is therefore capable of judging, discussing and defending her/his

¹⁷¹see Figure 5.46

¹⁷²**Question 23:** *Identifies and promotes opportunities for collaboration.*

¹⁷³**Question 58:** *Explains how the team fits into the project or company objectives.*

¹⁷⁴**Question 24:** *Is concerned with how her/his decisions affect the lives of others.*

¹⁷⁵see Figure 5.47

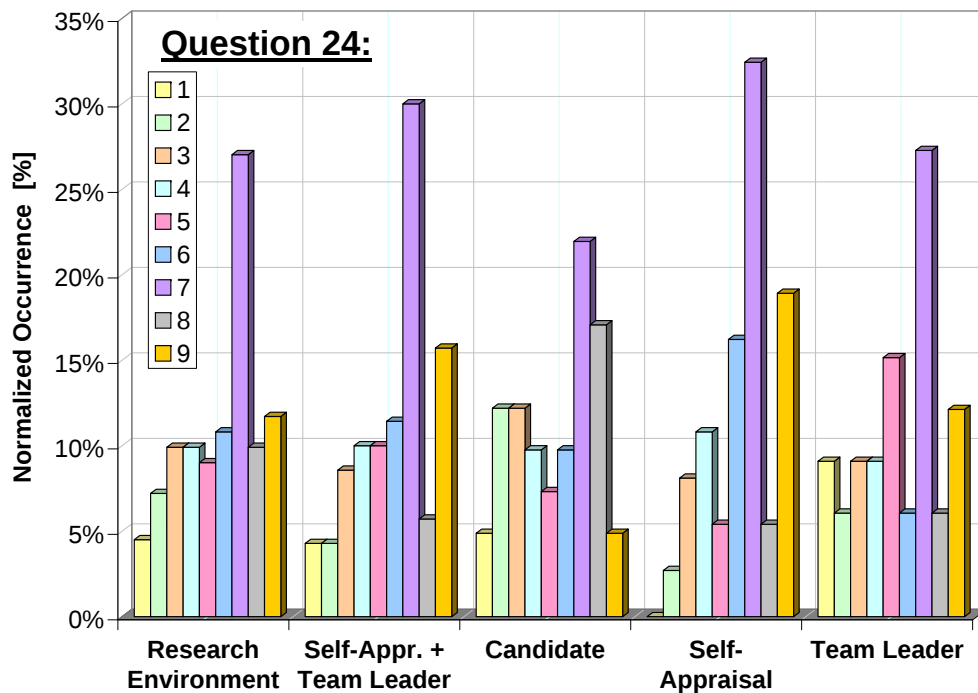


Figure 5.47: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 24: *Is concerned with how her/his decisions affect the lives of others.*

opinion about the team leaders decisions on her/his own. Supervisors and the candidate assume that team members will “raise their voice” and make her/him aware if their decisions affect their lives in an unpleasant way. This assumption might be true in many cases, but the reality¹⁷⁶ seems to be different than this assumption. Therefore, supervisors and the candidate should actively¹⁷⁷ discuss their decisions with their team members in appropriate environments¹⁷⁸ before they announce them in front of the group and push some members by their decisions “with their backs against a wall”.

The calculated correlation coefficients¹⁷⁹ for Question 24¹⁸⁰ are within the interval

¹⁷⁶see Figure 5.47

¹⁷⁷i.e., starting the discussions by themselves

¹⁷⁸e.g., privately and in a relaxed environment (during coffee breaks)

¹⁷⁹see Figure 5.48

¹⁸⁰**Question 24:** *Is concerned with how her/his decisions affect the lives of others.*

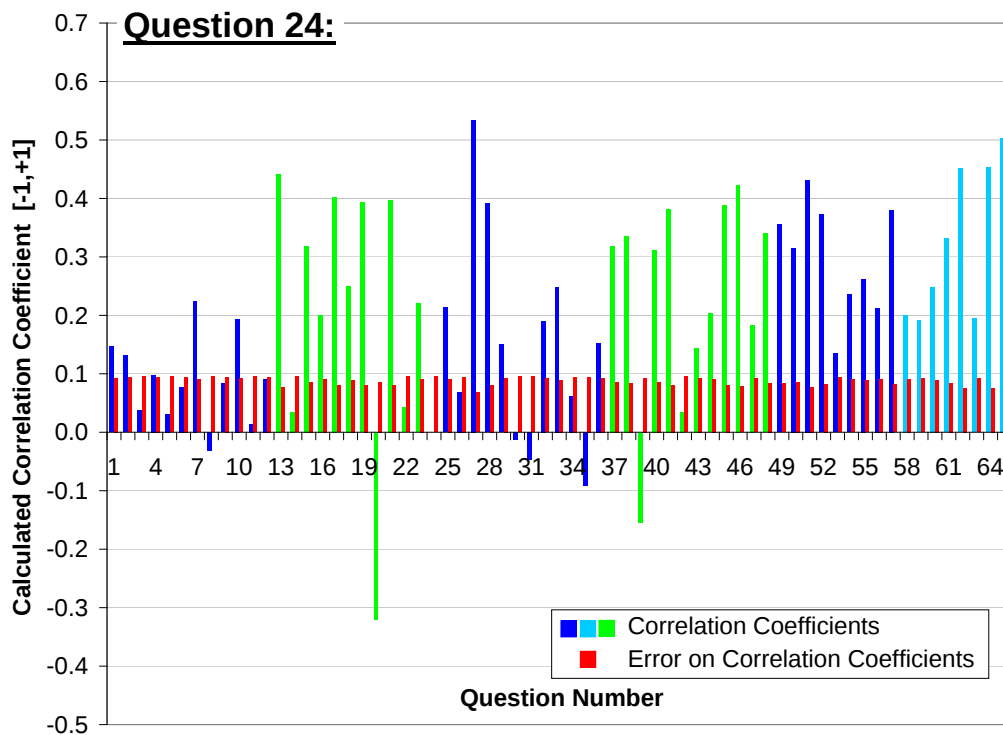


Figure 5.48: Correlation coefficients for Question 24: *Is concerned with how her/his decisions affect the lives of others.*

$[-0.5, +0.5]$, except for Question 27¹⁸¹ (0.534) and Question 65¹⁸² (0.504). The slightly higher correlation coefficient for Question 27 can be explained by a small causal overlap with the content of Question 24. Being concerned with how a leader's decisions affect the lives of others can also be seen as modeling positive team attributes, but the overlap is very small. Therefore, no causal correlation exists between Question 24 and any other question within the questionnaire and Question 24 does not need to be modified.

¹⁸¹Question 27: *Models positive team attributes such as mutual respect, open communication, and full participation.*

¹⁸²Question 65: *Handles difficult people and situations effectively.*

5.3 Leading by Example

5.3.1 Question 25

Question 25¹⁸³ asks if the team leader sets high and clear standards for others by her/his own behavior.

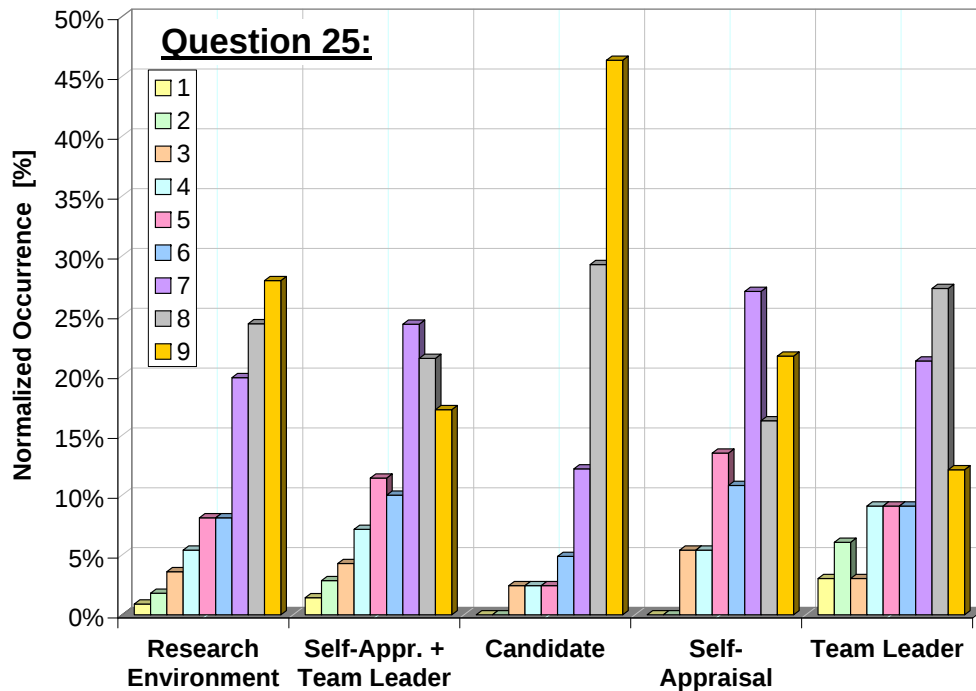


Figure 5.49: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 25: *Sets high and clear standards for others by her/his own behavior.*

Setting high and clear standards by her/his own behavior in international research laboratories means that the team leader prepares carefully for talks and thereby does not waste the time of the team while they are listening to the leaders presentations. It also includes the leaders daily behavior like dressing appropriately, treating colleagues and team members with the outmost respect, keeping an orderly office and work place, so that other team members are not bothered or handicapped. Furthermore, appearing on time for meetings, preparing carefully for the meeting, keeping her/his comments short and clear and thereby not wasting the time of her/his colleagues, etc.

¹⁸³ **Question 25:** *Sets high and clear standards for others by her/his own behavior.*

The obtained occurrence distributions¹⁸⁴ show a different pattern for all groups. The participants believe that in only 60% of all the cases their supervisor is Often (= 7) to Always (= 9) capable of motivating their team members by their own behavior. They also believe that their behavior motivates their colleagues and team members in 64% of all cases. The candidate represents an exception from this trend. Almost 88% of the participants believe that the candidate sets Often (= 7) to Always (= 9) high and clear standards by her/his own behavior. The candidate pattern shows a distinctive peak at 9 (= Always) with an amplitude of almost twice as high as all the other group maxima. Therefore, the candidate seems to set — not only a good example, but also — high and clear standards for others by her/his own behavior. The difference of the self-appraisal and supervisor groups from the candidate should be investigated by interviews in more detail to find out if some of the behaviors are just bothering team members or if they actually affect the team's work performance.

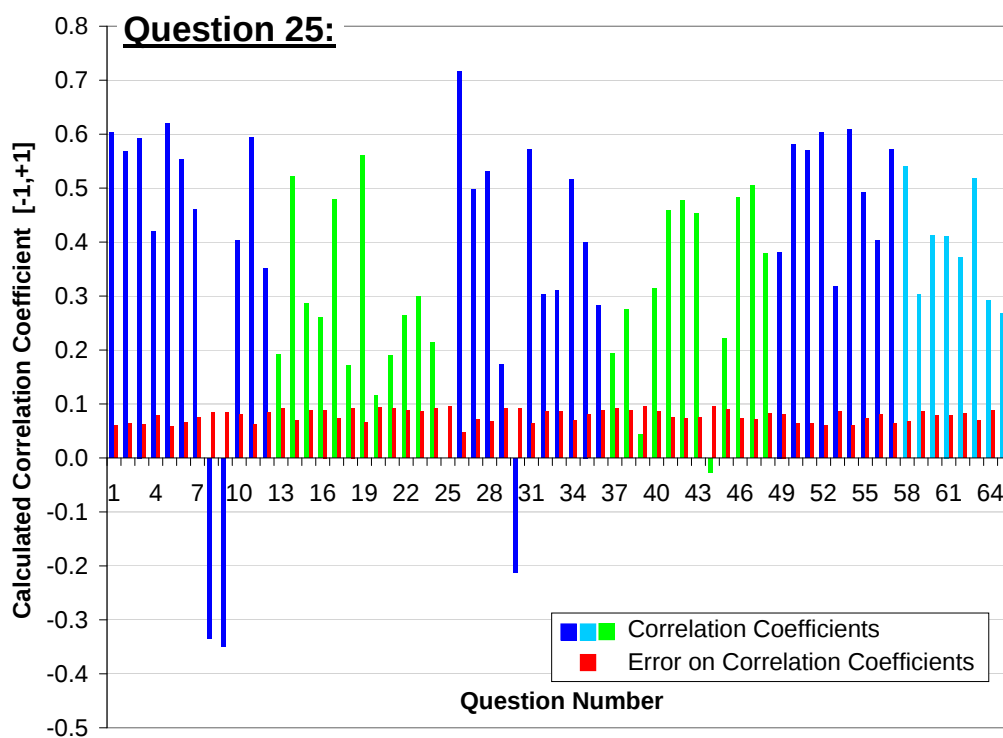


Figure 5.50: *Correlation coefficients for Question 25: Sets high and clear standards for others by her/his own behavior.*

¹⁸⁴see Figure 5.49

The calculated correlation coefficients¹⁸⁵ for Question 25¹⁸⁶ are smaller than 0.6, except for Question 01¹⁸⁷ (0.602), Question 05¹⁸⁸ (0.621), Question 26¹⁸⁹ (0.717), Question 52¹⁹⁰ (0.603), and Question 54¹⁹¹ (0.609). Question 03¹⁹² (0.593), Question 11¹⁹³ (0.593), and Question 50¹⁹⁴ (0.581) have a correlation coefficient close to 0.6.

Question 01, 03, 05, 11, 50, 52, and 54 have a correlation coefficient close to 0.6, but they do not show any close causal correlation to Question 25. The higher correlation coefficient can be explained by weak content overlaps. Setting high and clear standards for others by her/his own behavior has a weak relation to letting employees know what they are supposed to do, recognizing what needs to be done, developing others by demonstrating relevant skills, helping others team to focus on goals, accomplishing a goal or task in time, being good at making things work and completing assigned tasks, and paying attention to the team's performance. But all these overlaps are rather weak and asking for different independent directions and traits. Therefore, Question 25 does not need to be modified because of these mentioned questions.

Question 25 and 26 have a correlation coefficient of 0.717, which is higher than the aforementioned values. Setting high and clear standards for others by her/his own behavior has a stronger relation to working (at least) as hard as anyone in the work group and thereby motivating others to achieve and stretch performance than the previous questions. Question 25 is a more general question which is also related to moral standards and general behavior and not only to task specific traits as the formulation for Question 26. Therefore, Question 25 should be modified to the following formulation to distinguish it clearly from the task specific focus of Question 26:

Question 25*: *Sets high and clear standards for others by her/his own behavior towards team members.*

¹⁸⁵see Figure 5.50

¹⁸⁶**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

¹⁸⁷**Question 01:** *Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).*

¹⁸⁸**Question 05:** *Recognizes what needs to be done and takes the initiative to make it happen.*

¹⁸⁹**Question 26:** *Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.*

¹⁹⁰**Question 52:** *Develops others by explaining or demonstrating relevant skills.*

¹⁹¹**Question 54:** *Helps the team to focus on goals and objectives.*

¹⁹²**Question 03:** *Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.*

¹⁹³**Question 11:** *Is good at making things work and completing the assigned tasks.*

¹⁹⁴**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

5.3.2 Question 26

Question 26¹⁹⁵ asks if the team leader works (at least) as hard as anyone in the work group and if she/he thereby motivates team members to achieve or even stretch their performance levels.

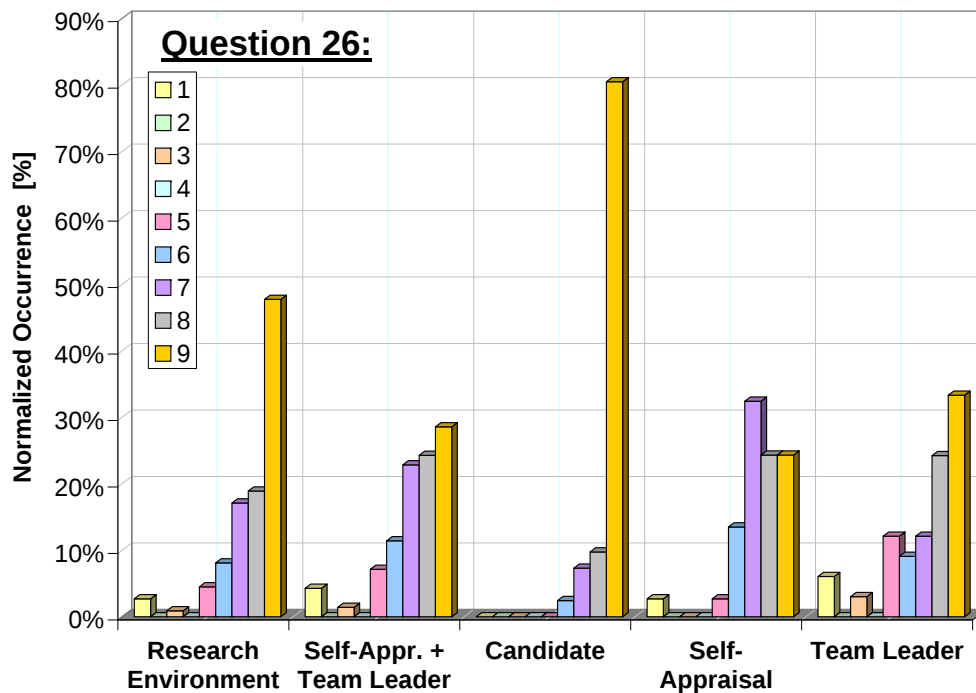


Figure 5.51: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 26: **Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.**

It is almost daily routine in scientific research projects to achieve challenging goals such as doing an experiment that has never been done before or using new procedures, because the old ones did not reach the required accuracy or performance levels. Therefore, it is essential to achieve or even stretch the teams typical performance levels, either by working very hard and long or by using methods which deviate from standard procedures and thereby induce a lot of stress in the involved personnel. The team members will only follow in such processes if the leader also works very hard, takes (at least) the same risks, and shows her/his commitment towards the project and the team. A team leader who

¹⁹⁵ **Question 26:** Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.

only dedicates the normal so-called “8-to-5” working hours to her/his research project will hardly be able to motivate her/his team members to go beyond this standard time-frame.

Another motivation for the team is also when problems are being solved “over night”. This means for example that the team leader still keeps on dealing with a problem that occurred shortly before the rest of the team left the work place and that she/he presents the next morning either a small report about the possible solutions that should be considered or can be excluded or even the solution itself. It is very frustrating for team members to return back the next morning and to discover that the problem still exists and that the team leader either spent a nice evening or had a good-night sleep. Therefore, working (at least) as hard as anyone else in the team motivates team members to achieve and even stretch their performance. Thus, Question 26 asks about the team leaders readiness to go beyond the standard working hours and thereby motivates her/his team members.

The obtained occurrence distributions¹⁹⁶ show a different pattern for all groups. 81% of the participants are willing to work “Often/Always” as hard as anyone in their team. The also believe that only 70% of their supervisor would be willing to do so. The pattern for the candidate shows a completely different picture. 97.6% of the participants believe that the candidate “Often/Always” works at least as hard as anyone else in the team and 81% believe that the candidate “Always” works at least as hard as anyone else and thereby motivates her/his team members to stretch their own performance.

The calculated correlation coefficients¹⁹⁷ for Question 26¹⁹⁸ are smaller than 0.6, except for Question 03¹⁹⁹ (0.603), Question 05²⁰⁰ (0.616), Question 11²⁰¹ (0.687), Question 25²⁰² (0.717), Question 31²⁰³ (0.662), and Question 42²⁰⁴ (0.604). Question 54²⁰⁵ (0.556) has a correlation coefficient close to 0.6.

¹⁹⁶see Figure 5.51

¹⁹⁷see Figure 5.52

¹⁹⁸**Question 26:** *Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.*

¹⁹⁹**Question 03:** *Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.*

²⁰⁰**Question 05:** *Recognizes what needs to be done and takes the initiative to make it happen.*

²⁰¹**Question 11:** *Is good at making things work and completing the assigned tasks.*

²⁰²**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

²⁰³**Question 31:** *Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.*

²⁰⁴**Question 42:** *Is capable of juggling multiple demands.*

²⁰⁵**Question 54:** *Helps the team to focus on goals and objectives.*

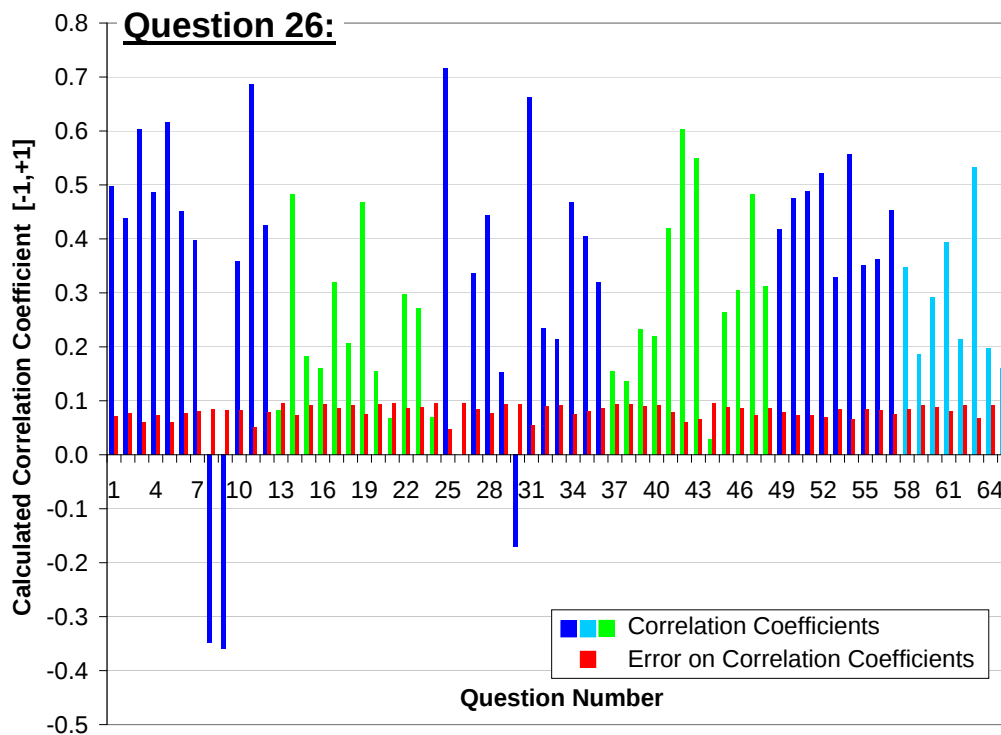


Figure 5.52: *Correlation coefficients for Question 26: Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.*

Question 03, 05, 11, 31, 42, and 54 have a weak causal connection to Question 26, because accomplishing a goal or task in time, or recognizing what needs to be done, or being good at making things work and completing assigned tasks, or setting high and clear standards for others by her/his own behavior, or establishing challenging goals for themselves, or being capable of juggling multiple demands, or helping the team to focus on goals and objectives always requires to work (at least) as hard as anyone in the work group. Thus, Question 26 is a global summary containing small content parts of all the other mentioned questions which point in different and independent directions. Question 26 requires no modification because there is no strong causal correlation to the other questions.

The high correlation coefficient between Question 26 and 25 was already discussed in the previous section.²⁰⁶

²⁰⁶see Section 5.3.1, page 122.

5.3.3 Question 27

Question 27²⁰⁷ asks about the team leader's capabilities to model positive team attributes such as mutual respect, open communication, and full participation.

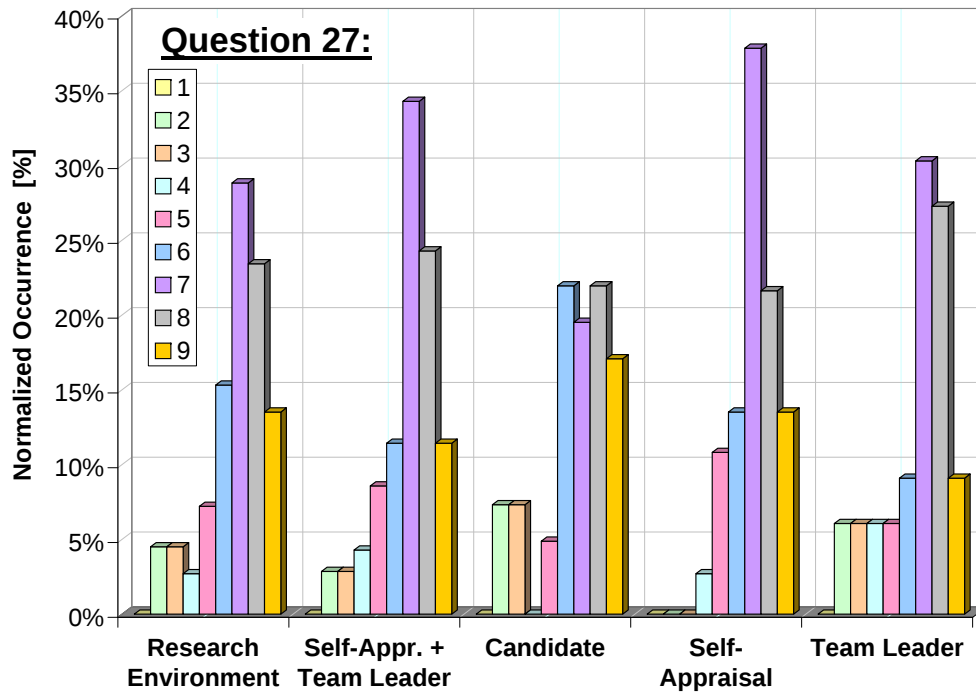


Figure 5.53: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 27: *Models positive team attributes such as mutual respect, open communication, and full participation.*

As already discussed in a previous section²⁰⁸, international scientific research communities are rather small groups of up to a maximum of a few hundred specialists who know each other very well, at least from their publications and presentations. Typically, teams change when a collaboration is dissolved after finishing a project or new members join or leave the team while the project is being carried out. However, the mentioned community stays roughly the same with only minor fluctuations and it is likely that team members will work together again for a different project after the previous project has been finished.

²⁰⁷**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

²⁰⁸see Section 5.2.8, page 110

Therefore, it is essential for a team leader to model positive team attributes such as mutual respect, full participation, etc. to motivate her/his actual team and also to prepare for future projects she/he might lead with at least some of the previous team members. Typically, new team members joining the team orient themselves in their motivation and behavior compared to team members who have already worked with the team leader in previous projects. Thus, modeling positive team attributes might not only have effects on the current team, but might also disturb or facilitate future projects in which the team leader could be involved with at least parts of her/his previous team.

The obtained occurrence distributions²⁰⁹ show a similar pattern for all groups: distinctive maximum peaks within the upper two categories from 7 (= Often) to 8 (= Often/Always). The tails towards lower category values (Occasionally (=5) to Never (= 1)) are the important parts of the distributions. The participants believe that more than 24% of their supervisor are only “Occasionally” to “Never” modeling positive team attributes, while in less than 20% of all cases the candidate is perceived as not modeling positive team attributes. On the other hand, the participants believe that in less than only 14% of all cases they are not modeling positive team attributes. It is important to study these groups and the reasons why they believe that their supervisors are not modeling positive team attributes. A change in the team leader’s behavior might improve the motivation and even enhance the performance of the whole team.

The calculated correlation coefficients²¹⁰ for Question 27²¹¹ are smaller than 0.6, except for Question 17²¹² (0.618), Question 19²¹³ (0.671), Question 46²¹⁴ (0.699), and Question 62²¹⁵ (0.628). Question 15²¹⁶ (0.588), Question 37²¹⁷ (0.580), Question 51²¹⁸ (0.582), and Question 57²¹⁹ (0.590) have a correlation coefficient close to 0.6.

²⁰⁹see Figure 5.53

²¹⁰see Figure 5.54

²¹¹**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

²¹²**Question 17:** *Acknowledges her/his own mistakes and takes corrective action.*

²¹³**Question 19:** *Gives team members honest and fair answers.*

²¹⁴**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

²¹⁵**Question 62:** *Openly shares information with others.*

²¹⁶**Question 15:** *Treats people as equals, fairly and consistently (behaves predictably).*

²¹⁷**Question 37:** *Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.*

²¹⁸**Question 51:** *Likes to use her/his leadership power to help subordinates grow.*

²¹⁹**Question 57:** *Spends time effectively teaching or mentoring team members.*

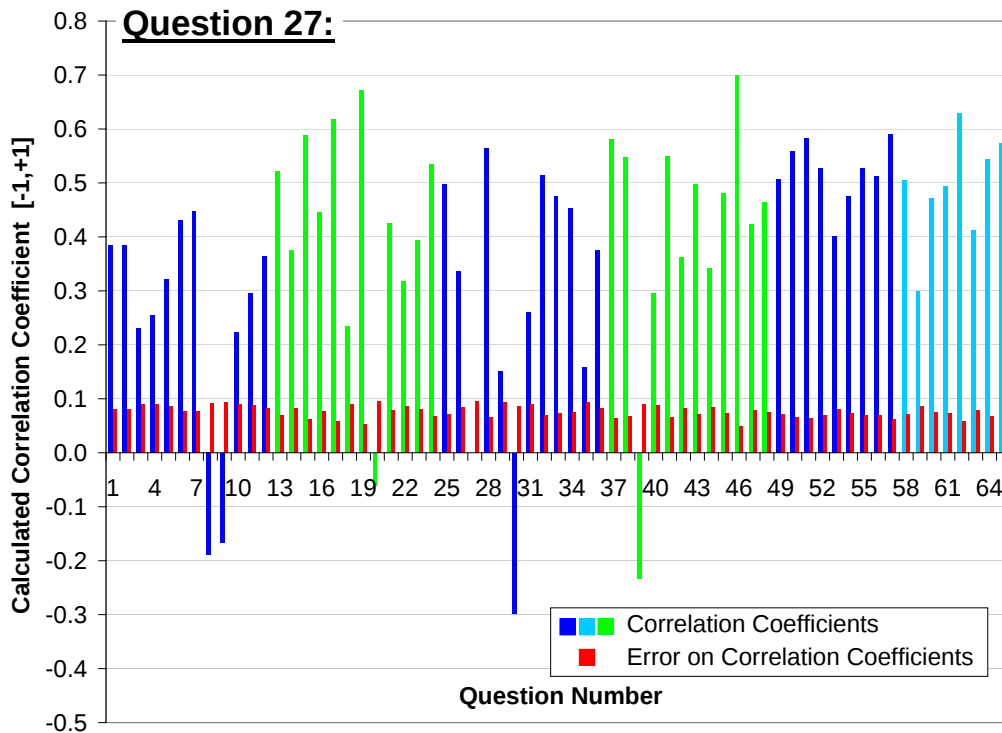


Figure 5.54: *Correlation coefficients for Question 27: Models positive team attributes such as mutual respect, open communication, and full participation.*

Question 19 and 46 have high correlation coefficients which lie inside the interval $[0.67, 0.70]$. This can be explained by content overlaps in the questions. Giving team members honest and fair answers, or creating a real feeling of teamwork within the team can be seen as a part of modeling positive team attributes. Question 27 asks about general leader attributes, while Question 19 and 46 focus on specific character traits like honesty and fairness or a feeling of teamwork. There is no strong content overlap between Question 27 and 46, despite the high correlation coefficient. Question 27 is modified (by deleting “open communication”) to the following formulation to reduce the correlation to Question 19:

Question 27*: *Models positive team attributes such as mutual respect and full participation.*

5.3.4 Question 28

Question 28²²⁰ asks about the team leader's moral standards and if she/he can be trusted with confidential information.

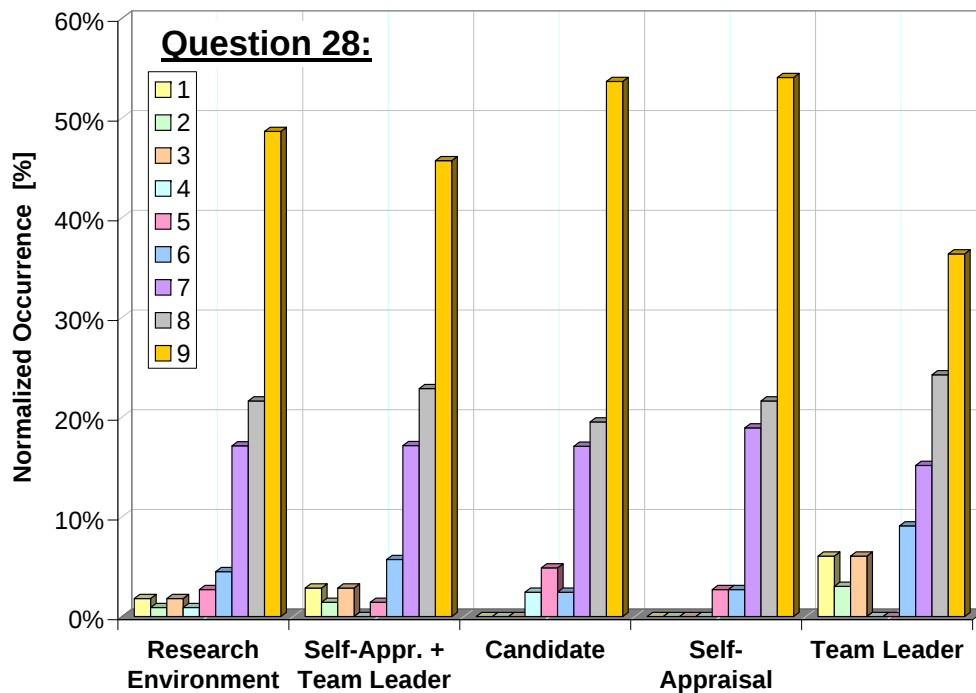


Figure 5.55: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 28: *Has high moral standards. Can be trusted with confidential information.*

Research projects are usually finished by publishing obtained result in journals or presenting them at conferences, or by writing a Master or PhD thesis. In all cases, the obtained results have to be kept confidential until they are published and mutual trust between team leader and team members is essential. The team leader has to make sure that names in the publications and presentations are quoted according to the contributed work and achieved results. If this very fragile band of trust is broken once then a researcher is marked for the rest of her/his career and working in teams will become very difficult for her/him. Therefore, high moral standards up to the level that one can be trusted even with confidential information is a very important issue for both team leaders and team members.

²²⁰ **Question 28:** *Has high moral standards. Can be trusted with confidential information.*

The obtained occurrence distributions²²¹ show an almost identical pattern for all groups: distinctive maximum peaks for the category 9 (= Always). The trust in the candidate is almost identical to the self-trust of the participants in themselves. Surprisingly, more than 15% of the participants believe that their supervisor Never (= 1) or Seldom (= 3) has high moral standards and cannot be trusted with confidential information. This group of participants should be investigated more in detail to find out the reasons why they believe that their supervisors do not have high moral standards or cannot be trusted.

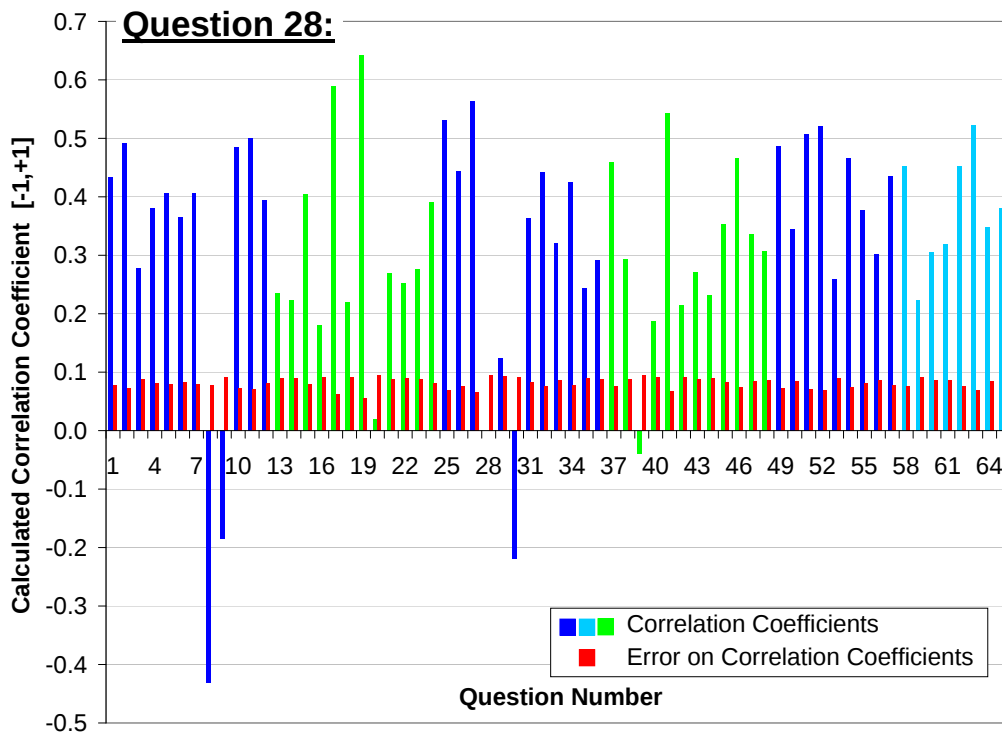


Figure 5.56: *Correlation coefficients for Question 28: Has high moral standards. Can be trusted with confidential information.*

The calculated correlation coefficients²²² for Question 28²²³ are smaller than 0.6, except

²²¹see Figure 5.55

²²²see Figure 5.56

²²³**Question 28:** *Has high moral standards. Can be trusted with confidential information.*

for Question 19²²⁴ (0.642). Question 17²²⁵ (0.589) and Question 27²²⁶ (0.564) have a correlation coefficient close to 0.6.

Specific leadership traits like giving honest and fair answers, or acknowledging own mistakes, or modeling positive team attributes can be summarized into the formulation “having high moral standards”. Despite this fact, Question 28 is not strongly overlapping with Question 17, 19, or 27, because these three questions describe rather specific and independent attributes. On the other hand, Question 28 summarizes several leader attributes and, in addition, specifies the level to which these attributes should reach: “Can be trusted with confidential information”. Therefore, no strong causal correlation exists between Question 28 and the mentioned questions or any other question within the questionnaire and the formulation of Question 28 does not need to be modified.

²²⁴**Question 19:** *Gives team members honest and fair answers.*

²²⁵**Question 17:** *Acknowledges her/his own mistakes and takes corrective action.*

²²⁶**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

5.3.5 Question 29

Question 29²²⁷ asks about the team leader's attitude towards taking credit for other people's ideas.

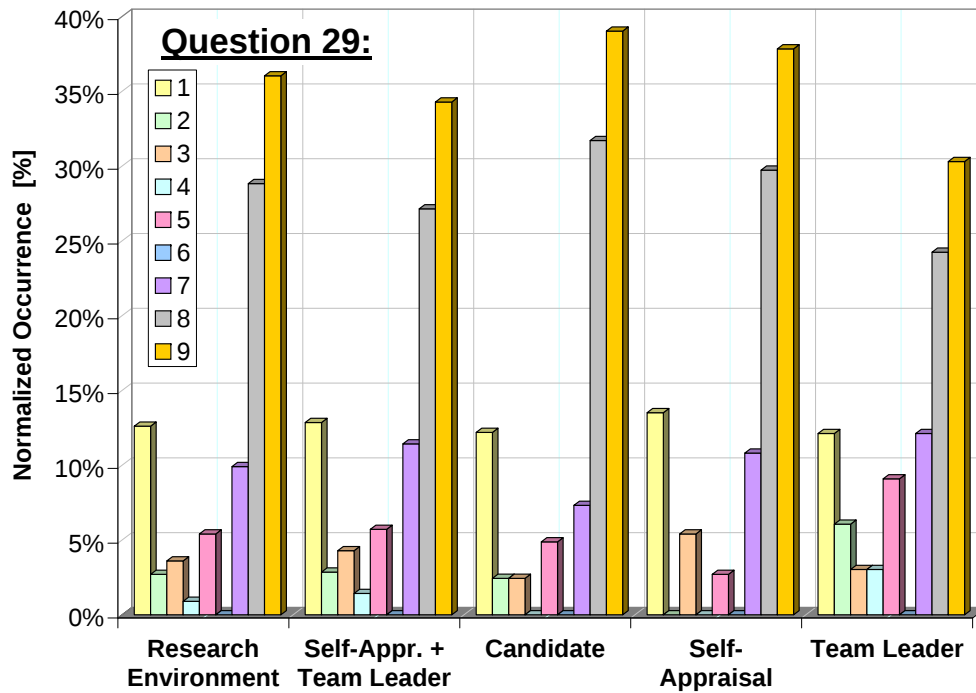


Figure 5.57: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 29: *Would never try to take credit for other people's ideas.*

Scientific research projects “live” and “grow” from people's ideas, which are basically intangible assets that cannot be easily identified as an individual person's property. Thus, there exists the immanent risk that team members or team leaders try to take credit for other people's ideas by publishing them as their own. Not only a direct use of other people's ideas, but also just the immanent threat that a person would be capable or willing to take credit for one's ideas can drop moral and destroy open communication within a team. Therefore, a leader should be permanently concerned with this important issue and make sure that no one within the team ever tries to take credit for other people's ideas.

The obtained occurrence distributions²²⁸ show an almost identical pattern for all groups:

²²⁷Question 29: *Would never try to take credit for other people's ideas.*

²²⁸see Figure 5.57

distinctive maximum peaks for the category 9 (= Always) and, in addition, distinctive peaks of about 13% for category 1 (= Never). It seems that about 13% of the participants had difficulties in correlating the performance key²²⁹ to the formulation of Question 29, since these peaks occur for all categories with the same magnitude. Therefore, Question 29 will be modified²³⁰ to the following formulation to allow a clear correlation between the content and the performance key categories:

Question 29*: *Would try to take credit for other people's ideas.*

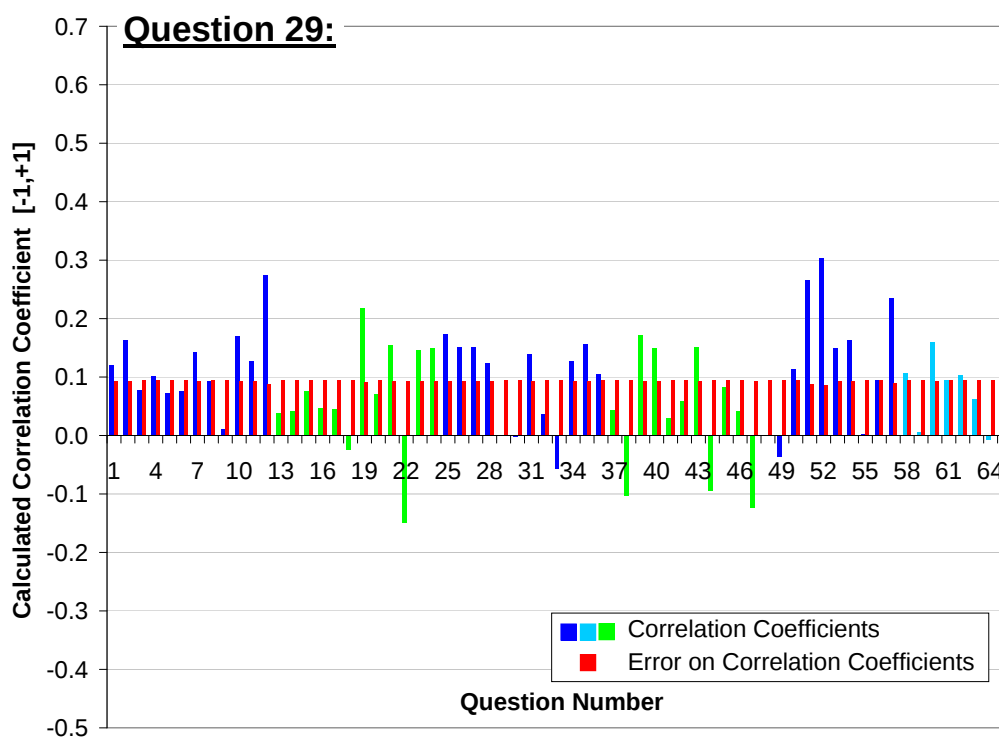


Figure 5.58: *Correlation coefficients for Question 29: Would never try to take credit for other people's ideas.*

The calculated correlation coefficients²³¹ for Question 29²³² are within the interval $[-0.31, +0.31]$. Therefore, no causal correlation exists between Question 29 and any other question within the questionnaire.

²²⁹1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

²³⁰by deleting the word "never"

²³¹see Figure 5.58

²³²**Question 29:** *Would never try to take credit for other people's ideas.*

5.3.6 Question 30

Question 30²³³ asks if the team leader shows favoritism (in an unfair amount) towards some people within the team.

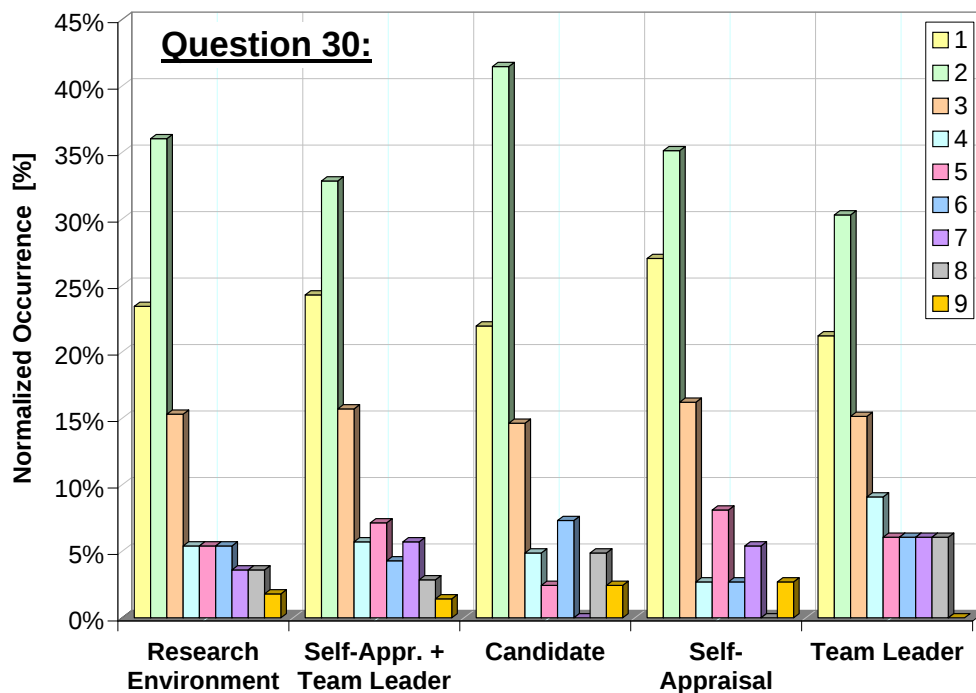


Figure 5.59: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 30: *Shows favoritism (in an unfair amount) towards some people.*

Favoritism exists in any kind of team, from families to professional football teams. Team leaders have to be aware of this fact and try to carefully distinguish between professional decisions and friendship favors. Sophisticated communication skills can reduce the risk that some team members feel excluded or isolated and that frustration occurs. Nevertheless, it is always a tightrope walk for any leader not to show any favoritism and still to have closer friendship relations with some of her/his team members.

The obtained occurrence distributions²³⁴ show almost identical patterns for all groups: distinctive maximum peaks for category 2 (= Never/Seldom). Surprisingly, none of the groups shows a maximum for category 1 (= Never), which means that there some sort

²³³ **Question 30:** *Shows favoritism (in an unfair amount) towards some people.*

²³⁴ see Figure 5.59

of favoritism always exists. This fact can be explained by friendships between some team members, while the relationship between others is purely on a professional level. The pattern for the candidate and self-appraisal are almost identical. The supervisor, on the other hand, shows peaks of 6% for all the categories from 5 (= Occasionally) to 8 (= Often/Always). This means that participants believe that supervisors show favoritism that goes beyond the typical amount caused by friendship relations within the team. Team leaders should be careful not to exaggerate their attention shown towards some team members and thereby risking the frustration and isolation other team members.

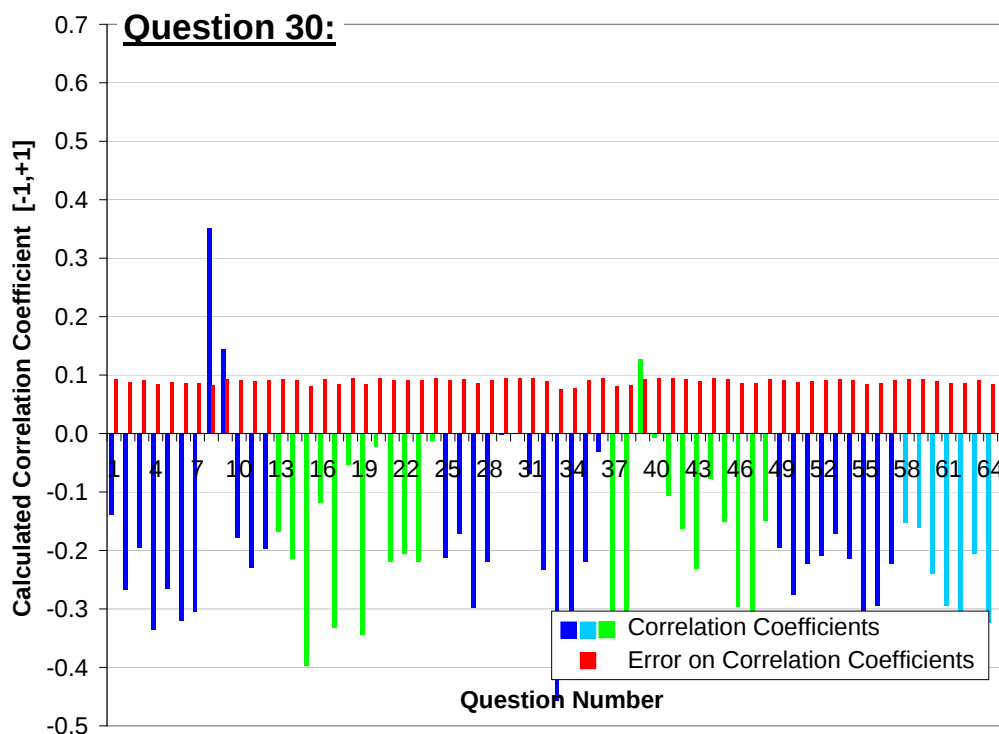


Figure 5.60: *Correlation coefficients for Question 30: Shows favoritism (in an unfair amount) towards some people.*

The calculated correlation coefficients²³⁵ for Question 30²³⁶ are within the interval $[-0.5, +0.5]$. Therefore, no causal correlation at all exists between Question 30 and any other question within the questionnaire.

²³⁵see Figure 5.60

²³⁶**Question 30:** *Shows favoritism (in an unfair amount) towards some people.*

5.3.7 Question 31

Question 31²³⁷ asks about the team leader's habit of establishing challenging goals and to go above and beyond what is expected.

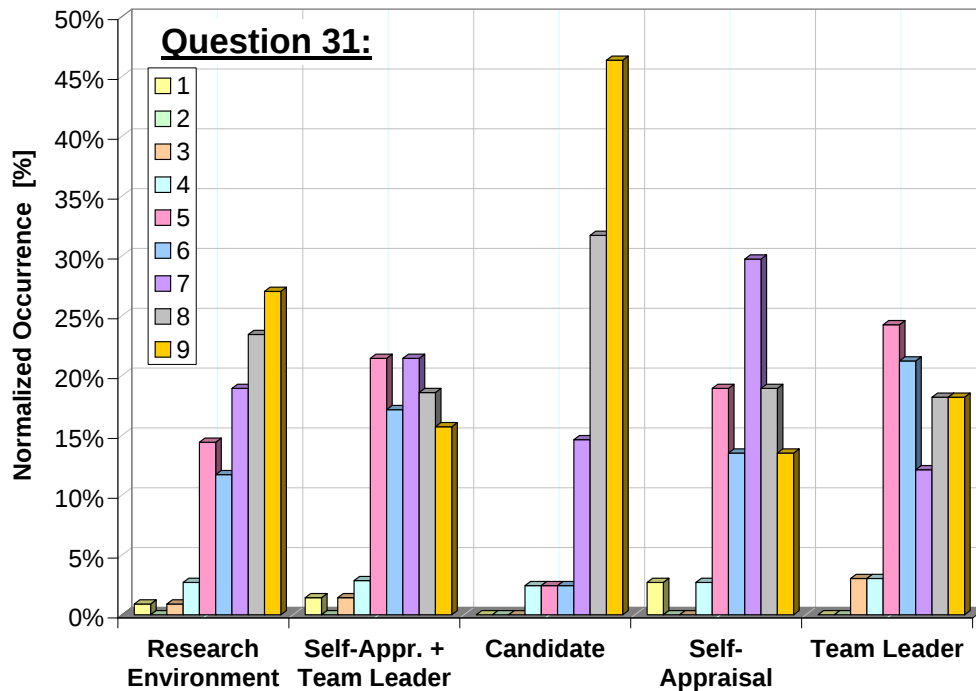


Figure 5.61: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 31: *Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.*

Science and our daily progress in research basically “lives” from people who enjoy establishing challenging goals to add new knowledge to the already existing findings or to make new discoveries. Those quantum-leaps in knowledge and progress are often connected with people who go above and beyond of what was initially expected to be the outcome of a specific research project. Question 31 tries to capture this spirit of a scientist in its content and to ask if the team leader is a manager who follows administrative rules and safe paths or if she/he is willing to set challenging goals and to go above and beyond what would be expected of her/him by her/his peers or superiors.

²³⁷ **Question 31:** *Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.*

The obtained occurrence distributions²³⁸ show a similar pattern for the self-appraisal and supervisor groups: a concentration of the occurrence values within the upper five categories from 5 (= Occasionally) to 9 (= Always). The candidate's pattern varies considerably from these distributions. More than 46% of the participants believe that the candidate Always (= 9) sets challenging goals and goes above and beyond what is expected and almost 93% believe that she/he Often (= 7) to Always (= 9) represents the spirit of a “true scientist”, while only 48.5% of the supervisors fall within these categories and 62% of the participants themselves believe that they would Often (= 7) to Always (= 9) establish challenging goals for themselves.

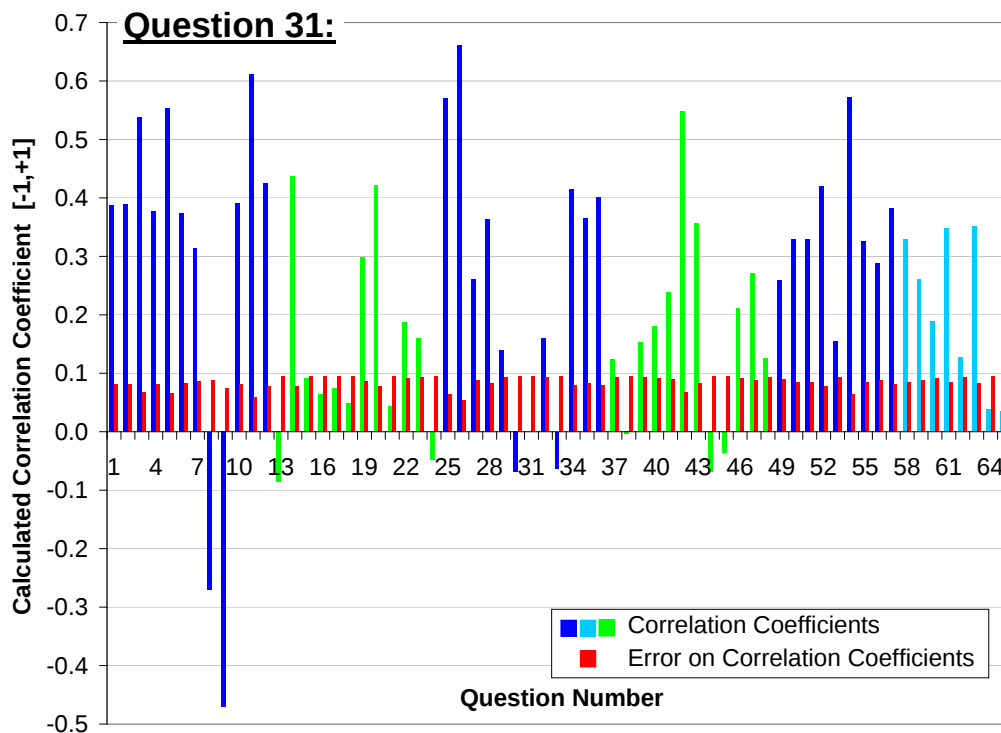


Figure 5.62: Correlation coefficients for Question 31: *Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.*

The calculated correlation coefficients²³⁹ for Question 31²⁴⁰ are smaller than 0.6, ex-

²³⁸see Figure 5.61

²³⁹see Figure 5.62

²⁴⁰**Question 31:** *Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.*

cept for Question 11²⁴¹ (0.611) and Question 26²⁴² (0.662). Question 25²⁴³ (0.571) and Question 54²⁴⁴ (0.573) have a correlation coefficient close to 0.6.

Being good at making things work and completing assigned tasks, or working (at least) as hard as anyone in the work group, or setting high standards by her/his own behavior, or the team to focus on goals are all basically similar to establishing challenging goals for themselves and going above and beyond what is expected. However, Question 31 asks about a general motivation and defines a lower limit or goal to which this drive is directed: going above and beyond what is expected. The other questions address specific and independent attributes which are similar to Question 31, but no strong causal correlation or big content overlaps exists between Question 31 and the mentioned questions or any other question within the questionnaire. Therefore, Question 31 does not need to be modified.

²⁴¹**Question 11:** *Is good at making things work and completing the assigned tasks.*

²⁴²**Question 26:** *Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.*

²⁴³**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

²⁴⁴**Question 54:** *Helps the team to focus on goals and objectives.*

5.3.8 Question 32

Question 32²⁴⁵ asks about the team leader's awareness to recognize her/his own strengths and weaknesses.

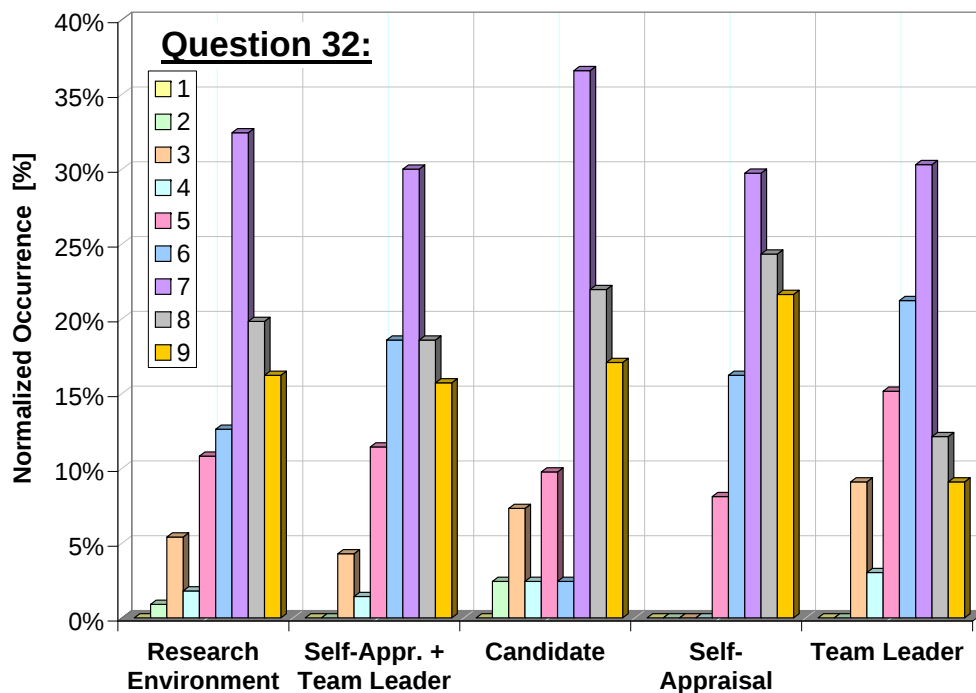


Figure 5.63: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 32: *Possesses awareness of her/his own strengths and weaknesses.*

Being aware of her/his own strengths and weaknesses is an important trait of a team leader within a scientific research project. It can affect the outcome of a project considerably if the leader is not willing to admit shortcomings in some areas and does not ask for help or assistance to finish parts of the project. On the other hand, the team leader should also be aware of her/his strengths so that she/he does not overload certain team members or asks about results or goals that she/he could hardly reach herself/himself, although the team leader might be a specialist in this specific area. Therefore, Question 32 summarizes the leader's awareness of both strengths and weaknesses so that she/he still sets challenging goals without overloading certain team members.

²⁴⁵**Question 32:** *Possesses awareness of her/his own strengths and weaknesses.*

The obtained occurrence distributions²⁴⁶ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants believe that in 76% of all cases they are aware of their own strengths and weaknesses. They also believe that the candidate falls in 76% of the cases in the categories from 7 (= Often) to 9 (= Always). But only 51% of the participants believe that their supervisor (the candidate excluded) are Often (= 7) to Always (= 9) aware of their strengths and weaknesses. Only about 10% believe that their supervisor and the candidate are Seldom (= 2/3) aware of their shortcomings. The reasons for this small group should be investigated in more detail by interviews, which lies beyond the scope of this work.

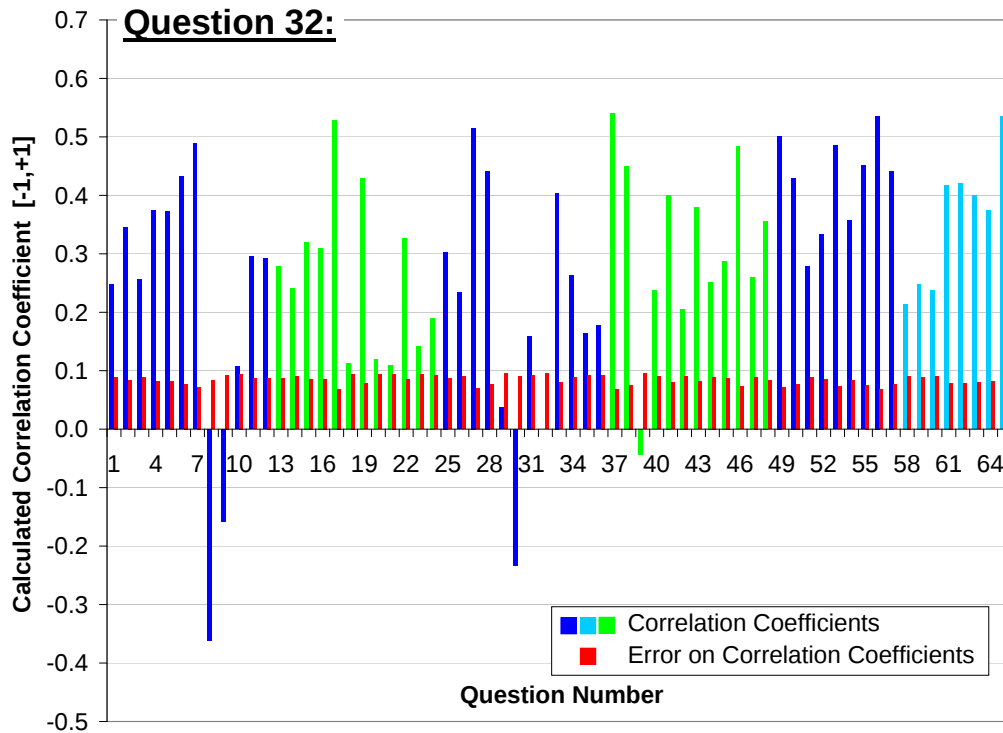


Figure 5.64: Correlation coefficients for Question 32: *Possesses awareness of her/his own strengths and weaknesses.*

The calculated correlation coefficients²⁴⁷ for Question 32²⁴⁸ are within the interval

²⁴⁶see Figure 5.63

²⁴⁷see Figure 5.64

²⁴⁸**Question 32:** *Possesses awareness of her/his own strengths and weaknesses.*

$[-0.5, +0.5]$, except for Question 17²⁴⁹ (0.528), Question 27²⁵⁰ (0.515), Question 37²⁵¹ (0.540), Question 56²⁵² (0.535), and Question 65²⁵³ (0.535).

Only weak causal correlations and small content overlaps exists between Question 32 and the mentioned questions, because awareness of own strengths and weaknesses either includes or describes small parts of the mentioned questions. Therefore, Question 32 does not need to be modified.

²⁴⁹**Question 17:** *Acknowledges her/his own mistakes and takes corrective action.*

²⁵⁰**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

²⁵¹**Question 37:** *Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.*

²⁵²**Question 56:** *Identifies causes of resistance and finds ways to overcome them.*

²⁵³**Question 65:** *Handles difficult people and situations effectively.*

5.3.9 Question 33

Question 33²⁵⁴ asks if the team leader is open to feedback from others and if she/he encourages others to give their feedback.

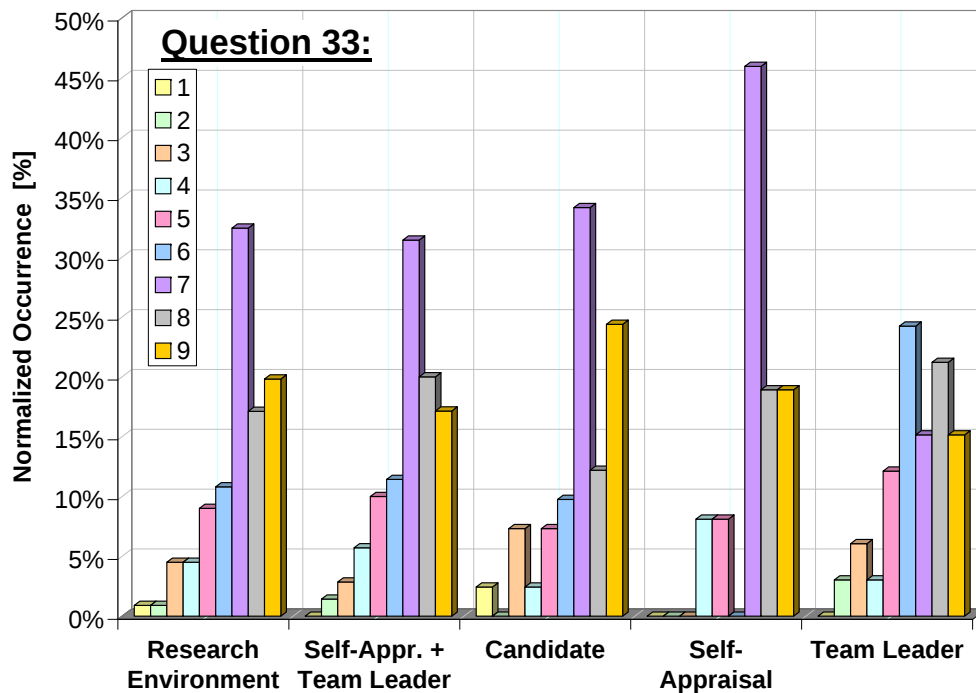


Figure 5.65: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 33: *Is open to feedback from others. Encourages others to give feedback.*

Openness to feedback is essential within scientific research teams that try to pursue challenging goals or to tread new paths. Stress, anxiety, insecurity, time pressure, high workloads, long working hours, conflicts, are just a few of the constant companions for any team member on the way to the project's finalization. A leader has to be open to feedback concerning task or relationship related suggestions of her/his team members to help them find at least some sort of relieve from their constant strain caused by the above mentioned reasons. If a team leader is either ignorant or unwilling to listen to suggestions about necessary changes then conflicts might arise that could affect the team's spirit and performance or in the worst case might destroy the project itself. Therefore, any team leader has not only to be open to feedback from others, but also encourage her/his team

²⁵⁴ **Question 33:** *Is open to feedback from others. Encourages others to give feedback.*

members to give their feedback. This should happen in a private and relaxed environment where the team member is put at ease and willing to speak openly. Furthermore, the team leader has to ensure that she/he is even willing to accept negative feedback and that this feedback will neither affect the work relations nor the career prospects of any team member in a negative way.

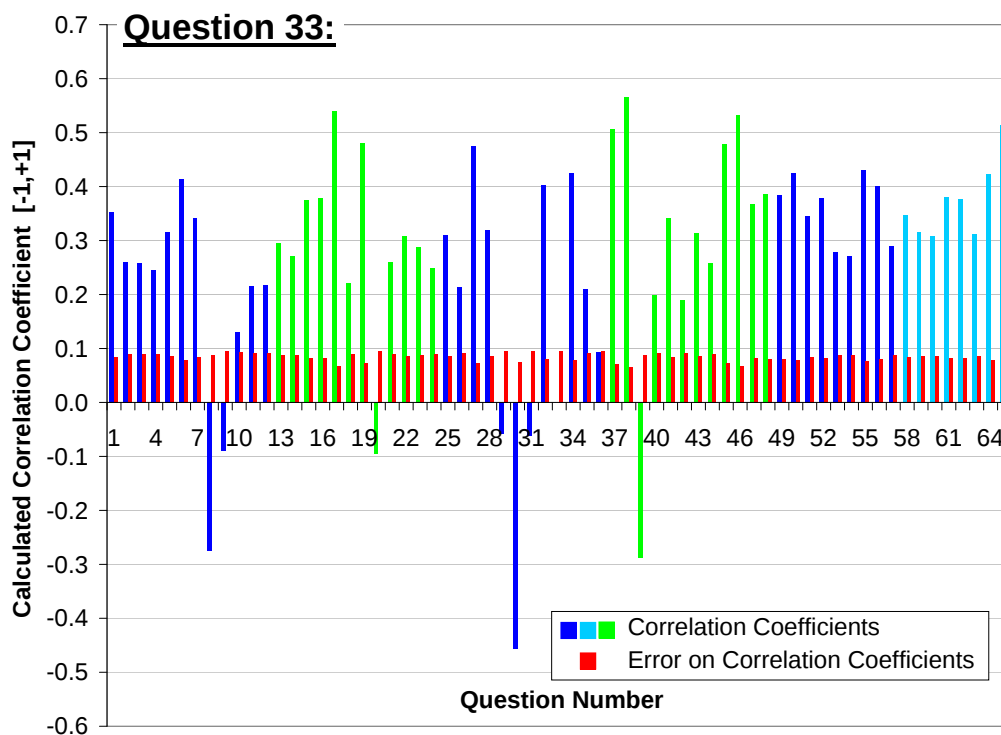


Figure 5.66: *Correlation coefficients for Question 33: Is open to feedback from others. Encourages others to give feedback.*

The obtained occurrence distributions²⁵⁵ show a similar pattern for the supervisor and the candidate: distinctive maximum peaks for the categories 6 resp. 7 (= Often). The participants, on the other hand, believe that they are considerably more often open to feedback than their supervisor or the candidate. They also believe that it Never (= 1) to Seldom (= 3) happens that they would ignore feedback from other or not encourage their team members enough to give them their feedback. The participants also believe that in about 10% of all cases their supervisor and also the candidate ignore feedback or are not encouraging their team members enough to give their feedback. The reasons for these beliefs go beyond the scope of this questionnaire and should be investigated in more detail

²⁵⁵see Figure 5.65

by personal interviews.

The calculated correlation coefficients²⁵⁶ for Question 33²⁵⁷ are within the interval $[-0.5, +0.5]$, except for Question 17²⁵⁸ (0.540), Question 37²⁵⁹ (0.507), Question 38²⁶⁰ (0.566), and Question 65²⁶¹ (0.515).

Acknowledging ones own mistakes, or encouraging team members to express ideas/suggestions and listening receptively to employees' ideas/suggestions, or handling difficult people and situations effectively includes being open to feedback from others as asked by Question 33. But there is no big content overlap or strong correlation between the independent directions described by the mentioned questions. Therefore, Question 33 does not need to be modified.

²⁵⁶see Figure 5.66

²⁵⁷**Question 33:** *Is open to feedback from others. Encourages others to give feedback.*

²⁵⁸**Question 17:** *Acknowledges her/his own mistakes and takes corrective action.*

²⁵⁹**Question 37:** *Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.*

²⁶⁰**Question 38:** *Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.*

²⁶¹**Question 65:** *Handles difficult people and situations effectively.*

5.3.10 Question 34

Question 34²⁶² asks about the team leader's readiness to learn from her/his own experiences and also those of others and, furthermore, to seek opportunities for self-development.

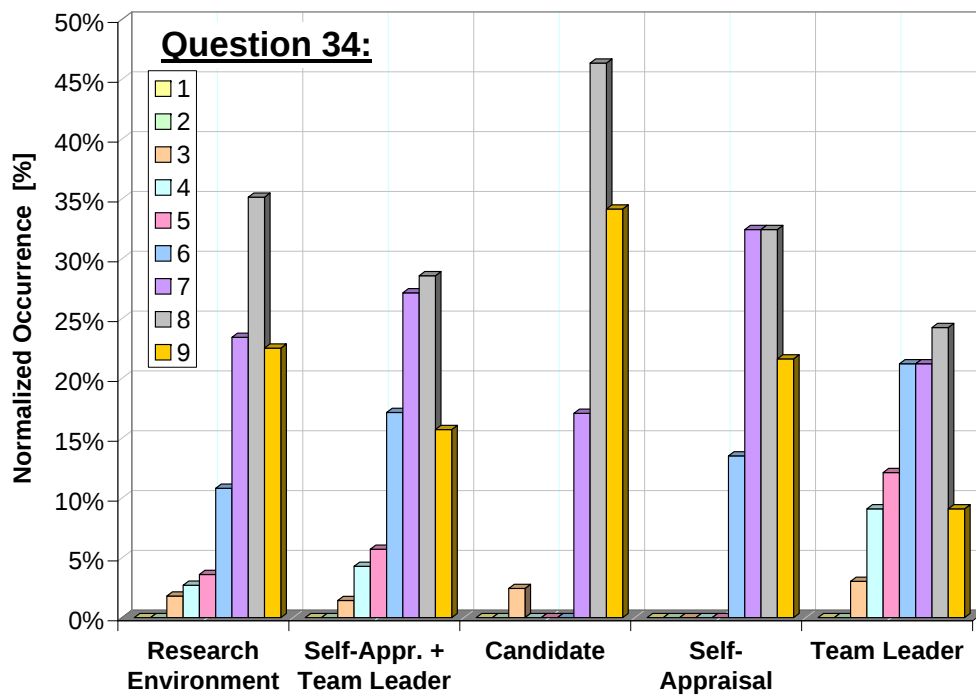


Figure 5.67: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 34: **Learns from own experiences and also those of others. Seeks opportunities for self-development.**

Science and research are processes of constant changes and evolution where successes and failures sometimes come hand-in-hand. Team leaders and team members should therefore be capable not only of learning from mistakes but also to review successes and try to learn and improve from the methods and procedures that have been used to achieve the results. It is very tempting just to celebrate the success and not to reflect about how this outcome was achieved. Thus, most scientists admit that they typically learned more from their mistakes than from their successes. Not only learning from one's own experiences is important for scientists and researchers, but also to learn from the experiences of others and, furthermore, to seek opportunities for self-development. Learning from experiences

²⁶² **Question 34:** *Learns from own experiences and also those of others. Seeks opportunities for self-development.*

and successfully pursuing self-development opportunities strengthens the self-confidence and therefore the trust of the team members in the team leaders capabilities to plan and execute experiments and projects.

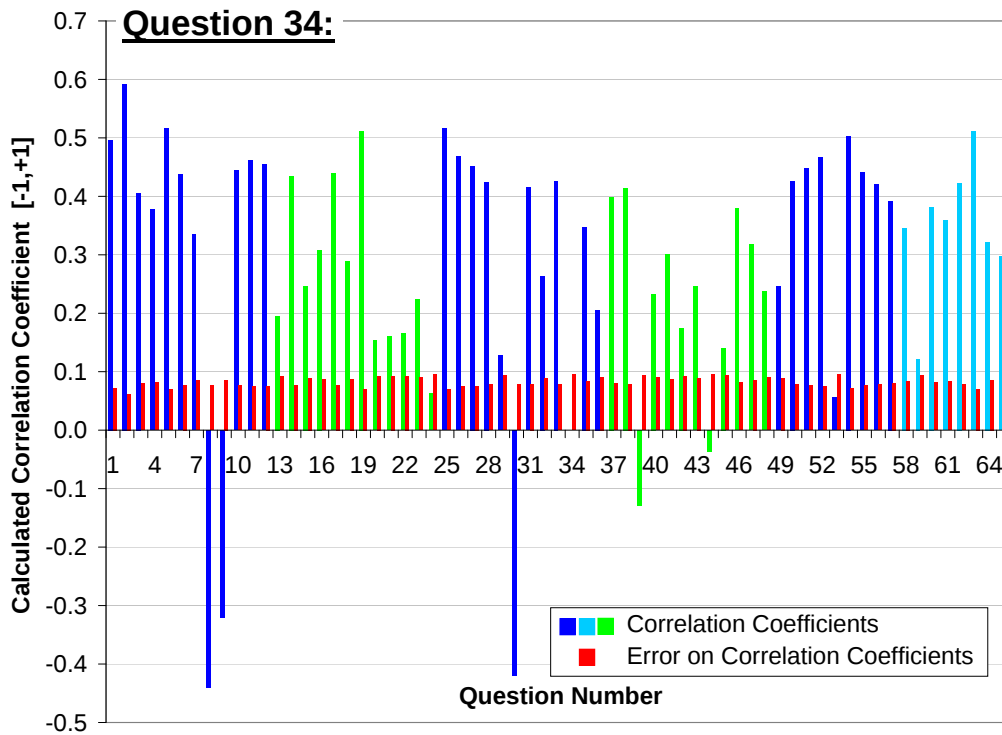


Figure 5.68: *Correlation coefficients for Question 34: Learns from own experiences and also those of others. Seeks opportunities for self-development.*

The obtained occurrence distributions²⁶³ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants believe that in 86.5% of all cases they Often (= 7) to Always (= 9) learn from their own experiences, but they think that only 54.5% of their supervisors are capable of learning from experiences. Again, the candidate's behavior is an exception to this pattern. The participants believe that the candidate learns in 97.5% of all cases from her/his own experiences and also seeks opportunities for self development. Surprisingly, more than 24% of the participant's supervisors are Occasionally (= 5) to Seldom (= 3) willing to learn from their own experiences or seek opportunities for self-development. The reasons for these beliefs go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

²⁶³see Figure 5.67

The calculated correlation coefficients²⁶⁴ for Question 34²⁶⁵ are within the interval $[-0.5, +0.5]$, except for Question 02²⁶⁶ (0.592), Question 05²⁶⁷ (0.516), Question 19²⁶⁸ (0.512), Question 54²⁶⁹ (0.503), and Question 63²⁷⁰ (0.511).

Making suggestions about how to solve problems, or recognizing what needs to be done, or team members honest and fair answers, or helping the team to focus on goals, or dealing with issues in a straightforward manner have almost no content overlap or causal correlation to learning from own experiences and seeking opportunities for self-development. Therefore, Question 34 does not need to be modified.

²⁶⁴see Figure 5.68

²⁶⁵**Question 34:** *Learns from own experiences and also those of others. Seeks opportunities for self-development.*

²⁶⁶**Question 02:** *Makes suggestions about how to solve problems and sets standards of performance for group members.*

²⁶⁷**Question 05:** *Recognizes what needs to be done and takes the initiative to make it happen.*

²⁶⁸**Question 19:** *Gives team members honest and fair answers.*

²⁶⁹**Question 54:** *Helps the team to focus on goals and objectives.*

²⁷⁰**Question 63:** *Deals with issues in a straightforward manner.*

5.3.11 Question 35

Question 35²⁷¹ asks about the team leader's readiness to speak up even when her/his opinion is in the minority.

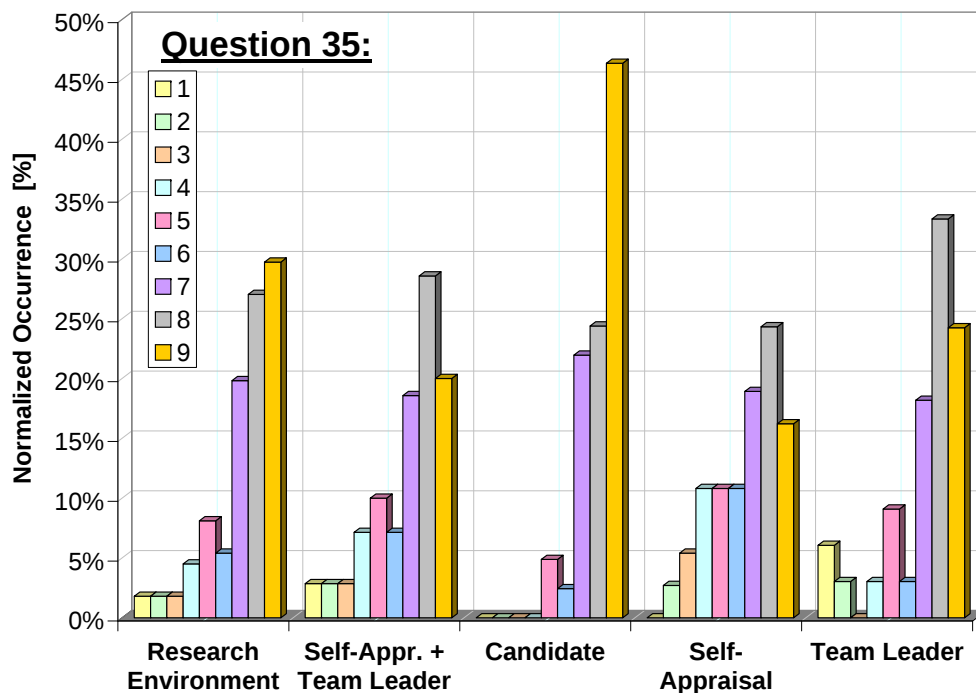


Figure 5.69: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 35: *Speaks up even when her/his opinion is in the minority.*

As already mentioned in the previous section²⁷², science and research are processes of constant changes and evolution where fresh and new ideas are sometimes needed on an almost hourly basis. Team leaders and team members should therefore be capable of not only having revolutionary thoughts and developing new ideas, but also having the capability to formulate and communicate these ideas and to defend them — if necessary — even against a majority of the team. Having new ideas, presenting and defending them, and finally implementing those ideas into a project is the heart and the core of scientific research. Learning how to speak up against a majority of the team and pushing through any resistance that might come up against those ideas, strengthens the self-confidence and therefore also the trust of the team members in the team leaders capabilities to plan and

²⁷¹Question 35: *Speaks up even when her/his opinion is in the minority.*

²⁷²see Section 5.3.10, page 147

execute experiments and projects and also to lead successfully through crisis situations. Question 35 therefore addresses the team leader's readiness to speak up even when her/his opinion is in the minority.

The obtained occurrence distributions²⁷³ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants believe that in only 60% of all cases they would speak up if their opinion is in the minority. They further believe, that just 75% of their supervisors would Often (= 7) to Always (= 9) raise their voices if their ideas are in the minority. On the other hand, in more than 92% of all cases the candidate would speak up and stand behind her/his opinion even if it is opposed by the rest of the team. Only 32% of the participants believe that they would Occasionally (4 to 6) stand up and defend their ideas against a majority in the team. Again, the reasons for this lack of self-confidence are not an objective of this questionnaire and should be investigated in more detail by the individual team leaders.

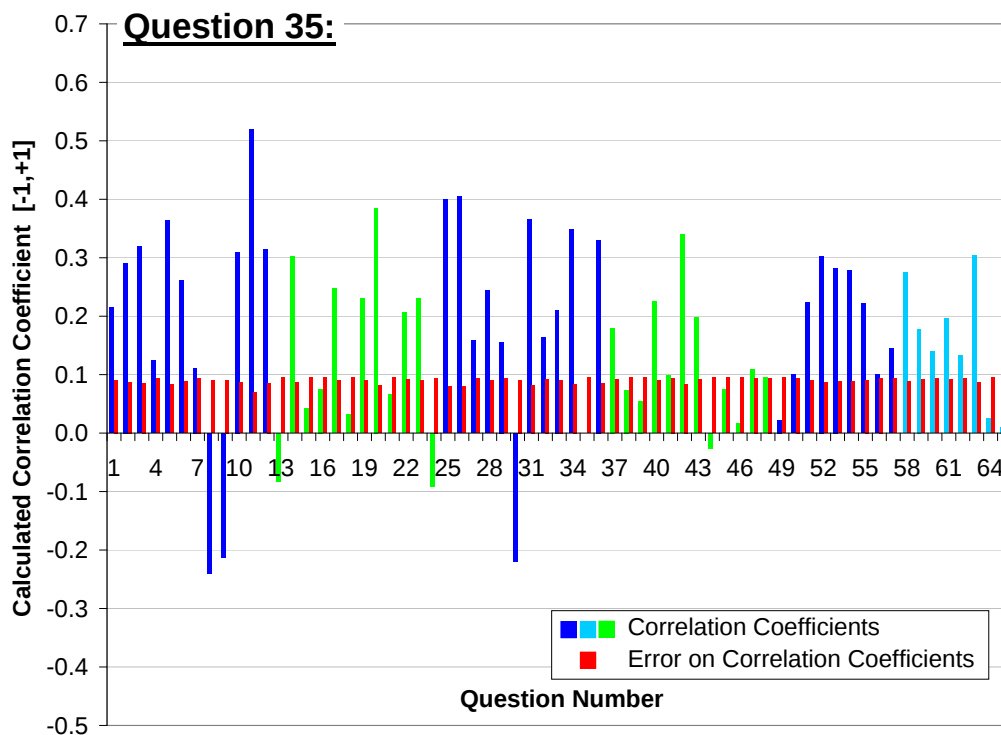


Figure 5.70: Correlation coefficients for Question 35: *Speaks up even when her/his opinion is in the minority.*

²⁷³see Figure 5.69

The calculated correlation coefficients²⁷⁴ for Question 35²⁷⁵ are within the interval $[-0.5, +0.5]$, except for Question 11²⁷⁶ (0.520).

Speaking up even when your own opinion is in the minority is not causally correlated to being good at making things work and completing assigned tasks. Therefore, no causal correlation exists between Question 35 and 11 or any other question within the questionnaire and Question 35 does not need to be modified.

²⁷⁴see Figure 5.70

²⁷⁵**Question 35:** *Speaks up even when her/his opinion is in the minority.*

²⁷⁶**Question 11:** *Is good at making things work and completing the assigned tasks.*

5.3.12 Question 36

Question 36²⁷⁷ asks if the team leader is capable of staying focused and thinking clearly under pressure or in difficult situations when she/he is experiencing strong emotions.

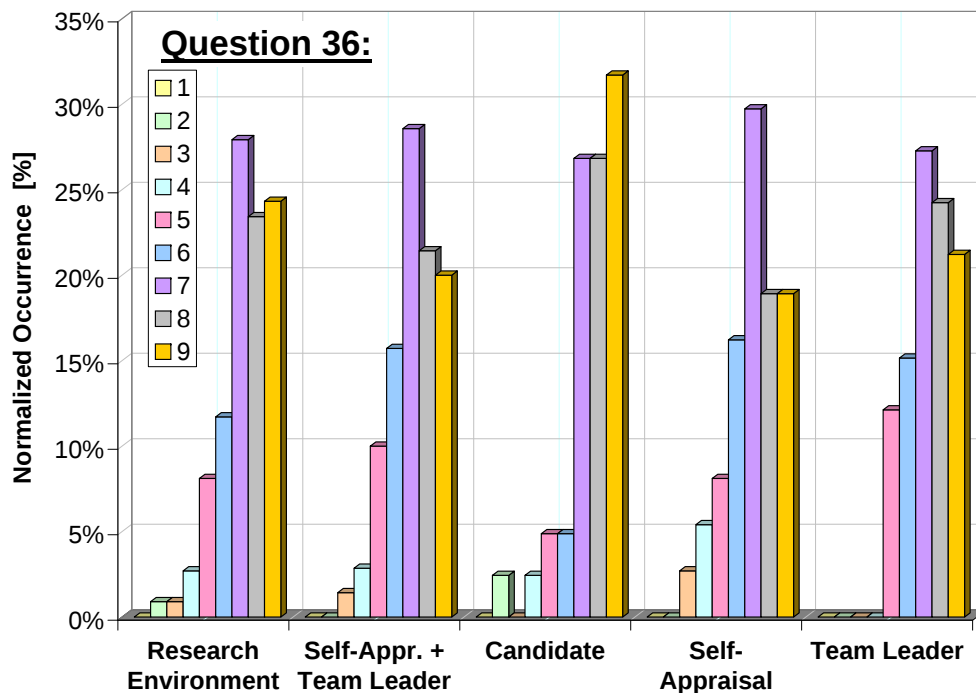


Figure 5.71: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 36: *Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.*

Scientific research is sometimes a risky operation where a lot of money or the reputation of a team leader is at risk. There is always an appropriate period used for preparation, verification, safety-measures, and even risk-calculation and worst-case estimations before an experiment or project is implemented and finally realized. However, there always remains a tiny fraction of risk that cannot be excluded, because nobody has ever done such a kind of experiment or such a big project in a certain research area before. And if this tiny fraction comes into play and causes either a loss of precious time²⁷⁸ or even a complete failure of the experiment and the whole team or even many other people are

²⁷⁷**Question 36:** *Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.*

²⁷⁸typically, the experiment has to be performed within a predefined time-window

watching the process, then huge stresses pile upon the team leader who is then forced to stay focused and think clearly even when she/he is experiencing strong emotions. If the team leader is capable of staying focused and can think clearly, then she/he might be able to resolve the problem and bring things back on track. But if she/he panics, then things might even get worse and cause more troubles than originally would have happened if nobody would have intervened at all. Therefore, it is essential that a team leader in a scientific research project is capable of staying focused and thinking clearly under pressure or in difficult situations.

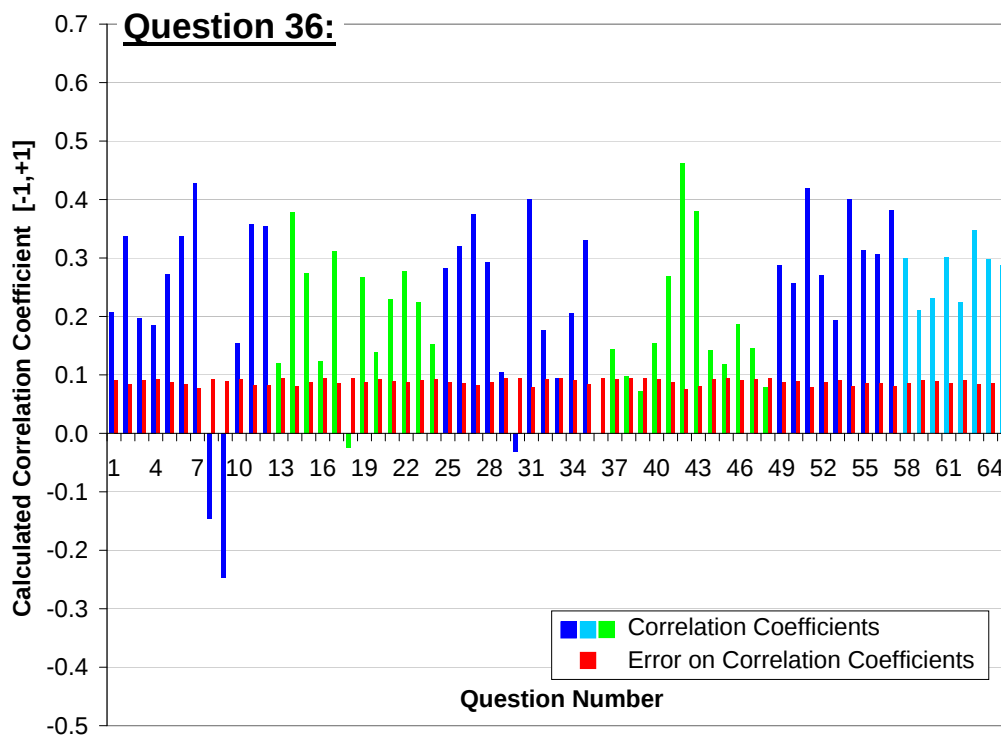


Figure 5.72: *Correlation coefficients for Question 36: Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.*

The obtained occurrence distributions²⁷⁹ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). Almost 73% of the participants believe that their supervisor is capable of staying focused and thinking clearly under pressure or in difficult situations, but only 67.5% believe that they themselves would have this capability. Again, the candidate is an exception from this

²⁷⁹see Figure 5.71

pattern. Almost 86% of the participants believe that she/he can handle difficult and stressful situations when she/he is experiencing strong emotions. On the contrary, less than 15% think that the candidate could only Occasionally (= 5) to Never (= 1) stay focused and think clearly under pressure, while their trust in their supervisors ($\sim 27\%$) or in themselves ($\sim 32\%$ for self-appraisal) is far less than in the candidate. This huge trust seems to make the candidate a good crisis manager who would be trusted even more than the supervisor or any individual candidate would trust herself/himself to handle difficult situations.

The calculated correlation coefficients²⁸⁰ for Question 36²⁸¹ are within the interval $[-0.5, +0.5]$. Therefore, no causal correlation exists between Question 36 and any other question within the questionnaire.

²⁸⁰see Figure 5.72

²⁸¹**Question 36:** *Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.*

5.4 Participative Behavior

5.4.1 Question 37

Question 37²⁸² asks about the team leader's readiness to encourage team members to express ideas/suggestions and if she/he gives all team members a chance to voice their opinions.

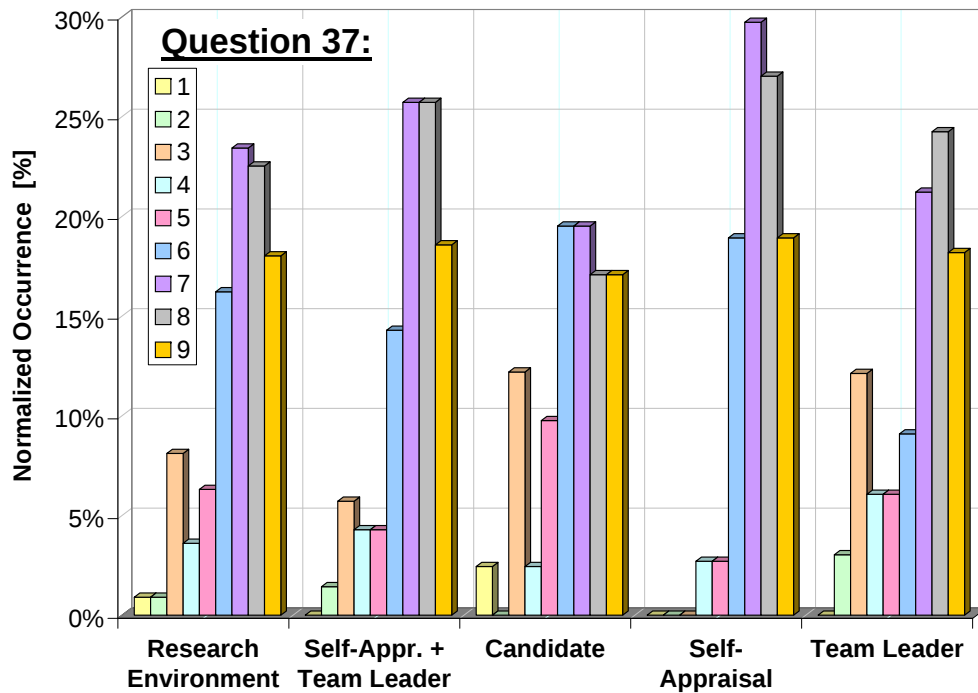


Figure 5.73: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 37: *Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.*

The obtained occurrence distributions²⁸³ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). Almost 76% of the participants believe that they would 7 (= Often) to 9 (= Always) encourage all team members to express their ideas or suggestions, but they also think that their supervisors in just 63.6% of all cases and the candidate in only 53.6% encourages all

²⁸²**Question 37:** *Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.*

²⁸³see Figure 5.73

team members to contribute their own ideas. The same pattern occurs at the opposite end of the performance key scale. About 15% of the participants believe that the supervisor and the candidate Never (= 1) to Seldom (= 3) encourages team members to express their ideas and suggestions, while the self-appraisal group has 0% occurrence values in these categories.

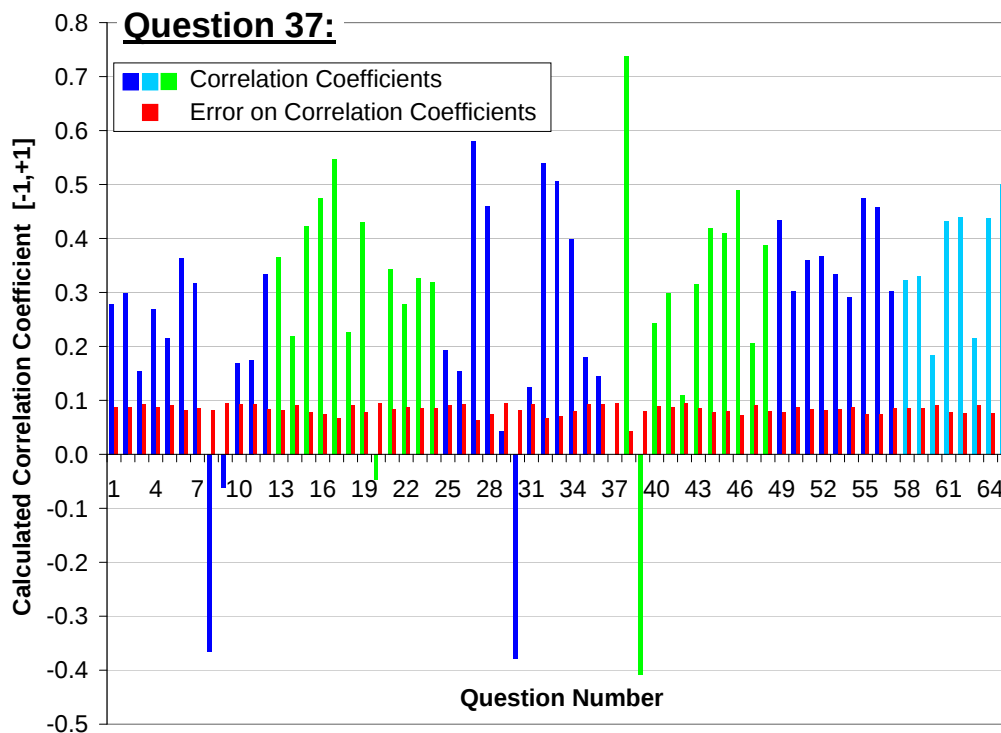


Figure 5.74: *Correlation coefficients for Question 37: Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.*

These differences between team leaders (including the candidate) and the team members might be explained by the lack of leadership experience that accounts for the higher figures for the self-appraisal. A team leader can not allow all team members to permanently bring in new ideas, especially not in crisis situations or implementation and execution phases. Any reasonable team leader would welcome ideas and suggestions during the planning and design phase. Team leaders would not only encourage, but also directly ask team members to contribute their ideas and suggestions. But the project leader cannot accept and constantly encourage new ideas when the planning and design phases are completed and the implementation or execution phase has started. In this phase of the project all team

members have to move in the previously decided direction. As soon as the implementation and execution phase has started, new ideas and major changes should only be brought to a broad discussion if the project gets stuck on its way to finalization because of problems or facts which were not considered during the planning and design phase. Otherwise, chaos would rule and the project would never be finished. Therefore, the team leader has to clearly communicate that ideas are welcome and very much appreciated during the planning and design phase, but as soon as the implementation or execution phases are reached, every team member should only suggest new ideas if a problem emerges or a big shortcut might be possible to reach the goal. Thus, either the lack of communication of these facts or the lack of own leadership experience might explain the difference in the obtained figures for the self-appraisal and supervisor groups.

The calculated correlation coefficients²⁸⁴ for Question 37²⁸⁵ are smaller than 0.6, except for Question 38²⁸⁶ (0.739). Question 27²⁸⁷ (0.580) has a correlation coefficient close to 0.6.

Encouraging team members to express ideas/suggestions and listening receptively to employees' ideas and suggestions has a strong content overlap. Only the first part of Question 38 should be modified to minimize the modification effects on the whole questionnaire.²⁸⁸ For the rest no causal correlation exists between Question 37 or any other question within the questionnaire. Therefore, Question 37 does not need to be modified.

²⁸⁴see Figure 5.74

²⁸⁵**Question 37:** *Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.*

²⁸⁶**Question 38:** *Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.*

²⁸⁷**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

²⁸⁸see Section 5.4.2, page 159

5.4.2 Question 38

Question 38²⁸⁹ asks if the team leader listens receptively to employees' ideas and suggestions and if she/he considers the team's ideas even when he/she disagrees with them.

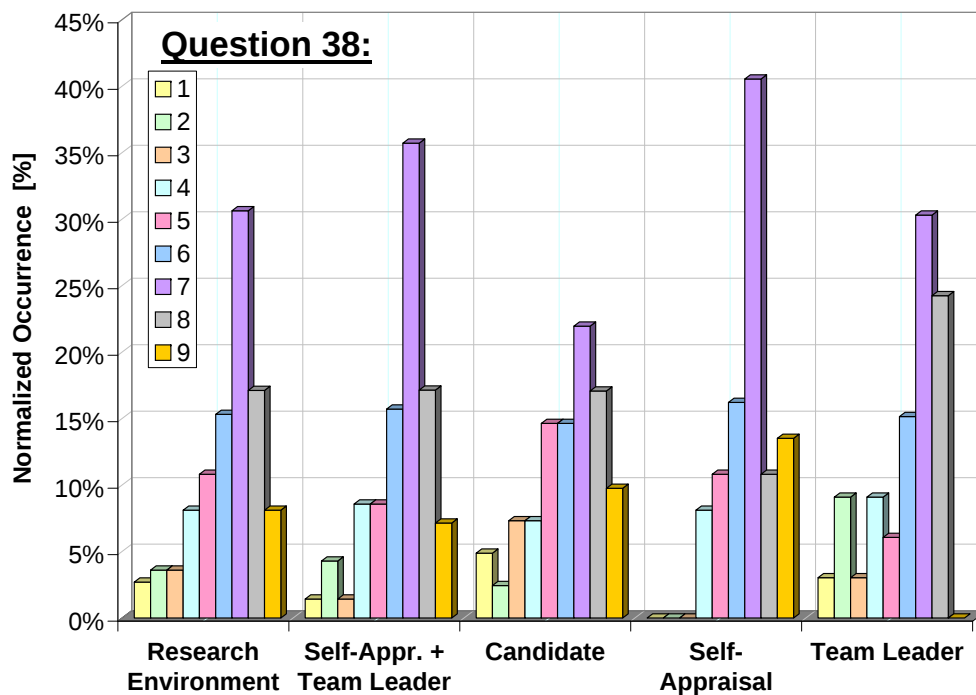


Figure 5.75: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 38: *Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.*

As already discussed in the previous section²⁹⁰, team leaders should always encourage their team members to express their ideas and suggestions in the planning and design phase of the project. As soon as the implementation and execution phase has started, ideas should only be brought to a broad discussion if the project might get stuck because of problems or facts which were not considered during the planning and design phase or if a big shortcut might be possible to reach the final goal. But the team leader should always listen receptively to team members ideas and consider them even when she/he disagrees with them. A lack of attention or a small hint of ignorance might cause severe

²⁸⁹**Question 38:** *Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.*

²⁹⁰see Section 5.4.1, page 156

relationship damages between the team member and the leader and in the worst case it might drop the team's moral. Thus, Question 38 addresses the leaders readiness to listen receptively to team members ideas and to consider them even if she/he disagrees or at least explain why she/he disagrees.

The obtained occurrence distributions²⁹¹ show a similar pattern for all groups: distinctive maximum peaks for category 7 (= Often). Almost 65% of the participants believe that they would Often (= 7) to Always (= 9) listen receptively to their team members ideas, while they also believe that just 54.5% of their supervisors (and only 49% for the candidate) would listen receptively to their team members and consider their ideas even if they disagree with them. The same pattern occurs at the opposite end of the performance key scale. Almost 15% of the participants believe that their supervisors and also the candidate would Never (= 1) to Seldom (= 3) listen receptively to their team members ideas, while they also believe that they would never fall by themselves into these categories (0% for the self-appraisal group). The difference in these figures can be explained — as already discussed in the previous section²⁹² — either by a lack of communication of the above mentioned facts or a lack of own leadership experience. Either way, the reasons for these beliefs go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

The calculated correlation coefficients²⁹³ for Question 38²⁹⁴ are smaller than 0.6, except for Question 37²⁹⁵ (0.739), Question 17²⁹⁶ (0.642), and Question 46²⁹⁷ (0.620). Question 33²⁹⁸ (0.566) and Question 65²⁹⁹ (0.567) have a correlation coefficient close to 0.6.

Acknowledging own mistakes, or creating a real feeling of teamwork, or being open to feedback from others have only small content overlaps with considering the team's ideas

²⁹¹see Figure 5.75

²⁹²see Section 5.4.1, page 156

²⁹³see Figure 5.76

²⁹⁴**Question 38:** *Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.*

²⁹⁵**Question 37:** *Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.*

²⁹⁶**Question 17:** *Acknowledges her/his own mistakes and takes corrective action.*

²⁹⁷**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

²⁹⁸**Question 33:** *Is open to feedback from others. Encourages others to give feedback.*

²⁹⁹**Question 65:** *Handles difficult people and situations effectively.*

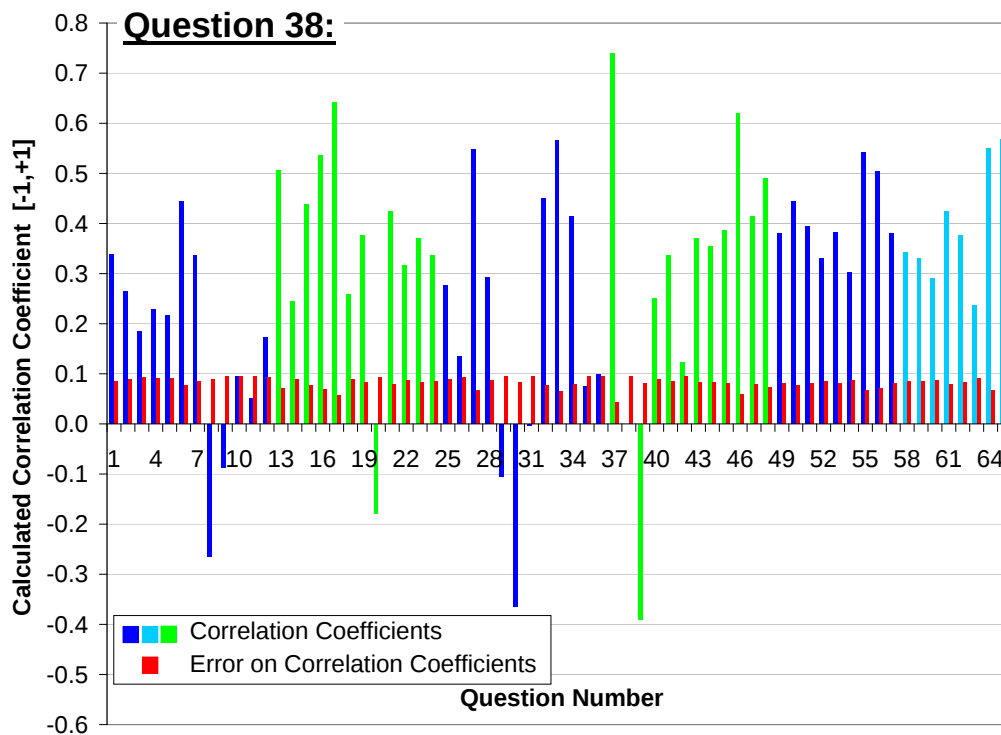


Figure 5.76: *Correlation coefficients for Question 38: Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.*

even when the leader disagrees with them. Being open to feedback from others is a more general formulation than considering the team's ideas, which is more task related. Thus, no causal correlation exists between Question 38 and the mentioned questions or any other question within the questionnaire. Therefore, Question 38 does not need to be modified based on those facts and arguments.

But, as already discussed in the previous section³⁰⁰, the first part of Question 38 should be modified to reduce the context overlap with Question 37. A modification of Question 38 minimizes the effect of the change on the whole questionnaire, which would be more severe by deleting Question 37. Therefore, Question 38 should be modified to the following formulation:

Question 38*: *Considers team's ideas even when he/she disagrees with them.*

³⁰⁰see Section 5.4.1, page 156

5.4.3 Question 39

Question 39³⁰¹ asks about the team leader's attitude about making decisions that are based only on his/her own ideas.

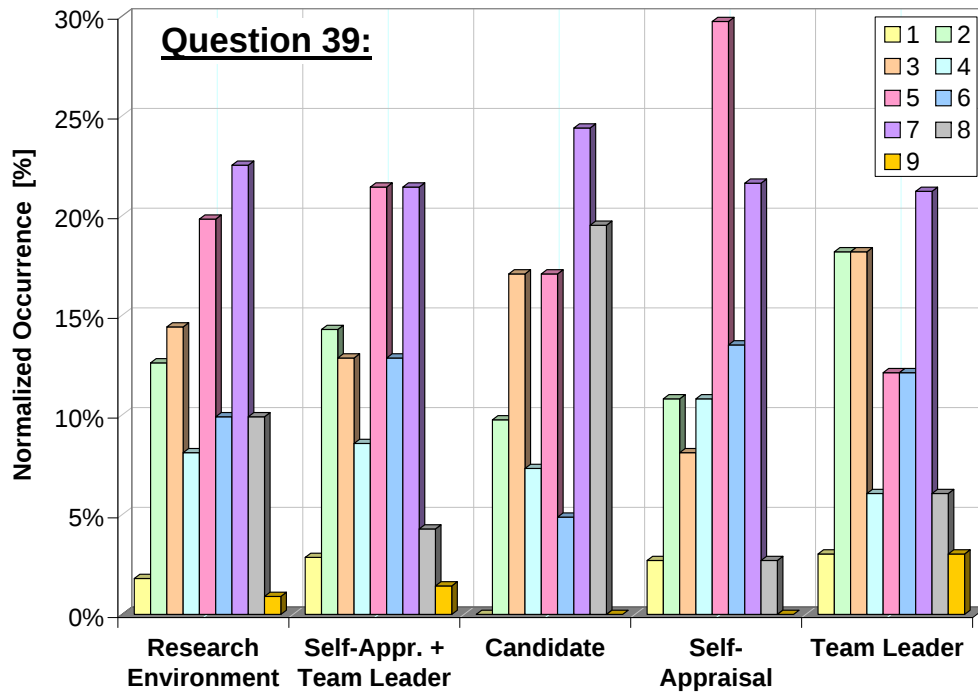


Figure 5.77: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 39: *Makes decisions that are based only on his/her own ideas.*

The obtained occurrence distributions³⁰² show considerably different patterns with no distinctive maximum peaks for all groups. The participants perceived occurrence values are given in Table 5.3. The pattern for the candidate (26.8 - 29.3 - 43.9)³⁰³ indicates that she/he is a rather “hands-on” person who likes to work at the front line and to make her/his own decisions based on the underlying technical facts. She/he might believe that — based on that underlying technical facts — a decision is clear and unequivocal and therefore does not require a further discussion by the rest of the team. The candidate then quickly decides based on her/his own ideas mainly to save time for the team leader or the rest of the team.

³⁰¹**Question 39:** *Makes decisions that are based only on his/her own ideas.*

³⁰²see Figure 5.77

³⁰³see first line in Table 5.3

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)
Candidate	26.8%	29.3%	43.9%
Self-Appraisal	21.6%	54.1%	24.3%
Supervisor	39.4%	30.3%	30.3%

Table 5.3: Obtained occurrence values for Question 39.

The pattern for the supervisor, on the other hand, is exactly the opposite (39.4 - 30.3 - 30.3)³⁰⁴ compared to that of the candidate. The supervisor prefers to make her/his decisions together with the team and consults first with her/his team members. Therefore, most of the supervisors decisions are based on the information given by the team members and only in less than one third of all cases purely motivated by herself/himself. This behavior could be explained by the fact that the decisions of the supervisor typically also affect the team itself. Thus, the supervisor consults with the rest of the team before she/he makes any decision.

The pattern for the participants (21.6 - 54.1 - 24.3)³⁰⁵ indicates that they see themselves as a mixture between the supervisor and a “hands-on” person (like the candidate). They hardly (< 22%) make decisions without ever discussing with either their supervisor or their team members. Only in less than one quarter of all cases they make their decisions based only on their own ideas, most likely because those decisions would not affect the rest of the team and thereby they save time for the rest of the team, because those decisions would then be discussed during one of the team’s meetings.

Based on the observed patterns³⁰⁶ one can conclude that no general rule exists about when a team leader or team members should make decisions based only on their own ideas and when they should consult either the team leader or the rest of their team. One could only suggest that the supervisor or the rest of the team should be consulted if the whole team would be affected by the consequences of the decisions that have to be made.

³⁰⁴see third line in Table 5.3

³⁰⁵see second line in Table 5.3

³⁰⁶see Figure 5.77

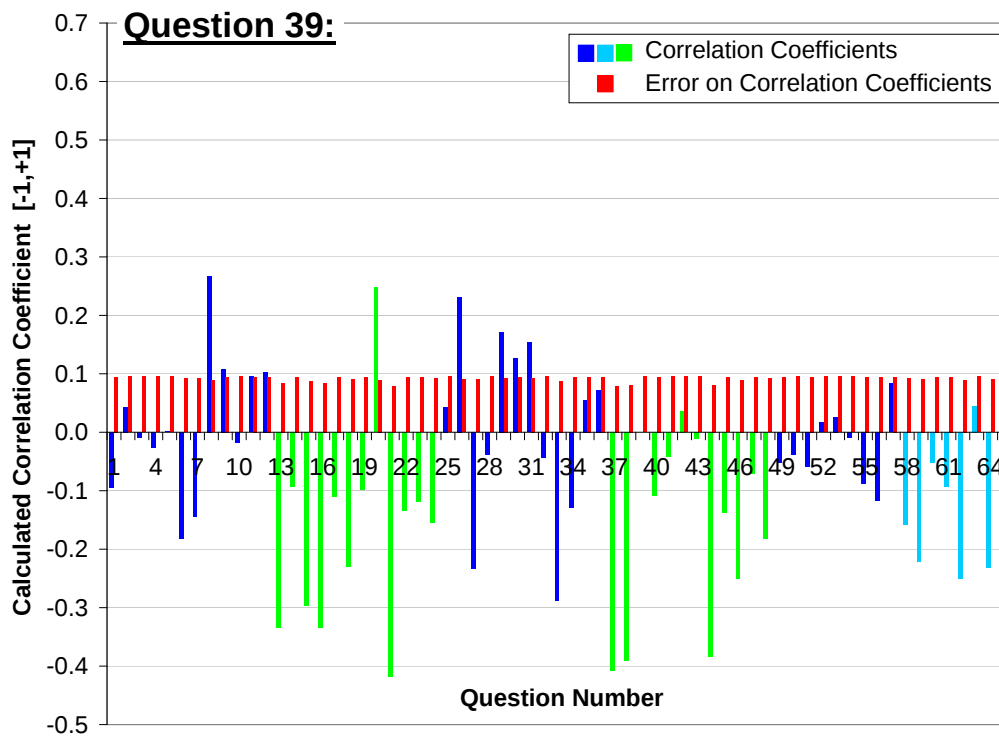


Figure 5.78: Correlation coefficients for Question 39: *Makes decisions that are based only on his/her own ideas.*

The calculated correlation coefficients³⁰⁷ for Question 39³⁰⁸ are within the interval $[-0.5, +0.5]$. Therefore, no causal correlation exists between Question 39 and any other question within the questionnaire.

³⁰⁷see Figure 5.78

³⁰⁸**Question 39:** *Makes decisions that are based only on his/her own ideas.*

5.4.4 Question 40

Question 40³⁰⁹ asks if the team leader consults with employees when facing an upcoming task or problem, although she/he maintains the final decision making authority.

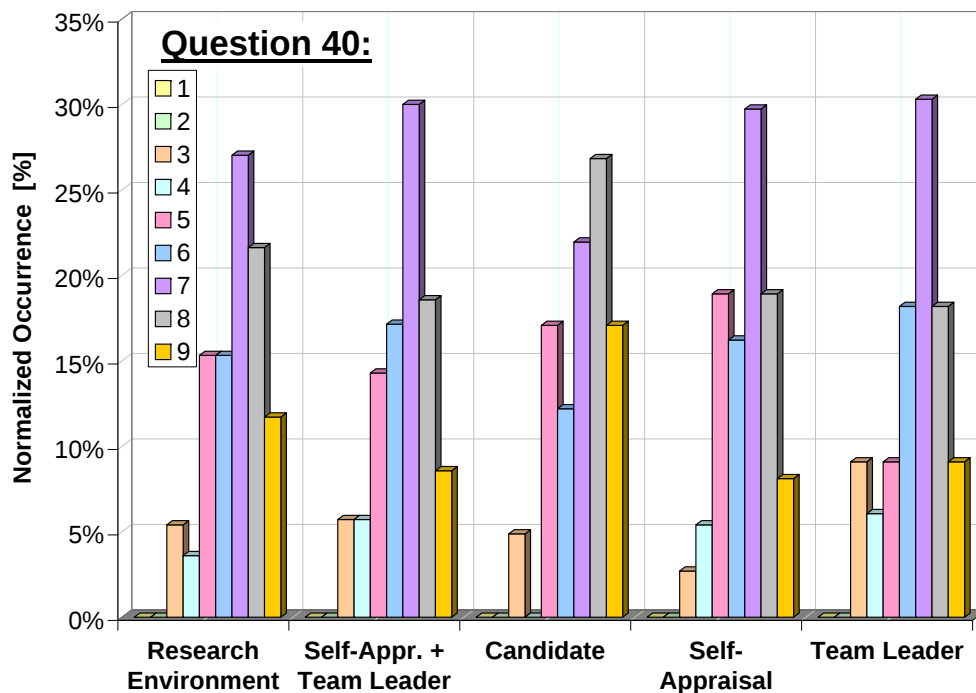


Figure 5.79: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 40: **Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.**

Consulting with the team when facing an upcoming task or problem is an excellent opportunity for any team leader to get the team involved and motivated for the project. Collecting ideas and suggestions, discussing and weighting them, and finally deciding together — under the guidance of the team leader — optimizes the participation and acceptance of the whole team. It further facilitates the communication of either the strategy to solve the problem or the work plan for the project. Different team members might see various parts of the project from different angles and by expressing their ideas and suggestions they also help the other team members to understand their point of view. This reduces future conflict potential because of misunderstandings and facilitates the

³⁰⁹ **Question 40:** Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.

work flow because of well defined delivery variables for all team members. Therefore, it is highly recommended for any team leader (not only) in scientific research projects to consult with their team members when facing an upcoming task or problem.

The obtained occurrence distributions³¹⁰ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). Less than 10% of the team leaders (the candidate included) or team members consult Never (= 1) to Seldom (= 3) with the rest of their team when facing an upcoming task or problem.

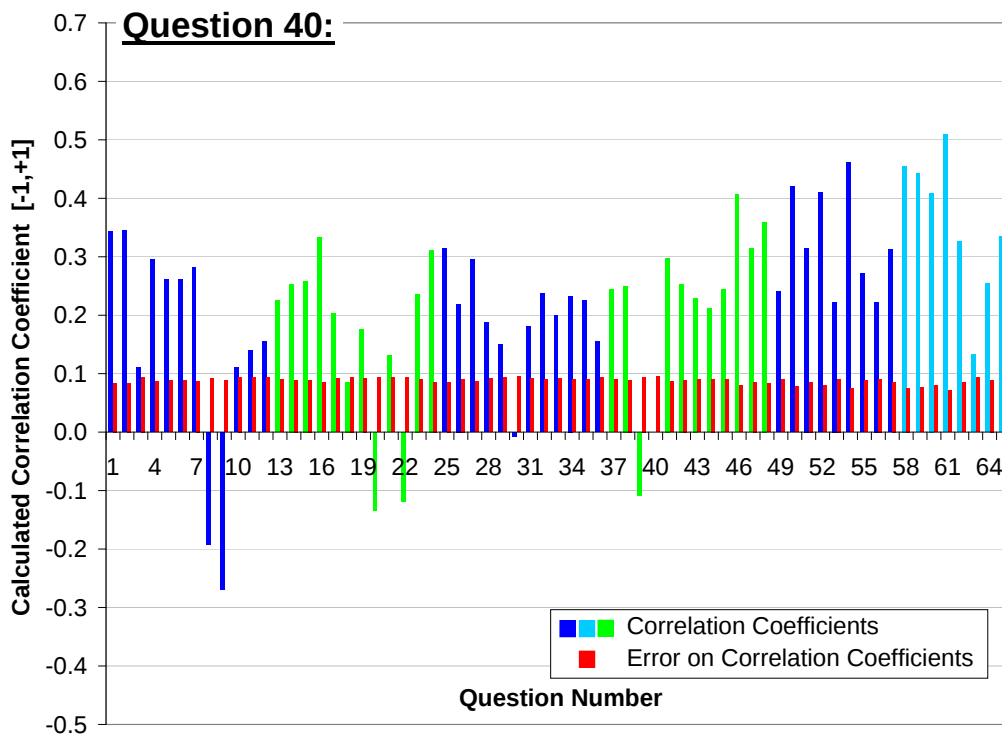


Figure 5.80: *Correlation coefficients for Question 40: Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.*

The calculated correlation coefficients³¹¹ for Question 40³¹² are within the interval

³¹⁰see Figure 5.79

³¹¹see Figure 5.80

³¹²**Question 40:** *Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.*

$[-0.5, +0.5]$, except for Question 61³¹³ (0.509). Therefore, no causal correlation exists between Question 40 and any other question within the questionnaire and Question 40 does not need to be modified.

5.4.5 Question 41

Question 41³¹⁴ asks about the team leader's readiness to take corrective actions rather than to lay blame if mistakes happen.

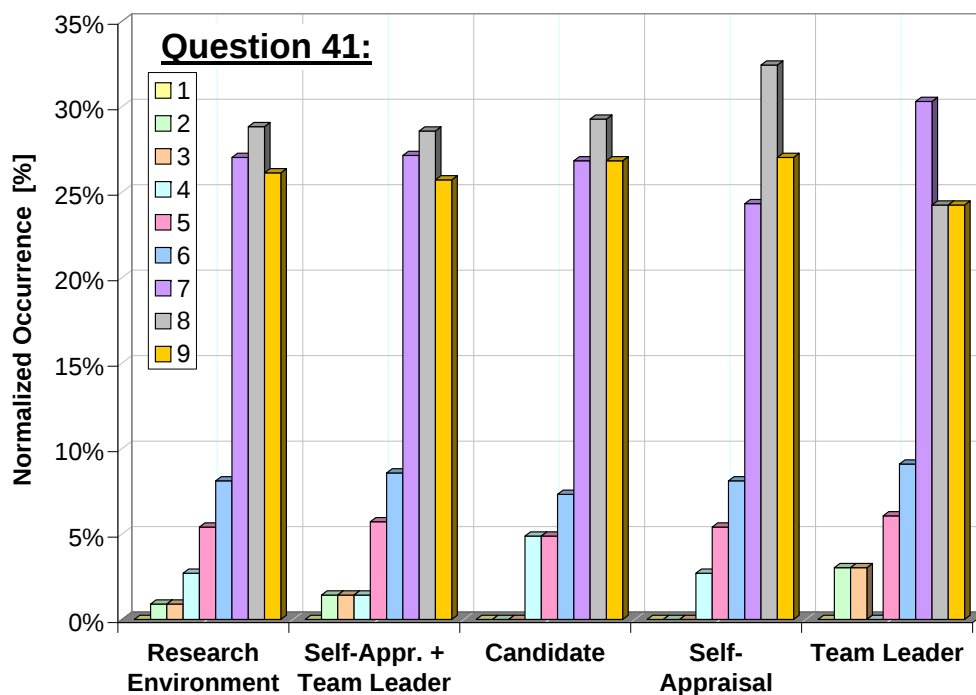


Figure 5.81: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 41: *When things go wrong, the main concern is to fix it, not to lay blame.*

The obtained occurrence distributions³¹⁵ show almost identical pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The supervisor group (the candidate excluded) shows two small peaks ($< 6\%$) in the Never (= 1) to Seldom (= 3) categories, meaning that they would

³¹³ **Question 61:** Explains (personal and company) decisions, actions, and goals.

³¹⁴ **Question 41:** When things go wrong, the main concern is to fix it, not to lay blame.

³¹⁵ see Figure 5.81

blame their team members if things go wrong rather than fix the problem. The reasons for this behavior are not an objective of this questionnaire and should be investigated in more detail by the individual team leaders.

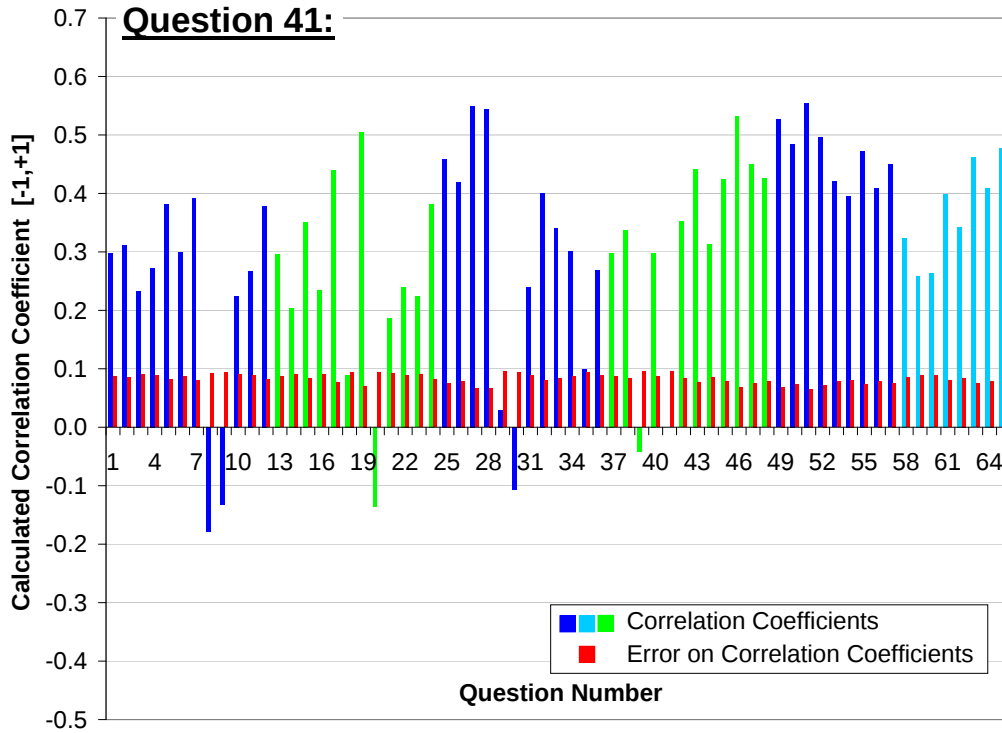


Figure 5.82: *Correlation coefficients for Question 41: When things go wrong, the main concern is to fix it, not to lay blame.*

The calculated correlation coefficients³¹⁶ for Question 41³¹⁷ are within the interval $[-0.5, +0.5]$, except for Question 19³¹⁸ (0.505), Question 27³¹⁹ (0.550), Question 28³²⁰ (0.543), Question 46³²¹ (0.532), Question 49³²² (0.527), and Question 51³²³ (0.555). No causal correlation exists between Question 41 and the mentioned questions or any other

³¹⁶see Figure 5.82

³¹⁷**Question 41:** *When things go wrong, the main concern is to fix it, not to lay blame.*

³¹⁸**Question 19:** *Gives team members honest and fair answers.*

³¹⁹**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

³²⁰**Question 28:** *Has high moral standards. Can be trusted with confidential information.*

³²¹**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

³²²**Question 49:** *Recognizes the potential of her/his team members.*

³²³**Question 51:** *Likes to use her/his leadership power to help subordinates grow.*

question within the questionnaire. Therefore, Question 41 does not need to be modified.

5.4.6 Question 42

Question 42³²⁴ asks if the team leader is capable of juggling multiple demands.

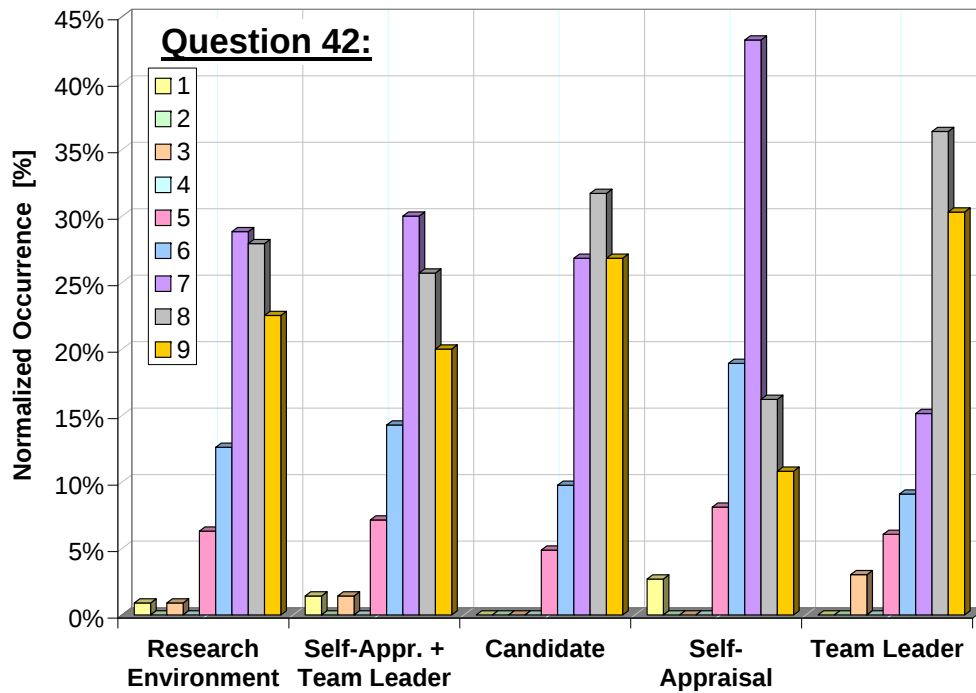


Figure 5.83: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 42: *Is capable of juggling multiple demands.*

Scientific research projects are composed of many different and rather complex tasks that are interconnected with each other. Therefore, it is essential that a team leader is capable of juggling multiple demands over extended time periods.

The obtained occurrence distributions³²⁵ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The self-confidence of the participants in their capabilities of juggling multiple demands is weaker than their opinion about their supervisors and the candidate. Only 70.3% of the

³²⁴**Question 42:** *Is capable of juggling multiple demands.*

³²⁵see Figure 5.83

participants believe that they would be able to deal with multiple demands, while 81.8% of them think that their supervisors can handle multiple demands and even 85.4% believe in the capabilities of the candidate.

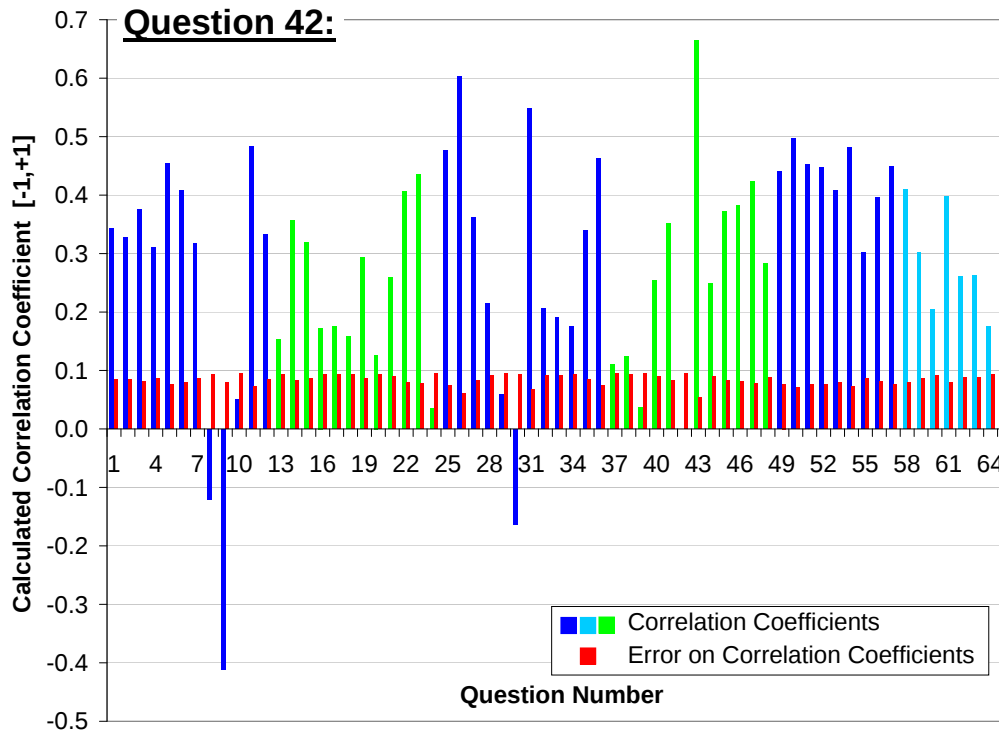


Figure 5.84: Correlation coefficients for Question 42: *Is capable of juggling multiple demands*.

The calculated correlation coefficients³²⁶ for Question 42³²⁷ are smaller than 0.6, except for Question 26³²⁸ (0.604) and Question 43³²⁹ (0.665).

Working (at least) as hard as anyone in the work group, or easily shifting priorities when the situation calls for it have no content overlap with being capable of juggling multiple demands. Therefore, no causal correlation exists between Question 42 and any other question within the questionnaire and Question 42 does not need to be modified.

³²⁶see Figure 5.84

³²⁷**Question 42:** *Is capable of juggling multiple demands*.

³²⁸**Question 26:** *Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.*

³²⁹**Question 43:** *Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.*

5.4.7 Question 43

Question 43³³⁰ asks if the team leader can easily shift priorities when the situation calls for it and if she/he deals with rapid change easily and effectively.

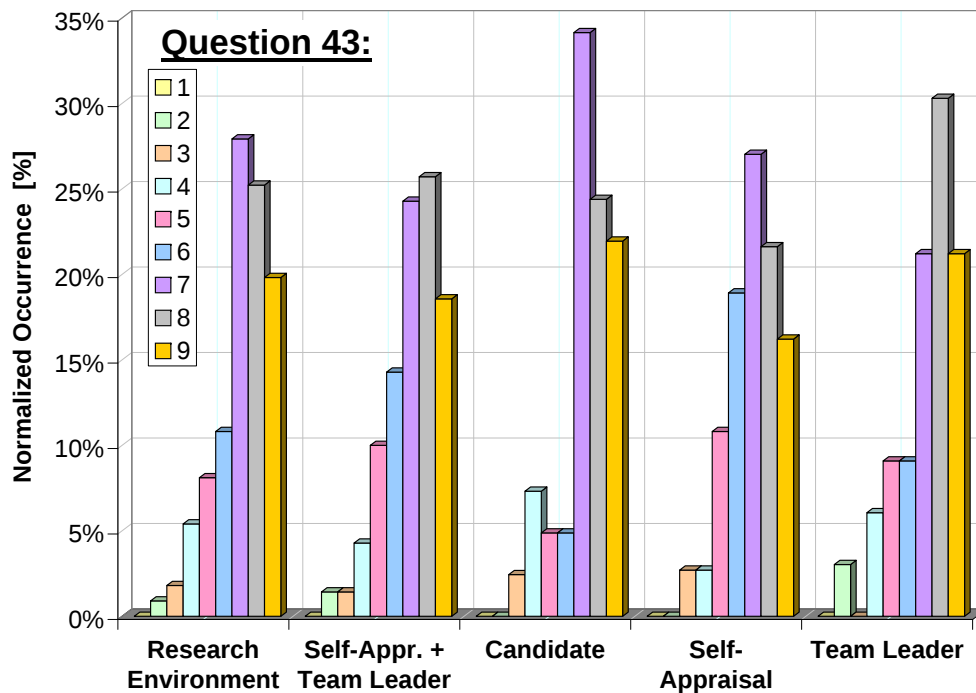


Figure 5.85: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 43: *Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.*

As already mentioned in the previous section³³¹, scientific research projects are composed of many different and rather complex tasks that are interconnected with each other. Small changes or time delays in one section or task might cause rather severe effects on the rest of the project, depending on the strength of the mentioned interconnections. Therefore, it is essential that a team leader is capable of dealing easily and effectively with rapid changes and still being able of keeping the priorities of the whole project in her/his mind. On top of this, the team leader also has to be capable of shifting the priorities effectively when the situation calls for it.

³³⁰**Question 43:** *Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.*

³³¹see Section 5.4.6, page 169

The obtained occurrence distributions³³² show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). Almost 73% of the participants believe that their supervisors are capable of dealing with rapid change easily and effectively and 80.5% of them believe in the capabilities of the candidate to shift priorities easily when the situation calls for it. On the other hand, the self-confidence in their own capabilities is considerably lower. Only 64.9% of the participants believe that they would be capable Often (= 7) to Always (= 9) of dealing with rapid change easily and effectively.

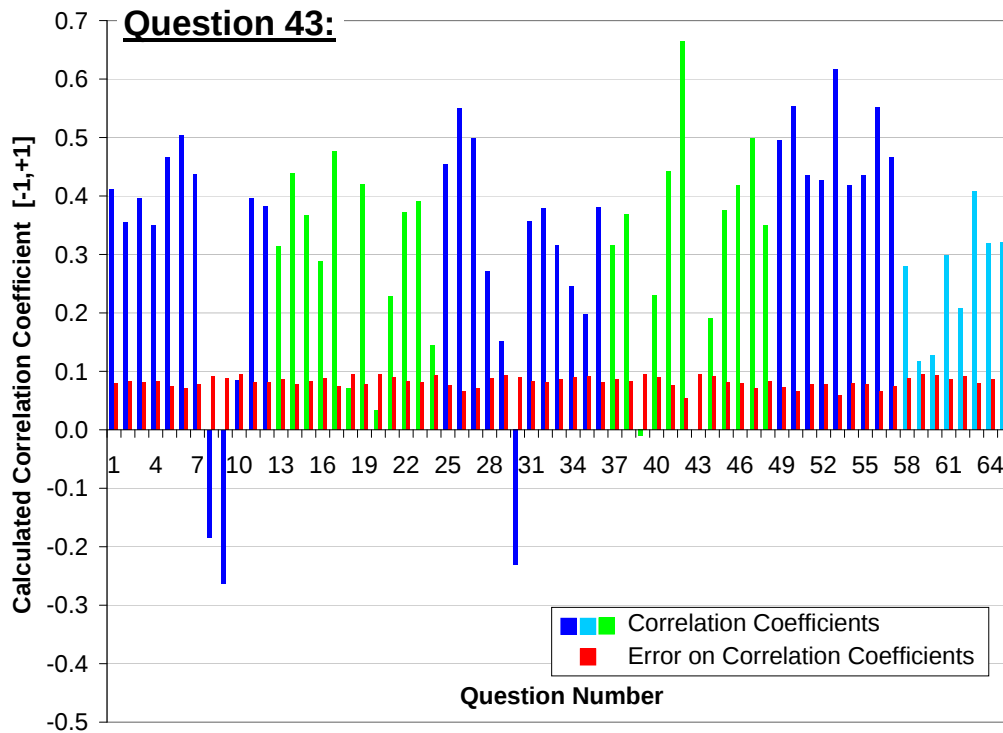


Figure 5.86: Correlation coefficients for Question 43: *Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.*

The calculated correlation coefficients³³³ for Question 43³³⁴ are smaller than 0.6, ex-

³³²see Figure 5.85

³³³see Figure 5.86

³³⁴**Question 43:** *Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.*

cept for Question 42³³⁵ (0.665) and Question 53³³⁶ (0.617). Question 50³³⁷ (0.554) and Question 56³³⁸ (0.551) have a correlation coefficient close to 0.6.

No causal correlation at all exists between Question 43 and the mentioned questions or any other question within the questionnaire. Therefore, Question 43 does not need to be modified.

³³⁵**Question 42:** *Is capable of juggling multiple demands.*

³³⁶**Question 53:** *Encourages team members to solve problems on their own.*

³³⁷**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

³³⁸**Question 56:** *Identifies causes of resistance and finds ways to overcome them.*

5.4.8 Question 44

Question 44³³⁹ asks about the team leader's readiness to allow team members to determine what needs to be done and how to do it.

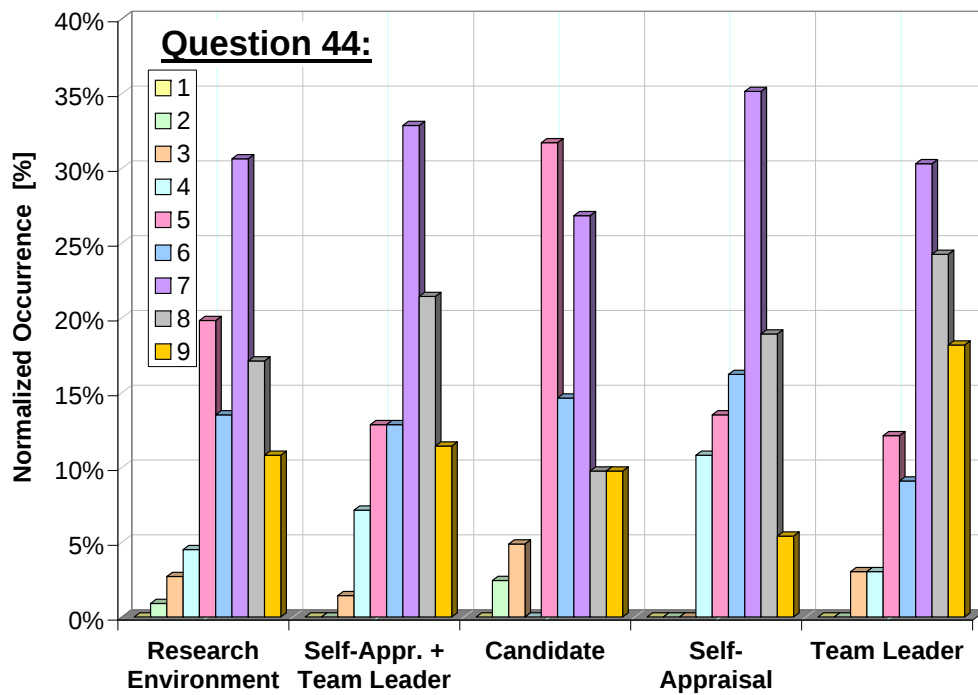


Figure 5.87: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 44: **Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).**

As already mentioned in a previous section³⁴⁰, scientific research projects are composed of many different and rather complex tasks and typically nobody is capable of handling all these tasks to the same quality level and effectiveness as individual specialists or team members. Therefore, it is essential that the team leader delegates those specific tasks and allows her/his team members to determine within their specific topic or immediate field of interest what needs to be done and how to do it, because the team members typically know best how to do their specific tasks.

³³⁹**Question 44:** Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).

³⁴⁰see Section 5.4.6, page 169

The obtained occurrence distributions³⁴¹ show a different pattern for all groups. The participants believe that their supervisor delegate tasks Often (= 7) to Always (= 9) in almost 73% of all cases. The participants themselves delegate in just 59.5% (self-appraisal group) of all cases and the candidate in only 46.3%. The maximum occurrence value for the candidate lies in the category 5 (= Occasionally) with an amplitude of 31.7%. This behavior can be explained by the fact that supervisors are usually occupied with many managerial and organizational tasks and that they cannot focus in addition on all the other technical tasks as well. Thus, supervisors tend to delegate the specific tasks to their team members. The candidate, on the other hand, is a rather “hands-on” person who likes to get directly involved with the ongoing tasks within her/his team. Therefore, she/he tends to Occasionally (= 5) allow her/his team members to determine what needs to be done and how to do it.

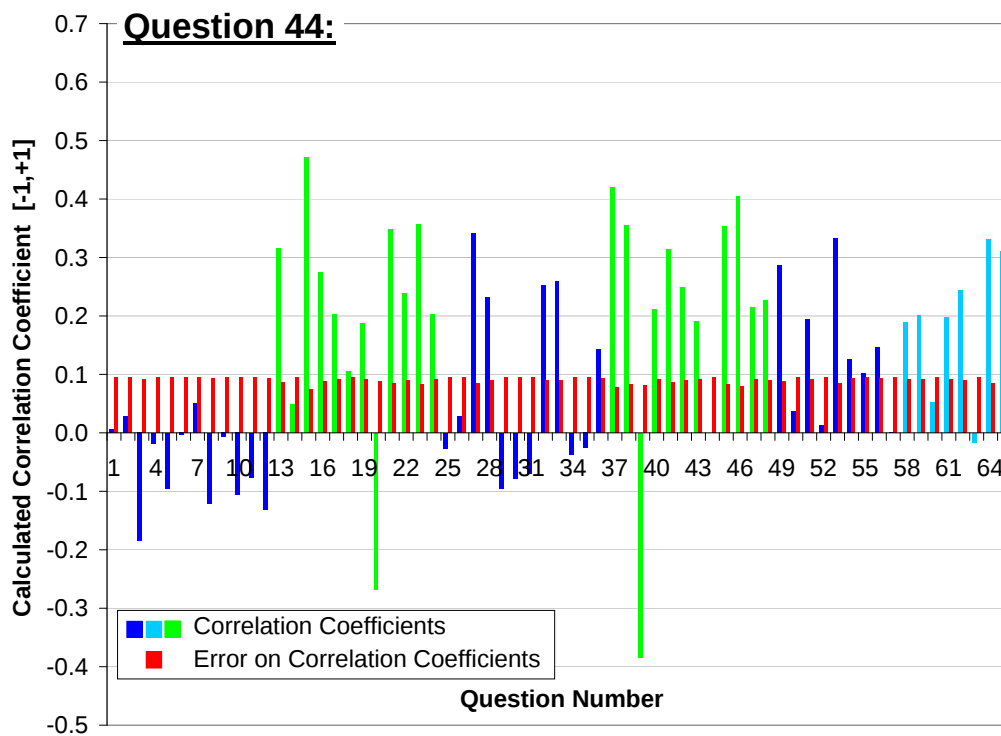


Figure 5.88: *Correlation coefficients for Question 44: Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).*

³⁴¹see Figure 5.87

The calculated correlation coefficients³⁴² for Question 44³⁴³ are within the interval $[-0.5, +0.5]$. Therefore, no causal correlation exists between Question 44 and any other question within the questionnaire.

5.4.9 Question 45

Question 45³⁴⁴ asks if the team leader likes to share her/his leadership power with team members.

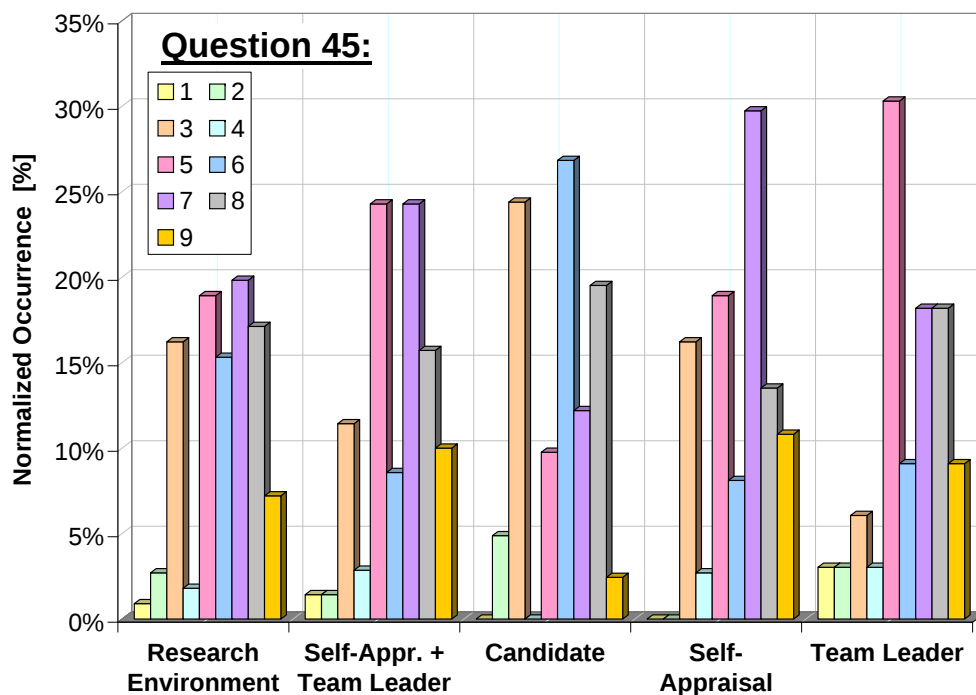


Figure 5.89: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 45: *Likes to share her/his leadership power with subordinates.*

As already discussed in a previous section³⁴⁵, scientific research projects are composed of many different and rather complex tasks that are interconnected with each other.

³⁴²see Figure 5.88

³⁴³**Question 44:** Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).

³⁴⁴**Question 45:** Likes to share her/his leadership power with subordinates.

³⁴⁵see Section 5.4.6, page 169

Sharing leadership power and delegating parts of the projects to team members is a delicate decision that cannot be decided on a global basis. On one hand, the team leader has to make sure that the person she/he puts in charge of a sub-projects possesses sufficient management skills and technical knowledge to carry out the task. On the other hand, the complexity and the technical diversity of the project calls for a delegation of sub-tasks to the individual team members. Therefore, a team leader has to decide whether she/he can share her/his leadership power with an individual team member.

The obtained occurrence distributions³⁴⁶ show a different pattern for all groups: several distinctive maximum peaks spread over the whole performance key spectrum from 3 (= Seldom) to 8 (= Often/Always). The participants perceived occurrence values are given in Table 5.4:

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)
Candidate	29.3%	36.6%	34.1%
Self-Appraisal	16.2%	29.7%	54.1%
Supervisor	12.1%	42.4%	45.5%

Table 5.4: Obtained occurrence values for Question 45.

The average value pattern for the candidate (29.3 - 36.6 - 34.1)³⁴⁷ shows an almost equal distribution for all three groups. This means that the candidate — on average — likes to share her/his leadership power, but only if she/he is sure that the team leaders can handle the situation at least as good as she/he can. The value for the Never (= 1) to Seldom (= 3) category is considerably higher than the ones for the self-appraisal and supervisor groups. This can be explained by the fact that the candidate is a rather “hands-on” person who likes to take responsibility and to lead people in difficult or critical situations.

The pattern for the participants themselves (self-appraisal) is more pronounced towards higher performance key values (16.2 - 29.7 - 54.1)³⁴⁸ compared to the initially mentioned candidate group. Participants like to share their leadership power in more than half of all the situations Often (= 7) to Always (= 9) and to delegate tasks to their team members. This rather high value can either be explained by a lack of management experience, or a fear to take responsibility, or the realization that the individual participant is not an

³⁴⁶see Figure 5.89

³⁴⁷see first line in Table 5.4

³⁴⁸see second line in Table 5.4

expert in any other field that is represented within the team. Therefore, the tendency to delegate and share leadership power and responsibility is much higher than for the supervisor or candidate groups.

The pattern for the supervisor is more pronounced towards higher and medium performance key values (12.1 - 42.4 - 45.5)³⁴⁹ compared to the self-appraisal group. This pattern can be explained by the fact that scientific research projects consist typically of many different and complex tasks and that delegation and sharing of leadership power becomes necessary because of the complexity and the amount of work.

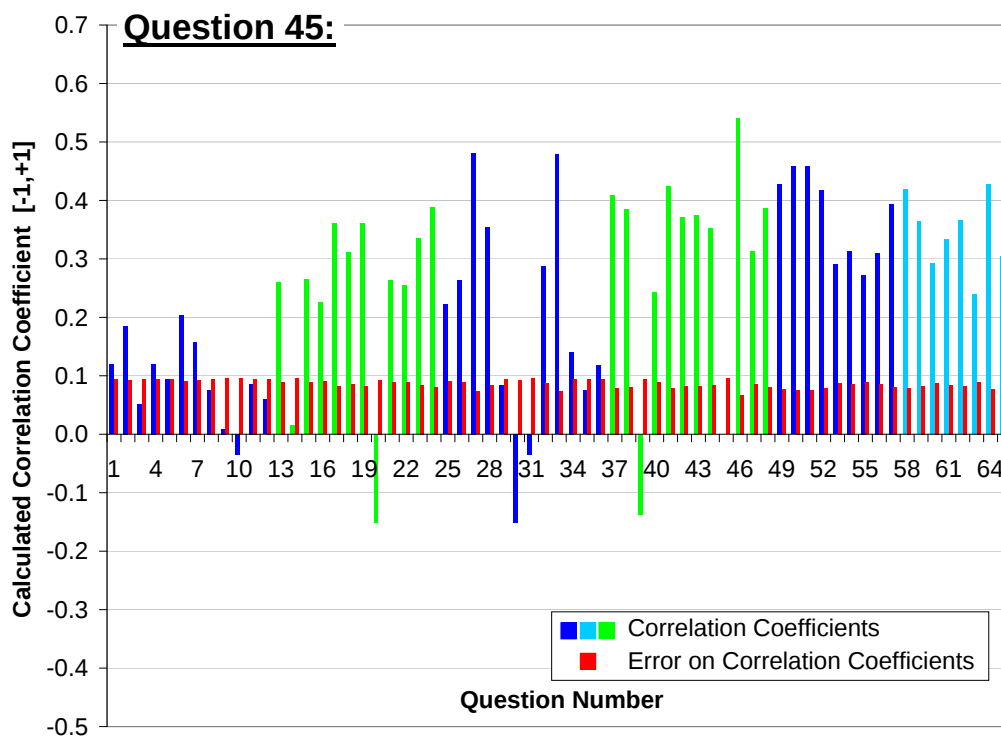


Figure 5.90: Correlation coefficients for Question 45: *Likes to share her/his leadership power with subordinates.*

The calculated correlation coefficients³⁵⁰ for Question 45³⁵¹ are within the interval $[-0.5, +0.5]$, except for Question 46³⁵² (0.541).

³⁴⁹see third line in Table 5.4

³⁵⁰see Figure 5.90

³⁵¹**Question 45:** *Likes to share her/his leadership power with subordinates.*

³⁵²**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

Sharing leadership power with subordinates and creating a real feeling of teamwork has only very small content overlaps. No causal correlation exists between Question 45 and the mentioned question or any other question within the questionnaire. Therefore, Question 45 does not need to be modified.

5.4.10 Question 46

Question 46³⁵³ asks if there is a real feeling of teamwork within the team and if team members feel that they are part of the project or organization.

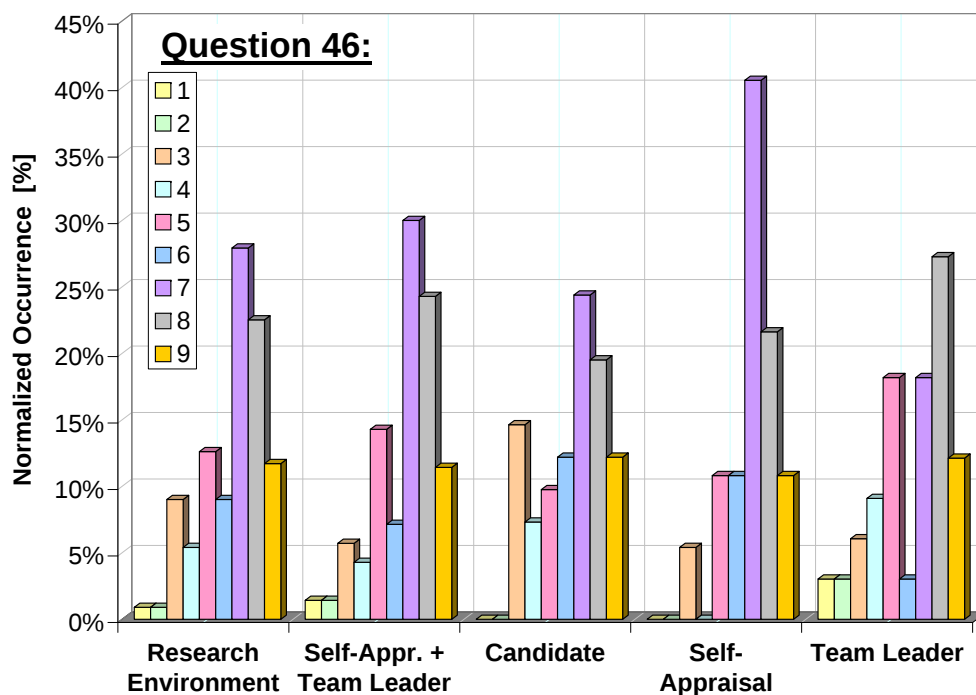


Figure 5.91: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 46: *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

Scientific research projects typically last longer than one year and in some cases up to several years. Team members have to work together closely during this time period and

³⁵³ **Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

share ideas, suggestion, successes, failures, night shifts, etc. and they also have to trust each other. Therefore, the team leader has to make sure that the team members not only get along with each other, but also that a feeling of teamwork and some sort of team spirit develops and is maintained and fostered.

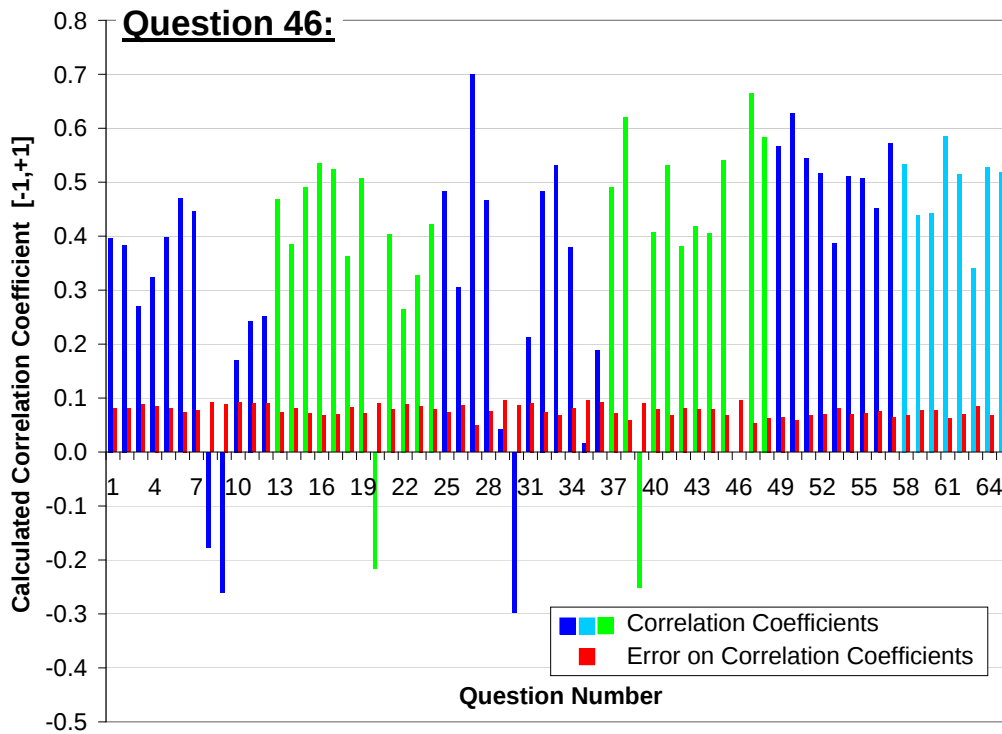


Figure 5.92: *Correlation coefficients for Question 46: There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

The obtained occurrence distributions³⁵⁴ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants believe that they in 73% of all cases Often (= 7) to Always (= 9) contribute towards team members feeling part of the team, while their supervisors and the candidate only ensure in 56% of all cases that a real feeling of teamwork is being developed and fostered within the team. On the other hand, about 14% believe that the supervisors and the candidate Never (= 1) to Seldom (= 3) contribute to the creation of a team spirit, while only 5% of the participants (self-appraisal) see themselves in this category. A possible explanation for this observation could be the fact that a team leader in a scientific research project has to possess a very strong task focus to ensure that task are

³⁵⁴see Figure 5.91

being done correctly and accomplished in time. Therefore, supervisors sometimes forget that their team members do not always share the same priorities and that their main concern is not always to push the team and themselves to a maximum of performance. Nevertheless, the reasons for these beliefs go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

The calculated correlation coefficients³⁵⁵ for Question 46³⁵⁶ are smaller than 0.6, except for Question 27³⁵⁷ (0.699), Question 38³⁵⁸ (0.620), Question 47³⁵⁹ (0.665), and Question 50³⁶⁰ (0.628). Question 48³⁶¹ (0.584), Question 49³⁶² (0.566), Question 57³⁶³ (0.572), and Question 61³⁶⁴ (0.584) have a correlation coefficient close to 0.6.

The reasons for the high correlation coefficient between Question 46 and 27 were already discussed in Section 5.3.3 (page 128).

Listening receptively to employees' ideas, creating a feeling of responsibility to make things work, paying attention to team's performance, acknowledging others for their contributions, recognizing the potential of her/his employees, spending time effectively teaching team members, and explaining decisions, actions, and goals all contribute in general to the creation of a real feeling of teamwork. The mentioned questions focus on specific character traits while Question 46 asks about the result when all these traits work together. Therefore, the content overlap is small and Question 46 does not need to be modified.

³⁵⁵see Figure 5.92

³⁵⁶**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

³⁵⁷**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

³⁵⁸**Question 38:** *Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.*

³⁵⁹**Question 47:** *The team members feel a real responsibility to make things work.*

³⁶⁰**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

³⁶¹**Question 48:** *Acknowledges others for their contributions and celebrates in their successes.*

³⁶²**Question 49:** *Recognizes the potential of her/his team members.*

³⁶³**Question 57:** *Spends time effectively teaching or mentoring team members.*

³⁶⁴**Question 61:** *Explains (personal and company) decisions, actions, and goals.*

5.4.11 Question 47

Question 47³⁶⁵ asks if the team members feel a real responsibility to make things work.

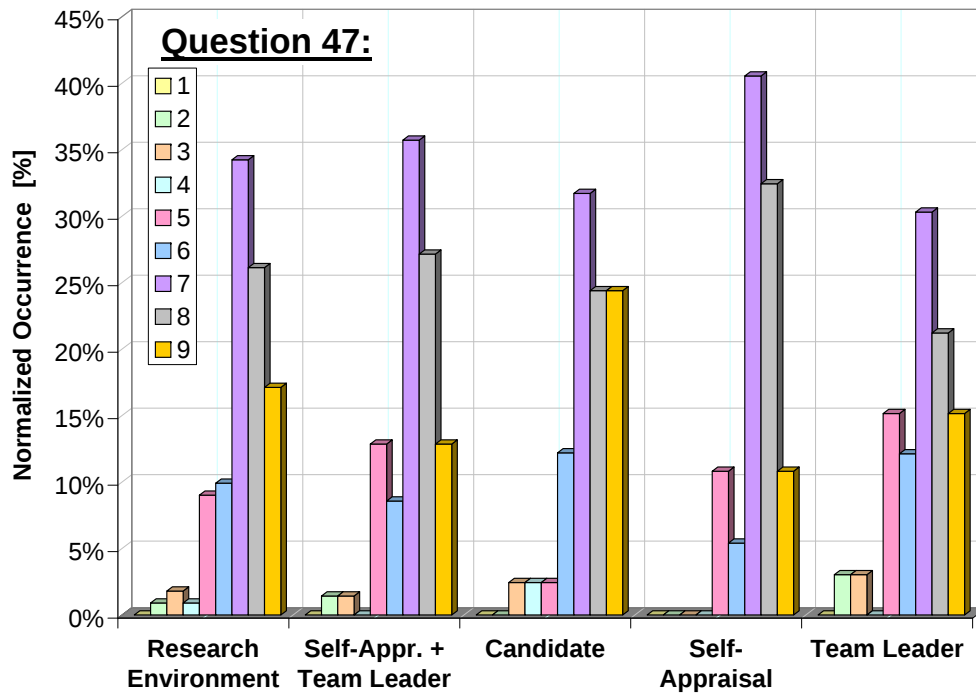


Figure 5.93: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 47: *The team members feel a real responsibility to make things work.*

As already discussed in a previous section³⁶⁶, scientific research projects are composed of many different and rather complex tasks that are interconnected with each other. A team leader has to delegate to some extent sub-projects to her/his team members because of the complexity and diversity of the whole project. Those delegated tasks have to be completed correctly and in time and for that reason it is necessary that team members feel a real responsibility to make things work. This feeling of responsibility can be created in various ways, which depend mainly on the personalities of the individual team members and which are beyond the scope of this questionnaire.

The obtained occurrence distributions³⁶⁷ show a similar pattern for all groups: a distinctive

³⁶⁵ **Question 47:** *The team members feel a real responsibility to make things work.*

³⁶⁶ see Section 5.4.6, page 169

³⁶⁷ see Figure 5.93

maximum peak for category 7 (= Often). The participants believe that in almost 84% of all cases they ensure that their team members feel a real responsibility to make things work, and also their perception about the candidate is similar (80.5%). But in the case of their supervisors only 67% of the participants believe that their supervisors would create a feeling of real responsibility to make things work. One reason for this difference might be that supervisors in scientific research projects see their team members as “grown” adults with at least one academic degree and that they would expect from such a person that she/he already possesses some sort of responsibility to make things work. Nevertheless, the reasons for these beliefs go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

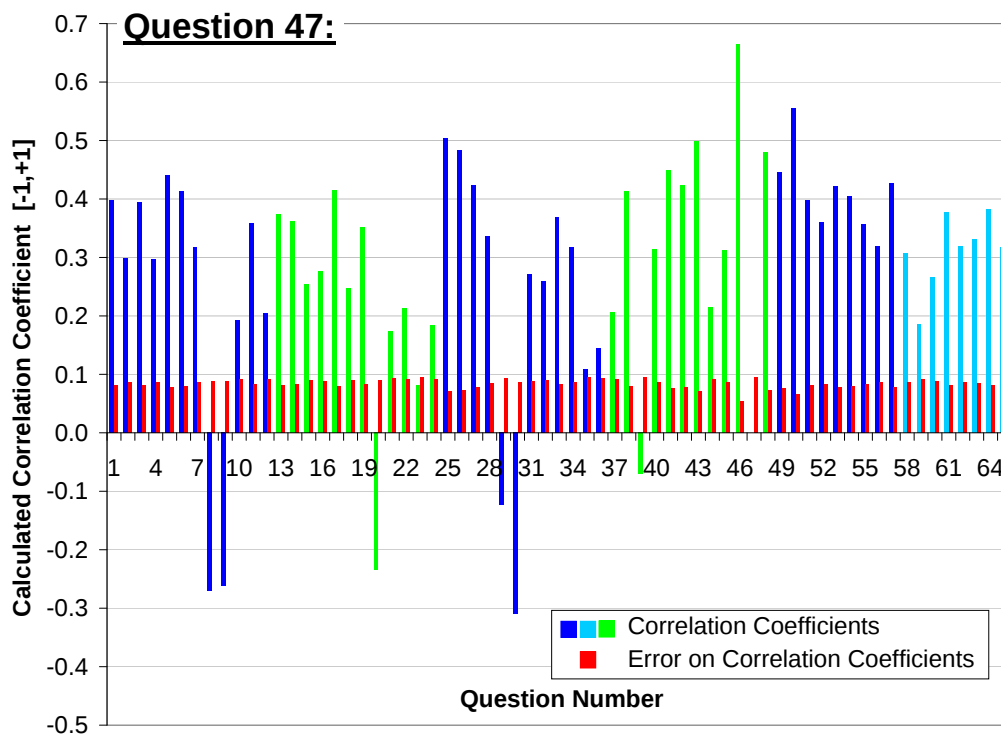


Figure 5.94: Correlation coefficients for Question 47: *The team members feel a real responsibility to make things work.*

The calculated correlation coefficients³⁶⁸ for Question 47³⁶⁹ are smaller than 0.6, except

³⁶⁸see Figure 5.94

³⁶⁹Question 47: *The team members feel a real responsibility to make things work.*

for Question 46³⁷⁰ (0.665). Question 50³⁷¹ (0.556) has a correlation coefficient close to 0.6.

Making employees feel a real responsibility to make things work asks about the team members willingness to achieve a goal or task, while creating a real feeling of teamwork deals with the personal relations of the team members within the team. Thus, the content overlap is small and Question 47 does not need to be modified.

5.4.12 Question 48

Question 48³⁷² asks if the team leader acknowledges others for their contributions and celebrates in their successes.

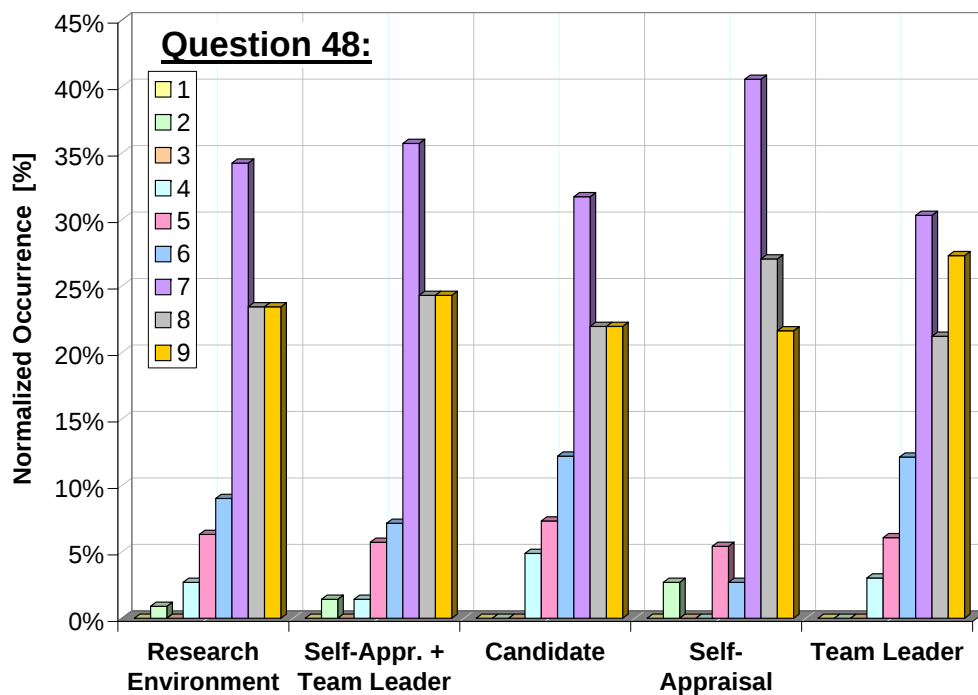


Figure 5.95: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 48: **Acknowledges others for their contributions and celebrates in their successes.**

³⁷⁰ **Question 46:** There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.

³⁷¹ **Question 50:** Pays attention to team's performance. Supports and gives feedback.

³⁷² **Question 48:** Acknowledges others for their contributions and celebrates in their successes.

As already discussed in previous sections³⁷³, scientific research projects are composed of many different and rather complex tasks that are interconnected with each other. A team leader has to delegate sub-projects to some extent to her/his team members because of the complexity and diversity of whole project. If those delegated tasks are completed successfully and in time, then the team leader has to acknowledge her/his team members for their contributions and celebrate in their successes, otherwise, moral and motivation would drop considerably and cause conflicts within the team.

The obtained occurrence distributions³⁷⁴ show an almost identical pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants believe that in almost 90% of all cases they always acknowledge the contributions of their team members, while for the supervisor and candidate groups they feel that in only about 76% of all cases contributions are acknowledged and celebrated.

The reason for this difference might be the fact that team leaders cannot “recognize and acknowledge every single screw that was fixed correctly”. This means, in other words, that the levels for which team members expect to receive acknowledgements and celebrations and when they are actually being made by their team leaders vary considerably. This fact is clearly demonstrated by the differences in the obtained occurrence values between the team members (self-appraisal group) and the supervisor (including the candidate) group.

As already discussed in the previous section³⁷⁵, one reason for this difference might be that supervisors in scientific research projects see their team members as “grown” adults with at least one academic degree. Team leaders would expect such a person not to need to be put in front of the whole group and be celebrated if standard tasks have been accomplished successfully. On the other hand, a formal “Thank you! Well done!” would neither harm nor cost a fortune for any team leader and would assure that motivation is kept at its maximum. Nevertheless, the reasons for these beliefs go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

The calculated correlation coefficients³⁷⁶ for Question 48³⁷⁷ are within the interval

³⁷³see Section 5.4.6, page 169 and previous Section 5.4.11, page 182

³⁷⁴see Figure 5.95

³⁷⁵see Section 5.4.11, page 182

³⁷⁶see Figure 5.96

³⁷⁷**Question 48:** *Acknowledges others for their contributions and celebrates in their successes.*

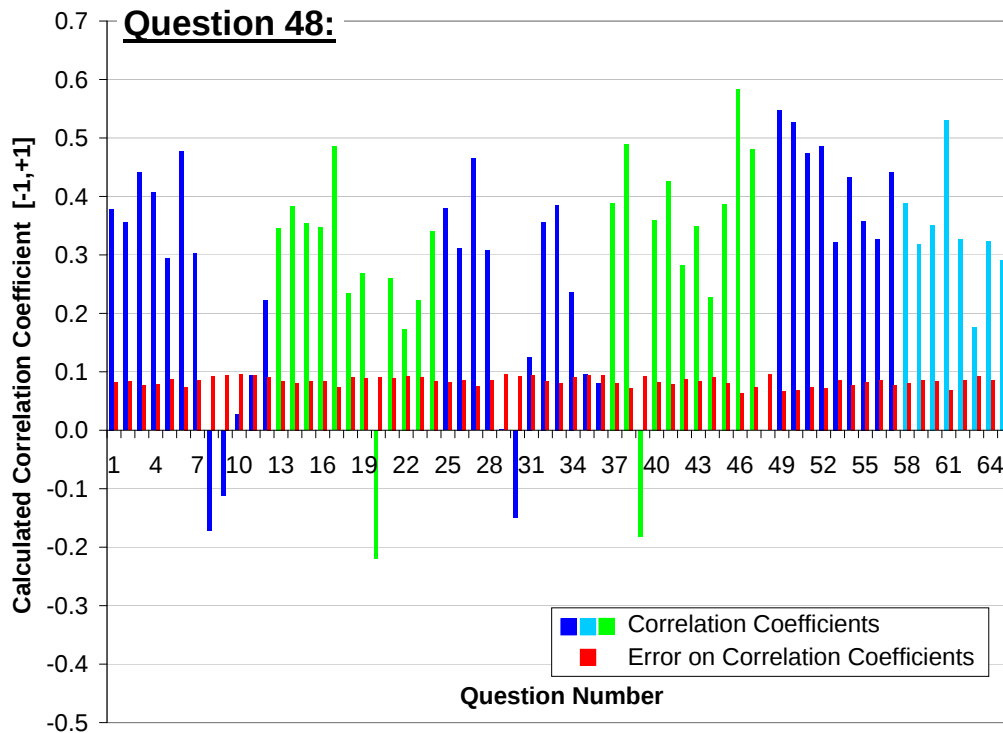


Figure 5.96: *Correlation coefficients for Question 48: Acknowledges others for their contributions and celebrates in their successes.*

$[-0.5, +0.5]$, except for Question 46³⁷⁸ (0.584), Question 49³⁷⁹ (0.547), Question 50³⁸⁰ (0.527), and Question 61³⁸¹ (0.530).

There are only small content overlaps between Question 48 and 46, which have already been discussed Section 5.4.10 (page 179). No causal correlation exists between Question 48 and the mentioned questions or any other question within the questionnaire. Therefore, Question 48 does not need to be modified.

³⁷⁸**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

³⁷⁹**Question 49:** *Recognizes the potential of her/his team members.*

³⁸⁰**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

³⁸¹**Question 61:** *Explains (personal and company) decisions, actions, and goals.*

5.5 Informing and Coaching

5.5.1 Question 49

Question 49³⁸² asks if the team leader recognizes the potential of her/his employees.

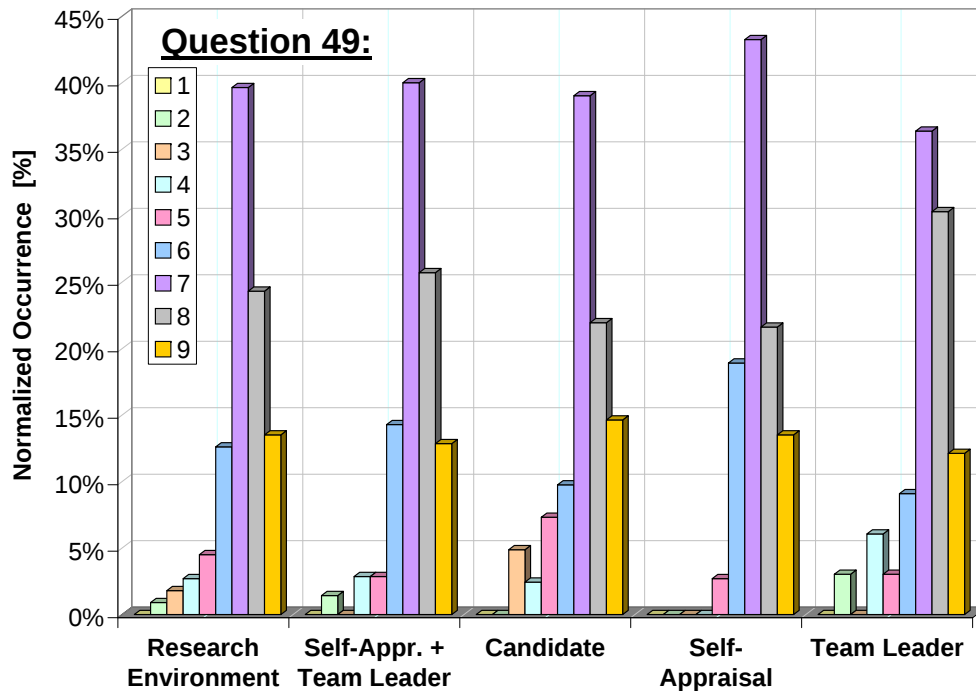


Figure 5.97: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 49: *Recognizes the potential of her/his team members.*

As already mentioned in previous sections³⁸³, scientific research projects are composed of many different and rather complex tasks and typically nobody is capable of handling all these tasks to the same quality level and effectiveness as individual specialists or team members. Thus, team leaders have to delegate specific tasks and sub-projects and it is essential for them to recognize the potential and capabilities of their team members so that they are not overloaded and the quality and performance of the project and the team suffers.

³⁸²**Question 49:** *Recognizes the potential of her/his team members.*

³⁸³see Section 5.4.6, page 169 and Section 5.4.8, page 174

The obtained occurrence distributions³⁸⁴ show an almost identical pattern for all groups: distinctive maximum peaks for the category 7 (= Often). The participants believe that in more than 75% of all the cases the candidate, their supervisors, and the participants themselves (self-appraisal group) Often (= 7) to Always (= 9) recognize the potential of their team members.

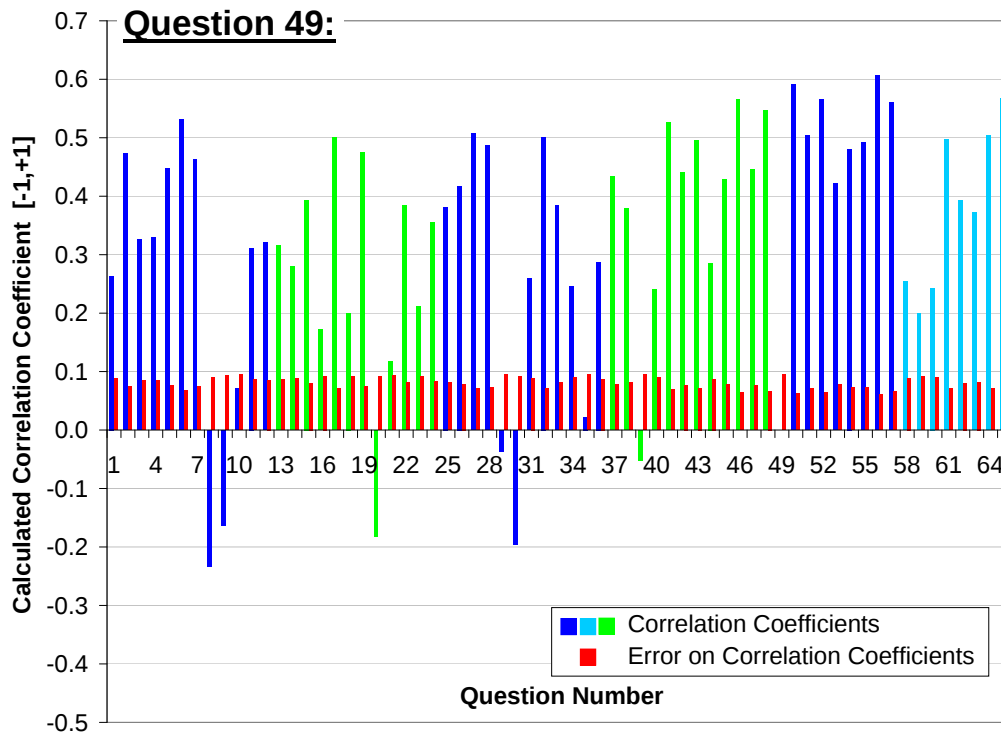


Figure 5.98: Correlation coefficients for Question 49: *Recognizes the potential of her/his team members.*

The calculated correlation coefficients³⁸⁵ for Question 49³⁸⁶ are smaller than 0.6, except for Question 56³⁸⁷ (0.606). Question 46³⁸⁸ (0.566), Question 50³⁸⁹ (0.591), Question 52³⁹⁰

³⁸⁴see Figure 5.97

³⁸⁵see Figure 5.98

³⁸⁶**Question 49:** *Recognizes the potential of her/his team members.*

³⁸⁷**Question 56:** *Identifies causes of resistance and finds ways to overcome them.*

³⁸⁸**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

³⁸⁹**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

³⁹⁰**Question 52:** *Develops others by explaining or demonstrating relevant skills.*

(0.565), Question 57³⁹¹ (0.560), and Question 65³⁹² (0.567) have a correlation coefficient close to 0.6.

Identifying causes of resistance, creating a real feeling of teamwork, paying attention to team's performance, developing others by explaining relevant skills, spending time effectively teaching team members, and handling difficult people and situations effectively have almost no content overlaps with recognizing the potential of her/his employees. Therefore, no causal correlation exists between Question 49 and any other question within the questionnaire and Question 49 does not need to be modified.

³⁹¹**Question 57:** *Spends time effectively teaching or mentoring team members.*

³⁹²**Question 65:** *Handles difficult people and situations effectively.*

5.5.2 Question 50

Question 50³⁹³ asks if the team leader pays attention to the team's performance and if she/he supports the team and gives feedback.

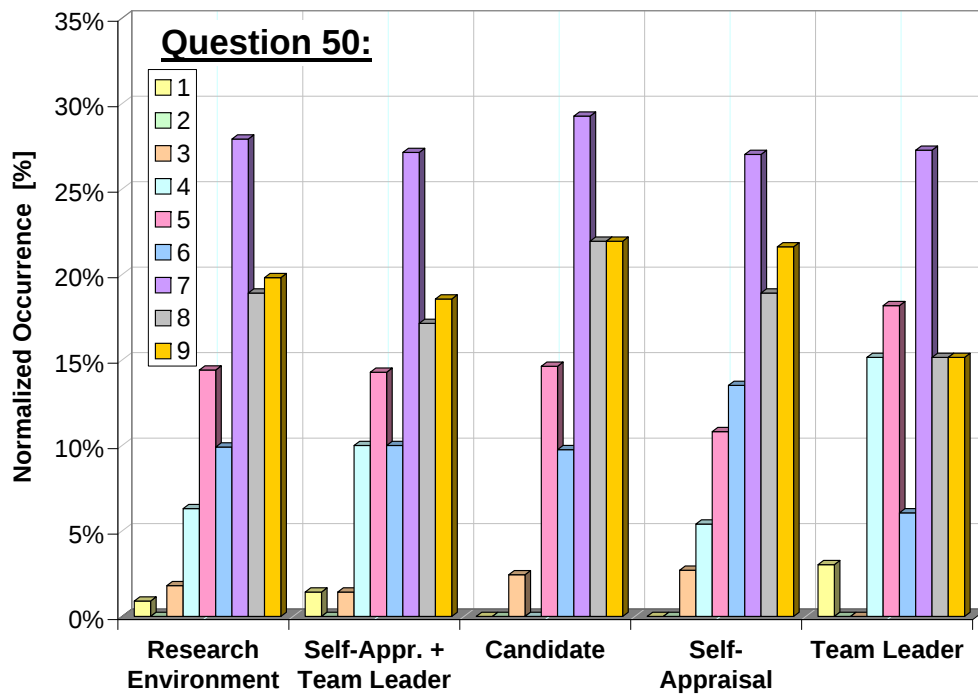


Figure 5.99: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 50: *Pays attention to team's performance. Supports and gives feedback.*

It is essential for a team leader to pay attention and to be aware about the team's and individual team member's performance, because some team members might be bored and under-occupied, some others might be overloaded, or another group might just not be motivated enough to perform at a reasonable performance level. Those differences can cause tensions within the team and lead to a drop in moral and overall performance. Therefore, the team leader has to check the team members performance regularly and to support and give feedback to them.

The obtained occurrence distributions³⁹⁴ show a similar pattern for all groups: distinctive maximum peaks for the category 7 (= Often). The participants believe that the candidate

³⁹³Question 50: *Pays attention to team's performance. Supports and gives feedback.*

³⁹⁴see Figure 5.99

pays Often (= 7) to Always (= 9) attention to the teams performance in 73.2% of all cases, while their supervisors are aware of the teams performance and support them by giving feedback only in 57.6%. The participants think that they are in 67.6% of all cases Often (= 7) to Always (= 9) aware of their team members performance and that they support them by giving feedback. These differences can be explained by the fact that the candidate can be considered as a “hands-on” person who likes to work in the middle of the team and on the front-line, even if she/he leads the team. Therefore, the candidate is well aware of the team’s performance and is also able to support them by giving feedback. On the other hand, participants believe that their supervisors are Occasionally (= 4 to 6) aware how the team is performing and that the team members probably might need feedback and support in only 39.4% of all cases. The reason for this behavior might be that supervisors are occupied most of the time with managerial tasks, so that their attention on the teams performance is less strong than compared to the candidate’s or the team members (self-appraisal group) awareness.

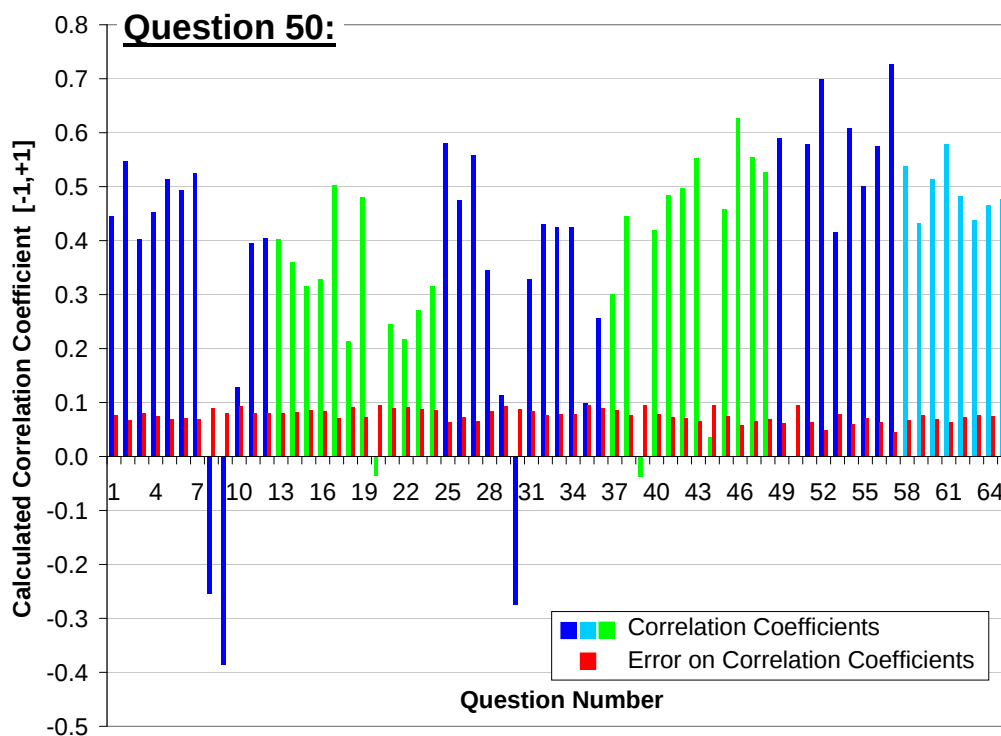


Figure 5.100: *Correlation coefficients for Question 50: Pays attention to team’s performance. Supports and gives feedback.*

The calculated correlation coefficients³⁹⁵ for Question 50³⁹⁶ are smaller than 0.6, except for Question 46³⁹⁷ (0.628), Question 52³⁹⁸ (0.699), Question 54³⁹⁹ (0.608), and Question 57⁴⁰⁰ (0.727). Question 25⁴⁰¹ (0.581), Question 49⁴⁰² (0.591), Question 51⁴⁰³ (0.578), Question 56⁴⁰⁴ (0.575), and Question 61⁴⁰⁵ (0.580) have a correlation coefficient close to 0.6.

Question 50's correlation coefficients for Question 52 and 57 are rather high (~ 0.7). Developing others by explaining relevant skills or effectively spending time teaching team members seems to be strongly overlapping in content with paying attention to the team's performance and supporting by giving feedback. Question 52 asks about the leader's willingness to develop team members by explaining skills directly on the spot and in the middle of work processes so that they can understand the purpose and motives of their work or to help them to overcome current problems. Question 57, on the other hand, addresses the leader's readiness to invest extra time in effectively teaching or mentoring groups of team members in small lectures or lessons by stopping the actual work process and spending additional time on the teaching process. Question 50 asks about the leader's awareness of the team's performance and her/his willingness to support them by giving feedback. There should only be small content overlaps in the mentioned questions, but due to the high correlation coefficients the formulation of all three questions should be modified to point out the differences clearly:

Question 50: *Is aware of the team's actual performance. Gives feedback to support team members.*

Question 52: *Develops others by explaining or demonstrating relevant skills (on the spot or during work processes).*

Question 57: *Spends additional time effectively teaching or mentoring team members (outside regular work processes).*

³⁹⁵see Figure 5.100

³⁹⁶**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

³⁹⁷**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

³⁹⁸**Question 52:** *Develops others by explaining or demonstrating relevant skills.*

³⁹⁹**Question 54:** *Helps the team to focus on goals and objectives.*

⁴⁰⁰**Question 57:** *Spends time effectively teaching or mentoring team members.*

⁴⁰¹**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

⁴⁰²**Question 49:** *Recognizes the potential of her/his team members.*

⁴⁰³**Question 51:** *Likes to use her/his leadership power to help subordinates grow.*

⁴⁰⁴**Question 56:** *Identifies causes of resistance and finds ways to overcome them.*

⁴⁰⁵**Question 61:** *Explains (personal and company) decisions, actions, and goals.*

No causal correlation at all exists between Question 50 and the mentioned questions or any other question within the questionnaire. Therefore, no further modification of any of the mentioned questions is required.

5.5.3 Question 51

Question 51⁴⁰⁶ asks if the team leader likes to use her/his leadership power to help subordinates grow.

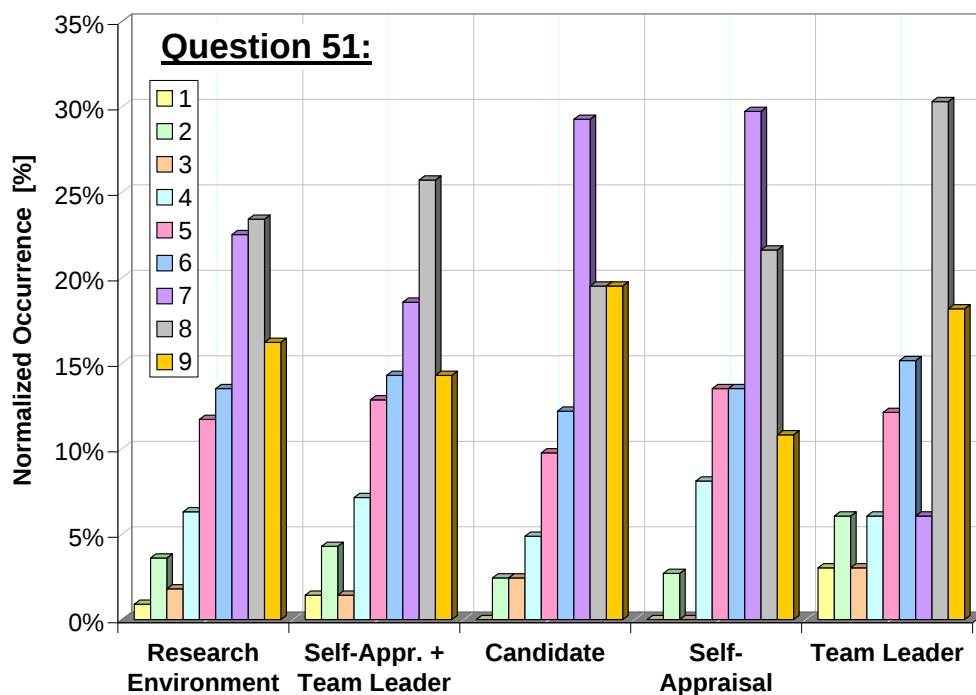


Figure 5.101: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 51: *Likes to use her/his leadership power to help subordinates grow.*

Team members and also team leaders in scientific research projects are in many cases master students, PhD students, or have post-PhD positions (“post-docs”). All those team members are either trying to change and evolve their academic status or they want to advance by getting a promotion or fix-term position within the research organization. However, not only academic goals are pursued within a team. Sometimes team members

⁴⁰⁶ **Question 51:** *Likes to use her/his leadership power to help subordinates grow.*

need some extra time to do specializations in their technical or engineering professions, or they need to learn an additional language, or they try to advance in another way within the organization. Therefore, it is up to the leader to use her/his leadership power to support her/his team members to achieve their goals: master thesis, PhD thesis, etc.

The obtained occurrence distributions⁴⁰⁷ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants believe that the candidate likes to use her/his leadership power Often (= 7) to Always (= 9) to help her/his team members to grow within the team or the organization in more than 68% of all cases, while their supervisors support their team members in only 54.5%. The participants think that they use their formal position in 62% of all cases to help their team members to change their position within their team. On the contrary, 12% believe that their supervisors would Never (= 1) to Seldom (= 3) use their leadership power to help their team members to grow. The reasons for these beliefs go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

The calculated correlation coefficients⁴⁰⁸ for Question 51⁴⁰⁹ are smaller than 0.6, except for Question 19⁴¹⁰ (0.618) and Question 52⁴¹¹ (0.657). Question 25⁴¹² (0.571), Question 27⁴¹³ (0.582), and Question 50⁴¹⁴ (0.578) have a correlation coefficient close to 0.6.

Using leadership power to help subordinates grow asks about the leaders willingness to support team members in such a way that they can grow and change their status within the organization. As already mentioned in the previous section,⁴¹⁵ Question 52 asks about the leader's willingness to develop team members by explaining skills in the middle of work processes to overcome current problems. Question 50⁴¹⁶ asks about the leader's awareness of the team's performance and her/his willingness to support team members by giving feedback. Thus, the content overlap should be rather small, but the formulation of Question 51 will be modified to reduce the correlation coefficient and clarify the differences between

⁴⁰⁷see Figure 5.101

⁴⁰⁸see Figure 5.102

⁴⁰⁹**Question 51:** *Likes to use her/his leadership power to help subordinates grow.*

⁴¹⁰**Question 19:** *Gives team members honest and fair answers.*

⁴¹¹**Question 52:** *Develops others by explaining or demonstrating relevant skills.*

⁴¹²**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

⁴¹³**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

⁴¹⁴**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

⁴¹⁵see Section 5.5.2, page 190

⁴¹⁶see (same discussion in) Section 5.5.2, page 190

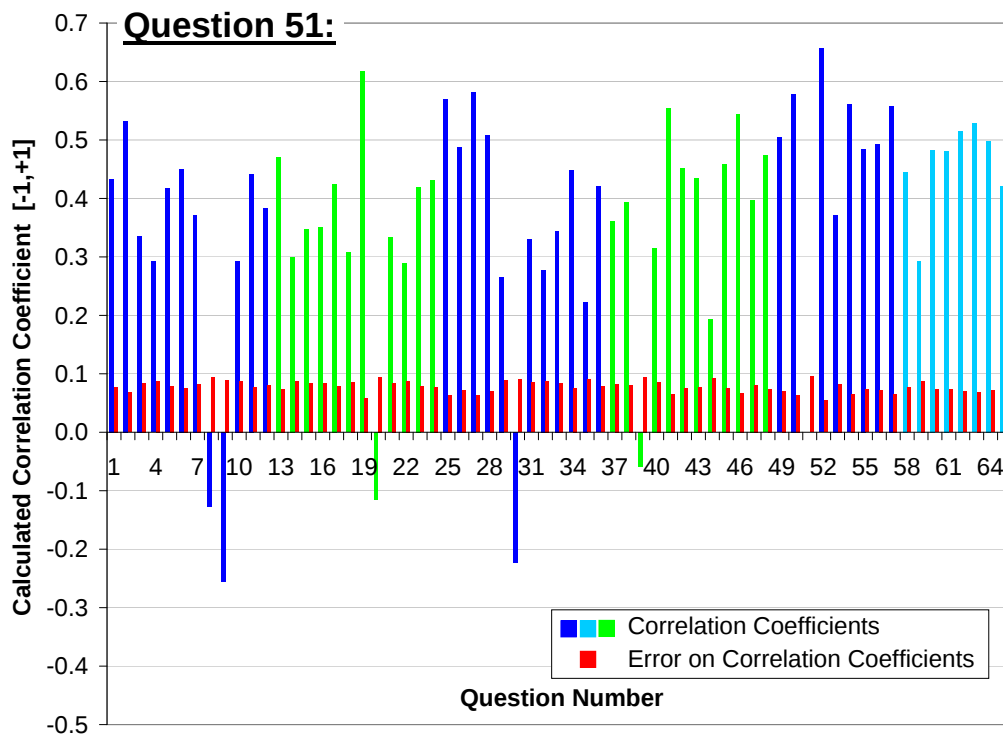


Figure 5.102: Correlation coefficients for Question 51: *Likes to use her/his leadership power to help subordinates grow.*

both questions:

Question 51: *Likes to use her/his leadership power to help subordinates grow and evolve (within the team's/company's hierarchical structure).*

Question 52: *Develops others by explaining or demonstrating relevant skills (on the spot or during work processes).*

Question 25 and 27 seem to have no content overlaps with Question 51. Therefore, no further modification of Question 51 is required.

5.5.4 Question 52

Question 52⁴¹⁷ asks if the team leader develops others by explaining or demonstrating relevant skills.

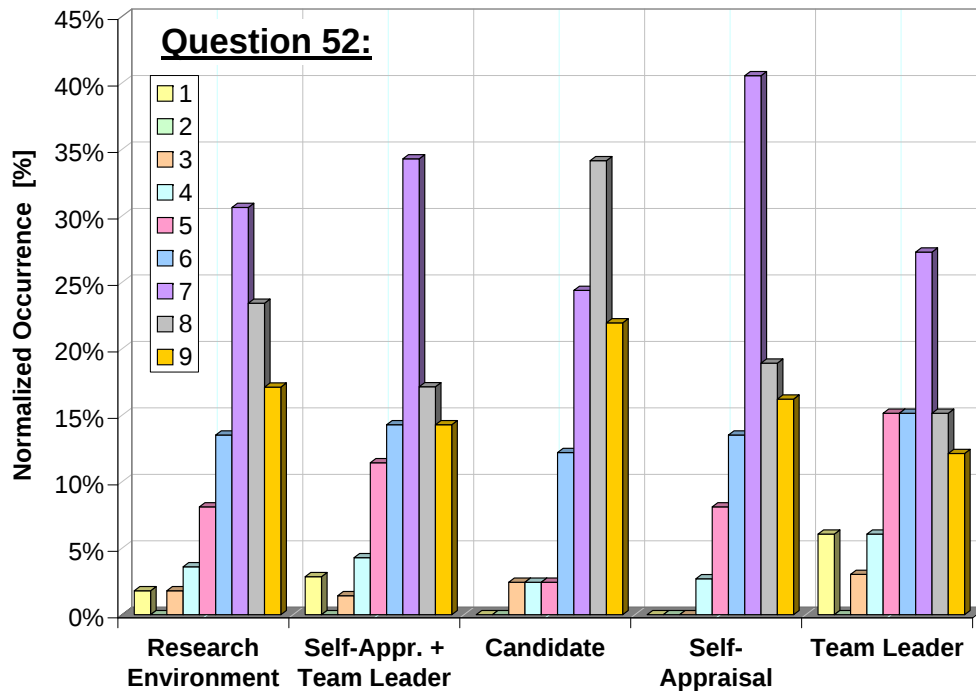


Figure 5.103: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 52: *Develops others by explaining or demonstrating relevant skills.*

As already mentioned in the previous section⁴¹⁸, team members and also team leaders in scientific research projects are in many cases master students, PhD students, or just newcomers who recently joined the team and who need an orientation about the work processes within the team. Thus, there are always some team members who are still undergoing some sort of training and who need to learn relevant skills required to perform their tasks within the research project. Question 52 asks about the leader's readiness to explain or demonstrate those relevant and needed skills to their team members.

The obtained occurrence distributions⁴¹⁹ show a similar pattern for all groups: distinctive

⁴¹⁷ **Question 52:** *Develops others by explaining or demonstrating relevant skills.*

⁴¹⁸ see Section 5.5.3, page 193

⁴¹⁹ see Figure 5.103

maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants believe that the candidate develops others by explaining or demonstrating relevant skills in 80.5% of all cases, while their supervisors Often (= 7) to Always (= 9) explain relevant skills in less than 55%. The participants also believe that they develop their team members in almost 76% of all cases. On the other hand, almost 10% of the participants believe that their supervisors would Never (= 1) to Seldom (= 3) explain or demonstrate relevant skills to their team members.

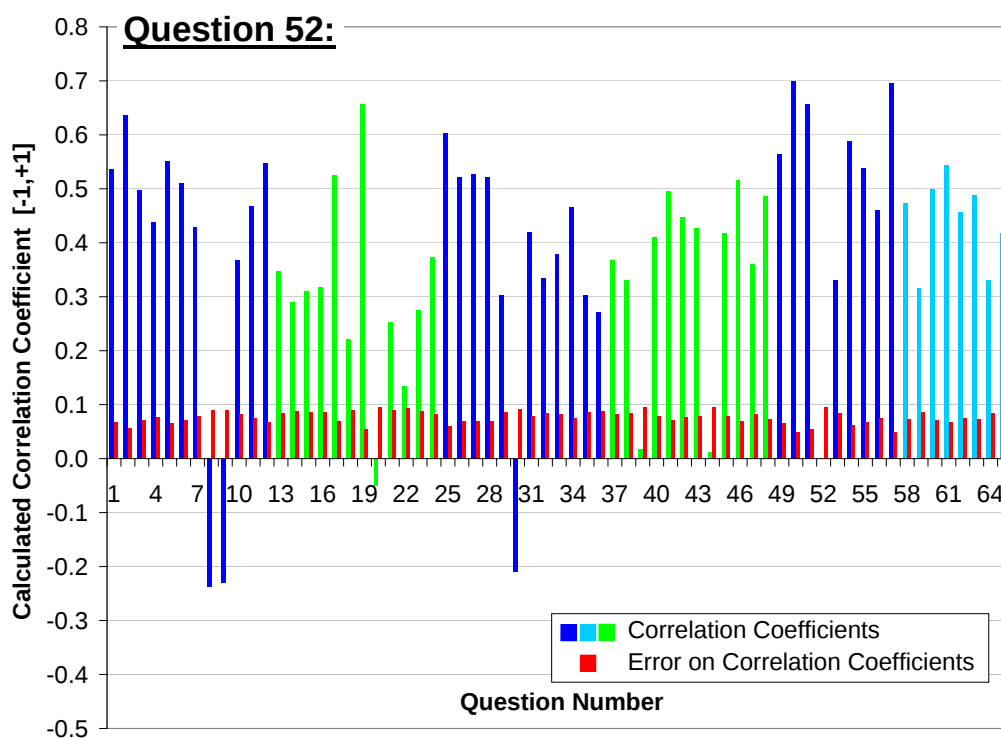


Figure 5.104: *Correlation coefficients for Question 52: Develops others by explaining or demonstrating relevant skills.*

The reasons for this behavior can be explained by the fact that team leaders are typically occupied with managerial tasks and that they delegate specific tasks and sub-projects to their team members. Therefore, they might also delegate the training and development of their team members to the specialists in their team. The candidate is a rather “hands-on” person who likes to be directly involved in the specific tasks. Thus, she/he is either already on the spot and available to explain and demonstrate relevant skills or she/he is specialized enough to do the particular training by herself/himself. The reasons for these beliefs go beyond the scope of this questionnaire and should be investigated in more detail

by personal interviews.

The calculated correlation coefficients⁴²⁰ for Question 52⁴²¹ are smaller than 0.6, except for Question 02⁴²² (0.637), Question 19⁴²³ (0.657), Question 25⁴²⁴ (0.603), Question 50⁴²⁵ (0.699), Question 51⁴²⁶ (0.657), and Question 57⁴²⁷ (0.696). Question 49⁴²⁸ (0.565) and Question 54⁴²⁹ (0.587) have a correlation coefficient close to 0.6.

The causes for the high correlation coefficients between Question 52, 50, and 57 and the related modifications on the question formulations were already discussed in a previous Section.⁴³⁰ No causal correlation or content overlaps exist between Question 52 and the mentioned questions or any other question within the questionnaire. Therefore, Question 52 does not need to be modified further.

⁴²⁰see Figure 5.104

⁴²¹**Question 52:** *Develops others by explaining or demonstrating relevant skills.*

⁴²²**Question 02:** *Makes suggestions about how to solve problems and sets standards of performance for group members.*

⁴²³**Question 19:** *Gives team members honest and fair answers.*

⁴²⁴**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

⁴²⁵**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

⁴²⁶**Question 51:** *Likes to use her/his leadership power to help subordinates grow.*

⁴²⁷**Question 57:** *Spends time effectively teaching or mentoring team members.*

⁴²⁸**Question 49:** *Recognizes the potential of her/his team members.*

⁴²⁹**Question 54:** *Helps the team to focus on goals and objectives.*

⁴³⁰see Section 5.5.2, page 190

5.5.5 Question 53

Question 53⁴³¹ asks if the team leader encourages team members to solve problems on their own.

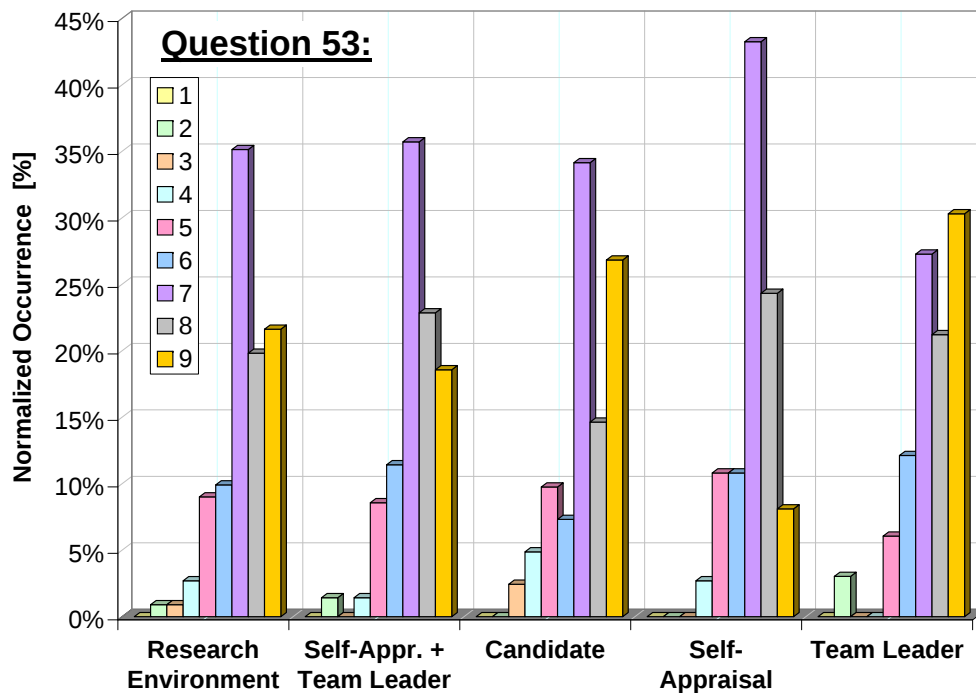


Figure 5.105: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 53: *Encourages team members to solve problems on their own.*

As already mentioned in previous sections⁴³², scientific research projects are composed of many different and rather complex tasks. Thus, team members should be encouraged to solve problems on their own, because if they either have to report to the team leader and wait for her/his availability to study the problem or to find a specialist who is capable of solving the problem, then too much precious time would be wasted. Furthermore⁴³³, team members and also team leaders in scientific research projects are in many cases master students, PhD students, or have post-PhD positions (“post-docs”). All these team members are either trying to change and evolve their academic status or they want to advance by getting a promotion or fix-term position within the research organization.

⁴³¹ **Question 53:** *Encourages team members to solve problems on their own.*

⁴³² see Section 5.4.6, page 169 and Section 5.4.8, page 174

⁴³³ see Section 5.5.3, page 193

Thus, they are either capable of or still have to demonstrate independent decision making and independence in recognizing, analyzing, and finally solving a problem. Team leaders should therefore encourage team members to solve problems on their own and anticipate or act in a way which the leader would have chosen. This saves time and also helps to develop and train their team members to become successful future team leaders, which is one of the goals of a scientific research project.

The obtained occurrence distributions⁴³⁴ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants believe that the candidate, their supervisors, and the participants themselves (self-appraisal group) in more than 75% of all cases encourage their team members Often (= 7) to Always (= 9) to solve problems on their own.

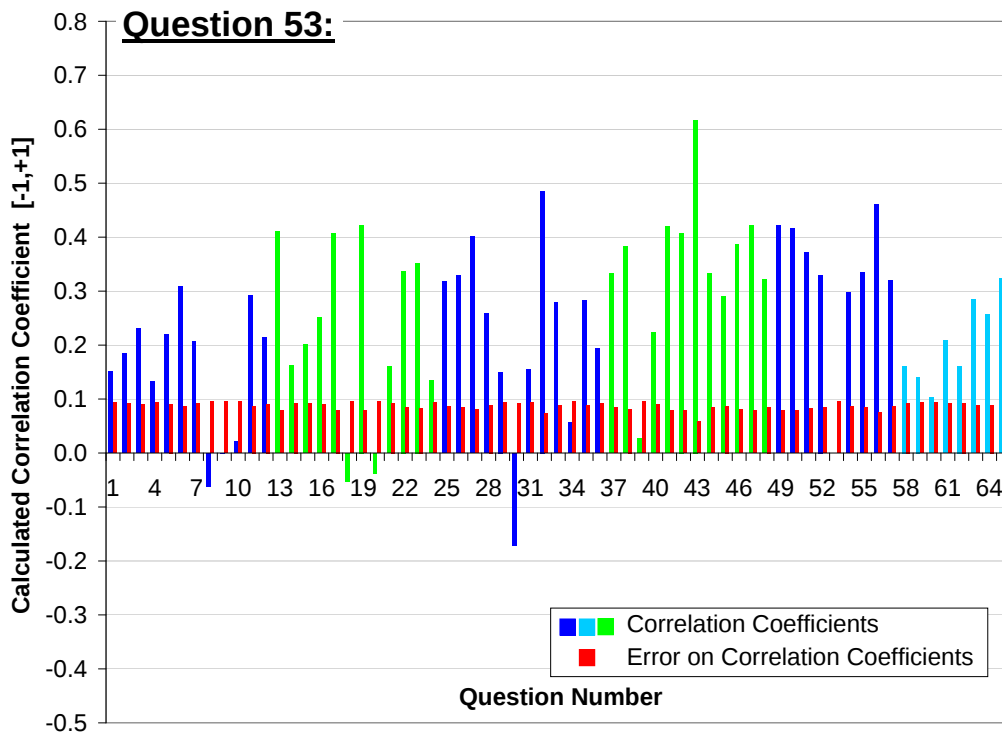


Figure 5.106: *Correlation coefficients for Question 53: Encourages team members to solve problems on their own.*

⁴³⁴see Figure 5.105

The calculated correlation coefficients⁴³⁵ for Question 53⁴³⁶ are within the interval $[-0.5, +0.5]$, except for Question 43⁴³⁷ (0.617).

No causal correlation exists between Question 53 and the mentioned questions or any other question within the questionnaire. Therefore, Question 53 does not need to be modified.

5.5.6 Question 54

Question 54⁴³⁸ asks if the team leader helps the team to focus on goals and objectives.

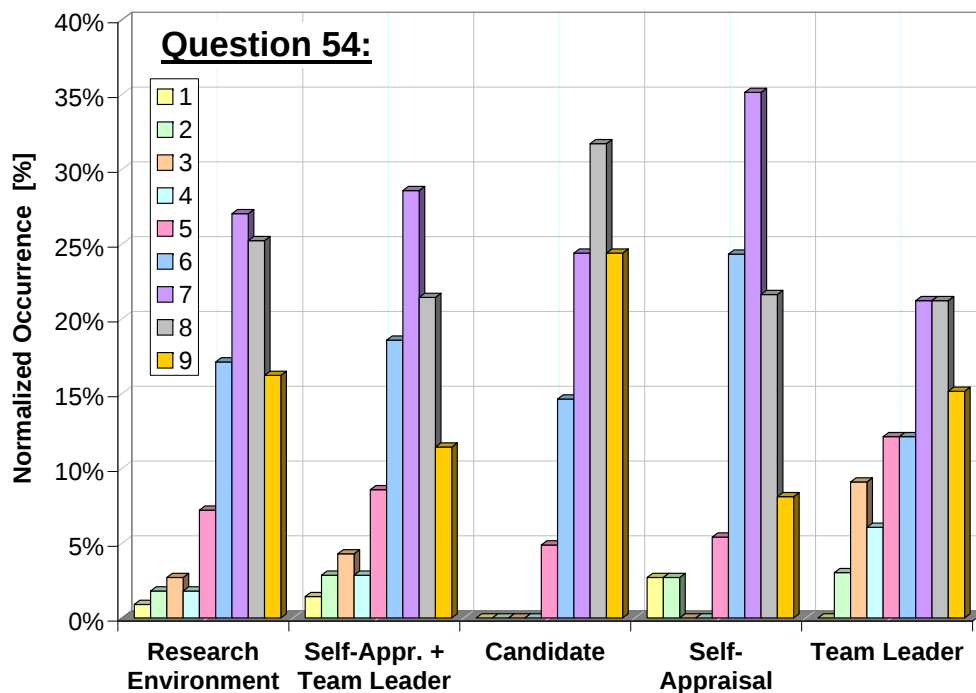


Figure 5.107: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 54: *Helps the team to focus on goals and objectives.*

⁴³⁵see Figure 5.106

⁴³⁶**Question 53:** Encourages team members to solve problems on their own.

⁴³⁷**Question 43:** Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.

⁴³⁸**Question 54:** Helps the team to focus on goals and objectives.

As already mentioned in previous sections⁴³⁹, scientific research projects are composed of many different and rather complex tasks where usually many people from different countries, research laboratories, and technical topics are working together over extended periods of time. The broad topic diversity and the different tasks require a leader with a strong task focus and managerial skills to keep the final goal of the project in mind and to communicate this goal and the required tasks to her/his team members. Otherwise, chaos starts to rule and the project becomes a disaster. Thus, team members should constantly help their team members to focus on goals and objectives.

The obtained occurrence distributions⁴⁴⁰ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The participants believe that the candidate helps the team in more than 80% of all cases to focus on goals and objectives, while their supervisors help Often (= 7) to Always (= 9) in only 57.6%. The participants believe that they help their team members 65% of the time to focus on goals and objectives. On the contrary, more than 12% of the supervisors Never (= 1) to Seldom (= 3) help their team members to get back on track and to focus on their goals. The reasons for these beliefs go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

The calculated correlation coefficients⁴⁴¹ for Question 54⁴⁴² are smaller than 0.6, except for Question 02⁴⁴³ (0.684), Question 25⁴⁴⁴ (0.609), Question 50⁴⁴⁵ (0.608), Question 57⁴⁴⁶ (0.666), Question 58⁴⁴⁷ (0.648), Question 60⁴⁴⁸ (0.611), and Question 61⁴⁴⁹ (0.678). Question 07⁴⁵⁰ (0.583), Question 31⁴⁵¹ (0.573), and Question 52⁴⁵² (0.587) have a correlation coefficient close to 0.6.

⁴³⁹see Section 5.4.6, page 169 and Section 5.4.8, page 174

⁴⁴⁰see Figure 5.107

⁴⁴¹see Figure 5.108

⁴⁴²**Question 54:** *Helps the team to focus on goals and objectives.*

⁴⁴³**Question 02:** *Makes suggestions about how to solve problems and sets standards of performance for group members.*

⁴⁴⁴**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

⁴⁴⁵**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

⁴⁴⁶**Question 57:** *Spends time effectively teaching or mentoring team members.*

⁴⁴⁷**Question 58:** *Explains how the team fits into the project or company objectives.*

⁴⁴⁸**Question 60:** *Explains rules and expectations.*

⁴⁴⁹**Question 61:** *Explains (personal and company) decisions, actions, and goals.*

⁴⁵⁰**Question 07:** *Effectively allocates available resources, e.g., time, people, money.*

⁴⁵¹**Question 31:** *Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.*

⁴⁵²**Question 52:** *Develops others by explaining or demonstrating relevant skills.*

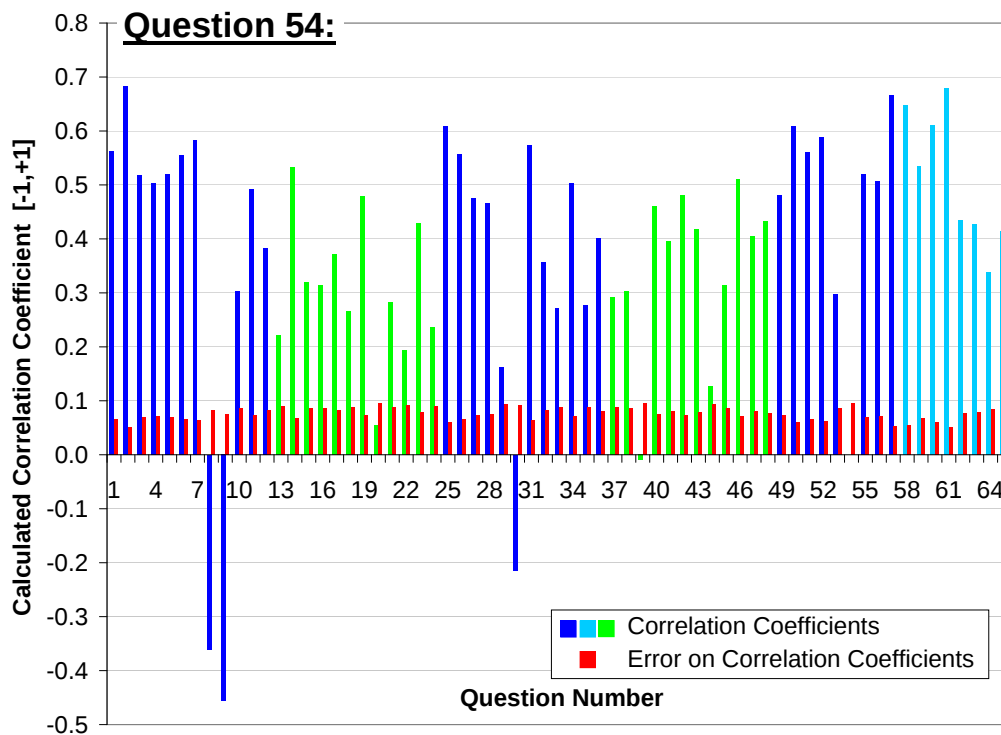


Figure 5.108: *Correlation coefficients for Question 54: **Helps the team to focus on goals and objectives.***

Making suggestions about how to solve problems, or spending time effectively teaching, or explaining decisions, actions, and goals has only small content overlap with helping the team to focus on goals. No causal correlation exists between Question 54 and the mentioned questions or any other question within the questionnaire. Therefore, Question 54 does not need to be modified.

5.5.7 Question 55

Question 55⁴⁵³ asks if the team leader gets team members to look at problems from many different angles.

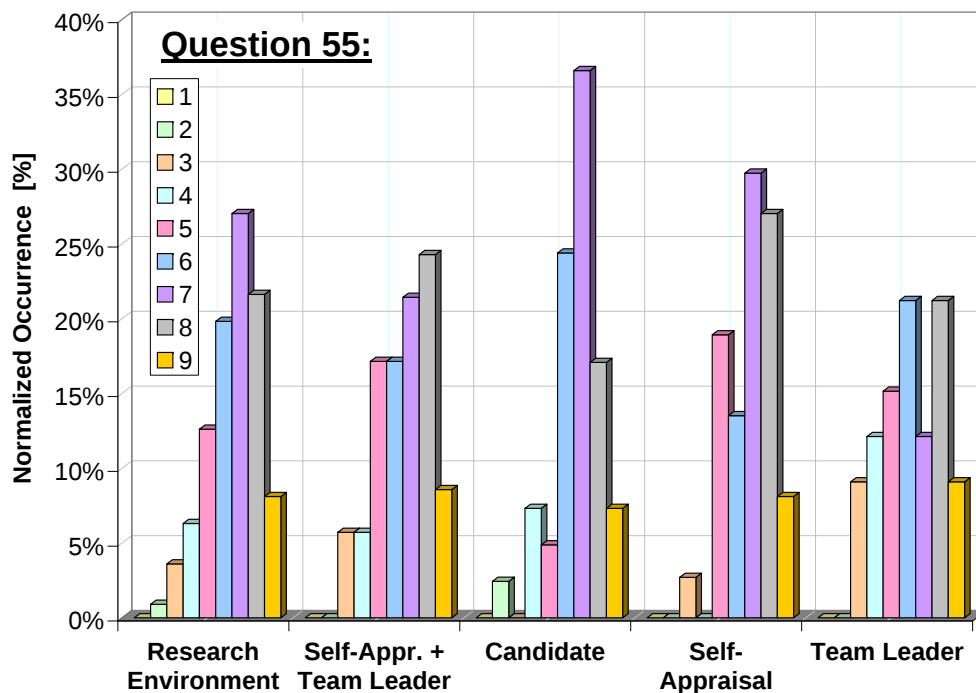


Figure 5.109: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 55: *Gets team members to look at problems from many different angles.*

Scientific research projects typically aim for challenging goals that sometimes require new technologies or methods to be developed. Team members have to be motivated to look at problems from many different angles and to be open to new ideas and perspectives to minimize the development time and to reduce the risk of getting stuck on the way. Therefore, it is essential that a team leader helps her/his team members to find those new perspectives and most importantly to accept new methods and technologies, because it is typically quite difficult to change procedures that have been proven to be successful in a specific situation.

The obtained occurrence distributions⁴⁵⁴ show a similar pattern for all groups: distinctive maximum peaks within the upper four categories from 6 (= Occasionally/Often) to

⁴⁵³Question 55: Gets team members to look at problems from many different angles.

⁴⁵⁴see Figure 5.109

9 (= Always). The participants believe that they would help their team members to look at problems from many different angles in almost 65% of all cases, while their supervisors provide their assistance in only 42.4%. The candidate is perceived to help Often (= 7) to Always (= 9) in 61% of all cases. On the other hand, 48.5% of the supervisors (the candidate excluded) help Occasionally (= 4 to 6) their team members to get a different perspective. The reasons for this behavior go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

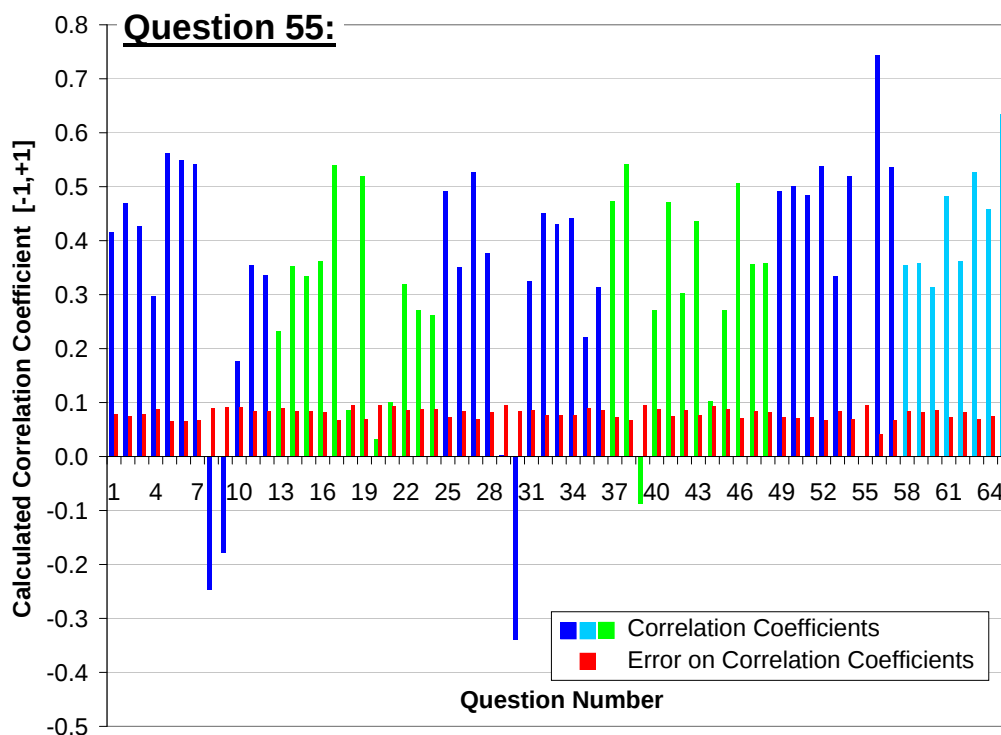


Figure 5.110: *Correlation coefficients for Question 55: Gets team members to look at problems from many different angles.*

The calculated correlation coefficients⁴⁵⁵ for Question 55⁴⁵⁶ are smaller than 0.6, except for Question 56⁴⁵⁷ (0.745) and Question 65⁴⁵⁸ (0.634). Question 05⁴⁵⁹ (0.562) has a correlation coefficient close to 0.6.

⁴⁵⁵see Figure 5.110

⁴⁵⁶**Question 55:** Gets team members to look at problems from many different angles.

⁴⁵⁷**Question 56:** Identifies causes of resistance and finds ways to overcome them.

⁴⁵⁸**Question 65:** Handles difficult people and situations effectively.

⁴⁵⁹**Question 05:** Recognizes what needs to be done and takes the initiative to make it happen.

Handling difficult people and situations effectively and identifying causes of resistance has no content overlaps with getting team members to look at problems from many different angles. No causal correlation exists between Question 55 and the mentioned questions or any other question within the questionnaire. Therefore, Question 55 does not need to be modified.

5.5.8 Question 56

Question 56⁴⁶⁰ asks if the team leader is capable of identifying causes of resistance and if she/he finds ways to overcome them.

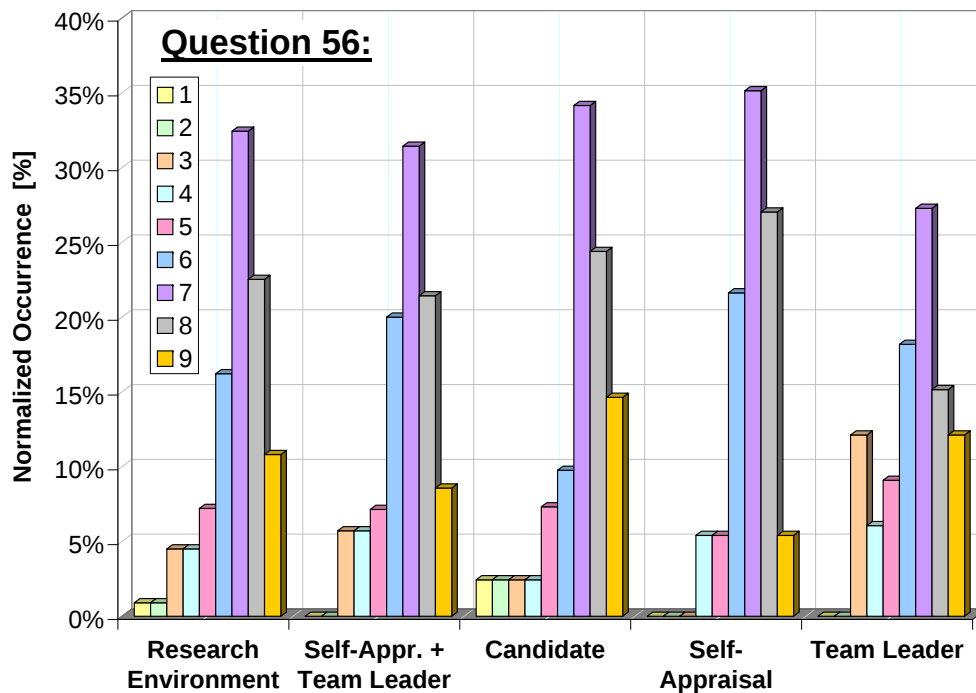


Figure 5.111: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 56: *Identifies causes of resistance and finds ways to overcome them.*

Scientific research projects are typically sophisticated projects consisting of many different topics and with many specialists involved. Communication barriers, misunderstandings, lack of training in a specialized topic, fear of taking risks, etc. can cause resistance and

⁴⁶⁰Question 56: *Identifies causes of resistance and finds ways to overcome them.*

conflicts within the team. Therefore, a team leader has to be able to quickly identify causes of resistance and to find effective ways to overcome them.

The obtained occurrence distributions⁴⁶¹ show an almost identical pattern for all groups: distinctive maximum peaks for the category 7 (= Often). The participants believe that the candidate is capable of identifying causes of resistance and of finding ways to overcome them in more than 73% of all cases, while their supervisors are in only 54.5% capable of locating the causes of resistance Often (= 7) to Always (= 9). The participants themselves think that they can identify the causes of resistance in almost 68% of all cases.

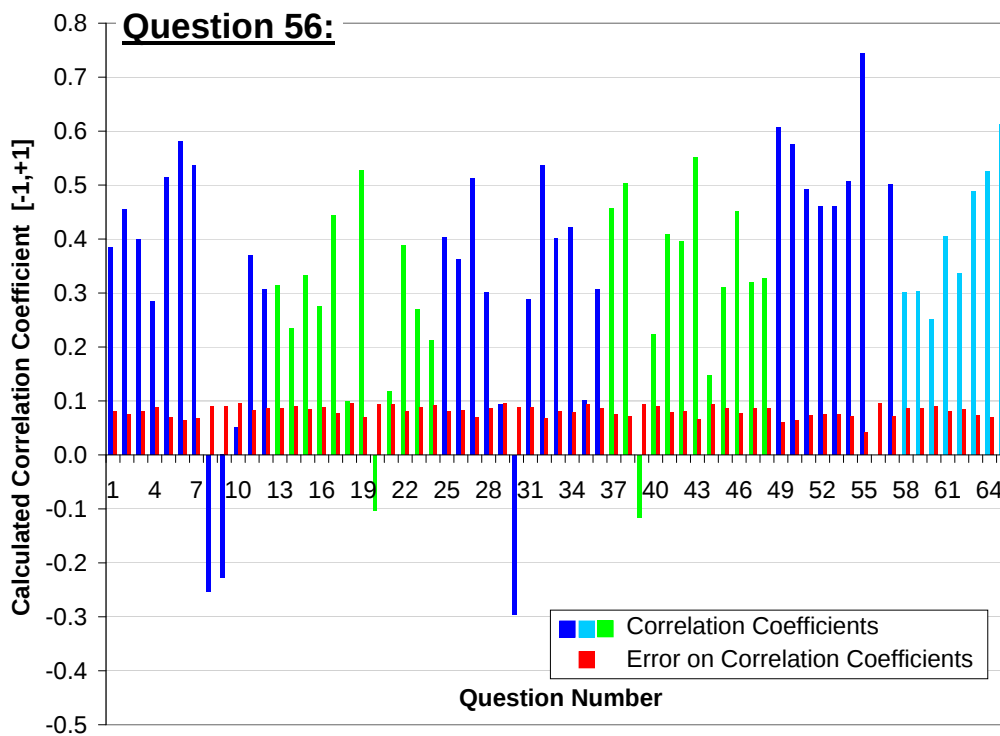


Figure 5.112: *Correlation coefficients for Question 56: Identifies causes of resistance and finds ways to overcome them.*

The difference in these figures might be explained by the fact that the candidate spends most of her/his time being directly involved in the design, implementation, and execution of the specific tasks, although she/he is leading the team as well. Therefore, it is easier for her/him to locate the causes of resistance and to find ways and methods to overcome them than for the supervisors, who are occupied most of the time by man-

⁴⁶¹see Figure 5.111

agerial tasks. Again, the reasons for these mentioned resistances are not an objective of this questionnaire and should be investigated in more detail by the individual team leaders.

The calculated correlation coefficients⁴⁶² for Question 56⁴⁶³ are smaller than 0.6, except for Question 49⁴⁶⁴ (0.606), Question 55⁴⁶⁵ (0.745), and Question 65⁴⁶⁶ (0.613). Question 06⁴⁶⁷ (0.581), Question 43⁴⁶⁸ (0.551), and Question 50⁴⁶⁹ (0.575) have a correlation coefficient close to 0.6.

Recognizing the potential of her/his employees, or handling difficult people and situations effectively has only small content overlap with identifying causes of resistance. No causal correlation exists between Question 56 and the mentioned questions or any other question within the questionnaire. Therefore, Question 56 does not need to be modified.

⁴⁶²see Figure 5.112

⁴⁶³**Question 56:** *Identifies causes of resistance and finds ways to overcome them.*

⁴⁶⁴**Question 49:** *Recognizes the potential of her/his team members.*

⁴⁶⁵**Question 55:** *Gets team members to look at problems from many different angles.*

⁴⁶⁶**Question 65:** *Handles difficult people and situations effectively.*

⁴⁶⁷**Question 06:** *Prioritizes key objectives and focuses the groups activity on them.*

⁴⁶⁸**Question 43:** *Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.*

⁴⁶⁹**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

5.5.9 Question 57

Question 57⁴⁷⁰ asks if the team leader spends time effectively teaching or mentoring team members.

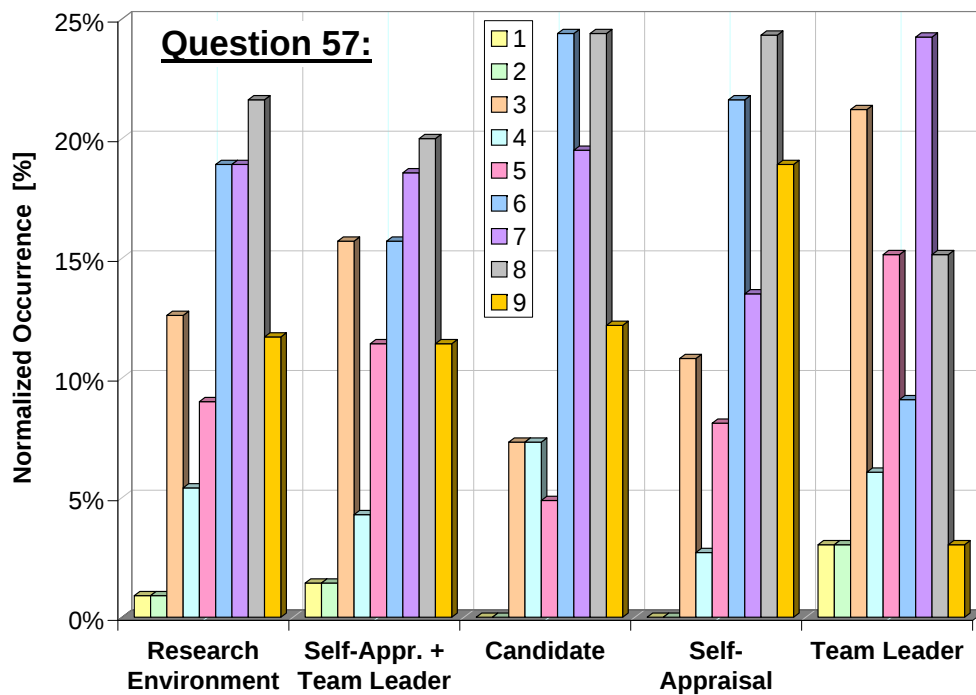


Figure 5.113: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 57: *Spends time effectively teaching or mentoring team members.*

The obtained occurrence distributions⁴⁷¹ show a considerably different pattern for all groups: different maximum peaks distributed over the whole performance key spectrum. The participants perceived occurrence values are given in Table 5.5. The pattern for the candidate (7.3 - 36.6 - 56.1)⁴⁷² indicates that she/he is a rather “hands-on” person who likes to be directly involved into the specific tasks, even if she/he leads the team. Thus, she/he is either already on the spot and available to teach and mentor team members effectively or she/he is specialized enough to do the particular training herself/himself.

⁴⁷⁰**Question 57:** *Spends time effectively teaching or mentoring team members.*

⁴⁷¹see Figure 5.113

⁴⁷²see first line in Table 5.5

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)
Candidate	7.3%	36.6%	56.1%
Self-Appraisal	10.8%	32.4%	56.8%
Supervisor	27.3%	30.3%	42.4%

Table 5.5: Obtained occurrence values for Question 57.

The pattern for the participants themselves (10.8 - 32.4 - 56.8)⁴⁷³ is almost identical to the candidate distribution. This confirms the explanation for the candidate distribution, since the participants are also directly involved in specific tasks and therefore either already on the spot and available to teach and mentor team members effectively or they are specialized enough to do the particular training themselves.

The pattern for the supervisors group (27.3 - 30.3 - 42.4)⁴⁷⁴ also confirms the given explanation. Team leaders are typically occupied by managerial tasks and not directly involved in the specific tasks. Therefore, they are either not specialized enough to do the particular training themselves or they simply tend to delegate those tasks to their specialists in the team. Nevertheless, in some cases it is very important that team leaders spend time teaching or mentoring newcomers effectively so that they build up their trust in the team leader.

Based on the observed patterns⁴⁷⁵ one can conclude that no general rule exists about the question if and how much time a team leader should spend teaching or mentoring team members effectively. Again, the reasons for this behavior are not an objective of this questionnaire and should be investigated in more detail by the individual team leaders.

The calculated correlation coefficients⁴⁷⁶ for Question 57⁴⁷⁷ are smaller than 0.6, except for Question 50⁴⁷⁸ (0.727), Question 52⁴⁷⁹ (0.696), Question 54⁴⁸⁰ (0.666), and

⁴⁷³see second line in Table 5.5

⁴⁷⁴see third line in Table 5.5

⁴⁷⁵see Figure 5.113

⁴⁷⁶see Figure 5.114

⁴⁷⁷**Question 57:** *Spends time effectively teaching or mentoring team members.*

⁴⁷⁸**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

⁴⁷⁹**Question 52:** *Develops others by explaining or demonstrating relevant skills.*

⁴⁸⁰**Question 54:** *Helps the team to focus on goals and objectives.*

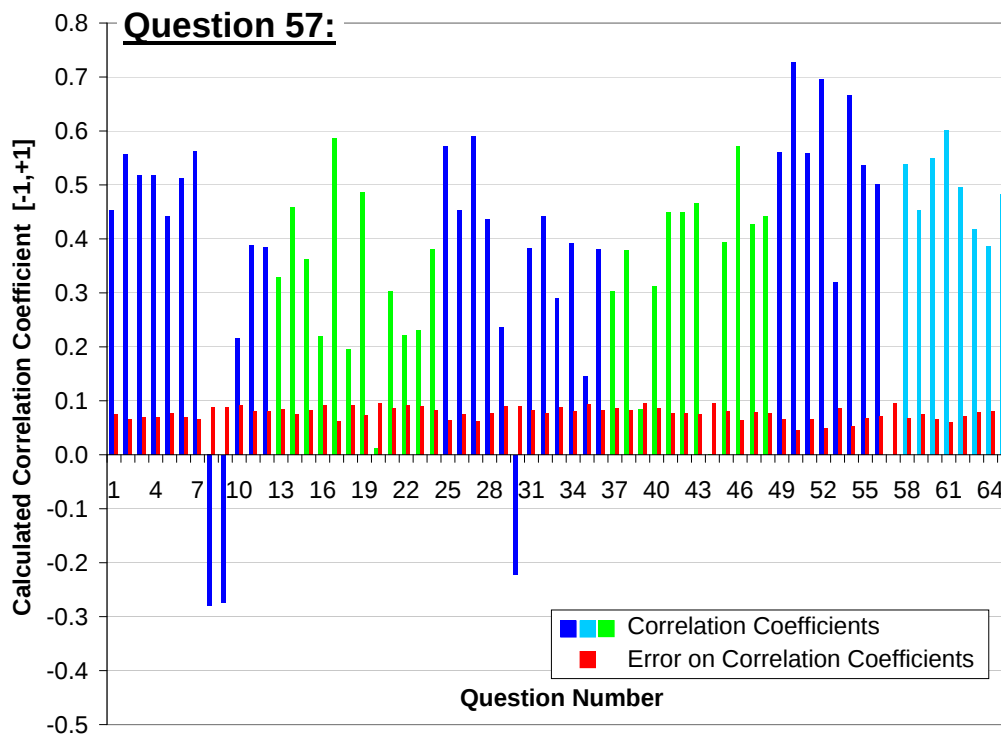


Figure 5.114: *Correlation coefficients for Question 57: Spends time effectively teaching or mentoring team members.*

Question 61⁴⁸¹ (0.602). Question 17⁴⁸² (0.586), Question 25⁴⁸³ (0.572), Question 27⁴⁸⁴ (0.590), and Question 46⁴⁸⁵ (0.572) have a correlation coefficient close to 0.6.

The causes of the high correlation coefficients between Question 57, 50, 52, and 54 have already been discussed in previous Sections.⁴⁸⁶ No causal correlation exists between Question 57 and the mentioned questions or any other question within the questionnaire. Therefore, Question 57 does not need to be modified.

⁴⁸¹**Question 61:** *Explains (personal and company) decisions, actions, and goals.*

⁴⁸²**Question 17:** *Acknowledges her/his own mistakes and takes corrective action.*

⁴⁸³**Question 25:** *Sets high and clear standards for others by her/his own behavior.*

⁴⁸⁴**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

⁴⁸⁵**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

⁴⁸⁶see Section 5.5.2, page 190 and Section 5.5.6, page 201

5.5.10 Question 58

Question 58⁴⁸⁷ asks if the team leader explains how the team fits into the project or company objectives.

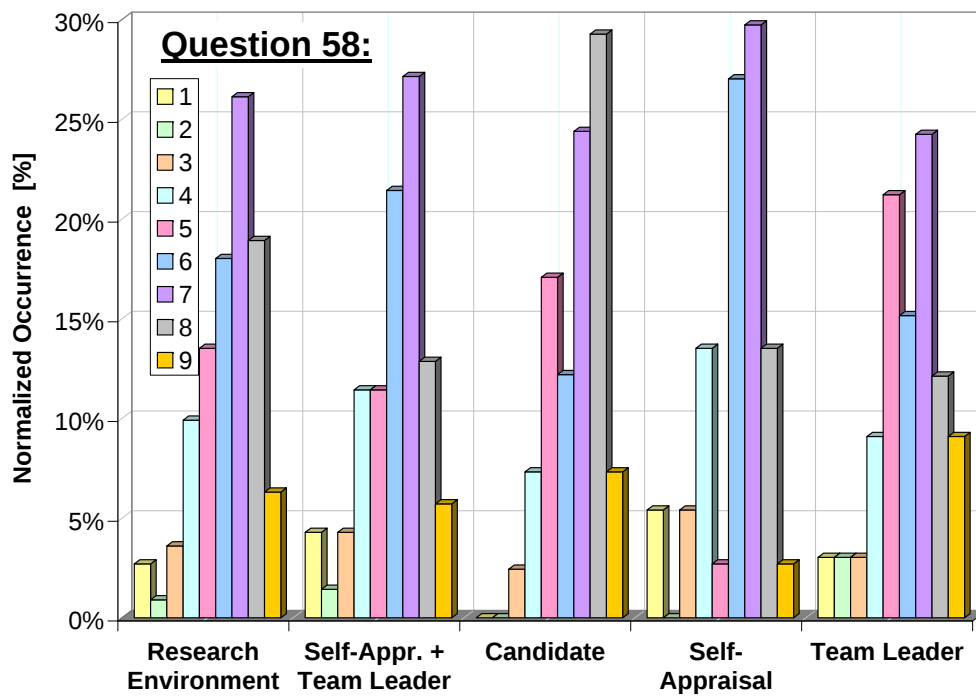


Figure 5.115: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 58: **Explains how the team fits into the project or company objectives.**

As already mentioned in previous sections⁴⁸⁸, scientific research projects are composed of many different and rather complex tasks and typically nobody is capable of handling all these tasks to the same quality level and effectiveness as individual specialists or team members. Thus, it is very difficult for individual team members — and especially for newcomers — to understand how the team and individual team members fit into the project or the research organization. It can be very frustrating for some team members not knowing how their individual work contributes to the overall project and sometimes it is very difficult for them to evaluate the required effort that should be invested or that is necessary to contribute valuable results to the project. Thus, the motivation and efficiency of team members can be increased considerably if they understand in detail how they and

⁴⁸⁷**Question 58:** Explains how the team fits into the project or company objectives.

⁴⁸⁸see Section 5.4.6, page 169 and Section 5.4.8, page 174

their team fit into the overall project.

The obtained occurrence distributions⁴⁸⁹ show a similar pattern for all groups: distinctive maximum peaks within the upper four categories from 6 (= Occasionally/Often) to 9 (= Always). The participants believe that in 46% of all cases their supervisors as well as themselves (self-appraisal group) would Often (= 7) to Always (= 9) explain how team members and the team fit into the project or the organization. Again, the candidate is an exception to this pattern. The participants believe that the candidate explains in 61% of all cases how team members and the team fit into the project. On the contrary, the participants believe that in about 10% of all cases both their supervisors and themselves would Never (= 1) to Seldom (= 3) explain the teams role in the project or organization.

The extraordinary high values for the candidate can be explained by the fact that she/he is a rather “hands-on” person who likes to be directly involved into the specific tasks, even if she/he leads the team. Thus, the candidate can see how newcomers see the team and the project and she/he understands quite well what difficulties newcomers face in order to understand their position within the team and the project itself. The reasons for these beliefs of the participants go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

The calculated correlation coefficients⁴⁹⁰ for Question 58⁴⁹¹ are smaller than 0.6, except for Question 54⁴⁹² (0.648), Question 59⁴⁹³ (0.770), and Question 60⁴⁹⁴ (0.672). Question 61⁴⁹⁵ (0.561) has a correlation coefficient close to 0.6.

Explaining the purpose of the company’s policies, or explaining rules and expectations have strong content overlaps with how the team fits into the company’s objectives. Thus, Questions 58, 59, and 60 should be merged into one single question:

Question 58*: *Explains rules, expectations, and the purpose of the company’s policies and how the team or individual team members can fulfill company objectives.*

⁴⁸⁹see Figure 5.115

⁴⁹⁰see Figure 5.116

⁴⁹¹**Question 58:** *Explains how the team fits into the project or company objectives.*

⁴⁹²**Question 54:** *Helps the team to focus on goals and objectives.*

⁴⁹³**Question 59:** *Explains the purpose of the company’s policies to the team.*

⁴⁹⁴**Question 60:** *Explains rules and expectations.*

⁴⁹⁵**Question 61:** *Explains (personal and company) decisions, actions, and goals.*

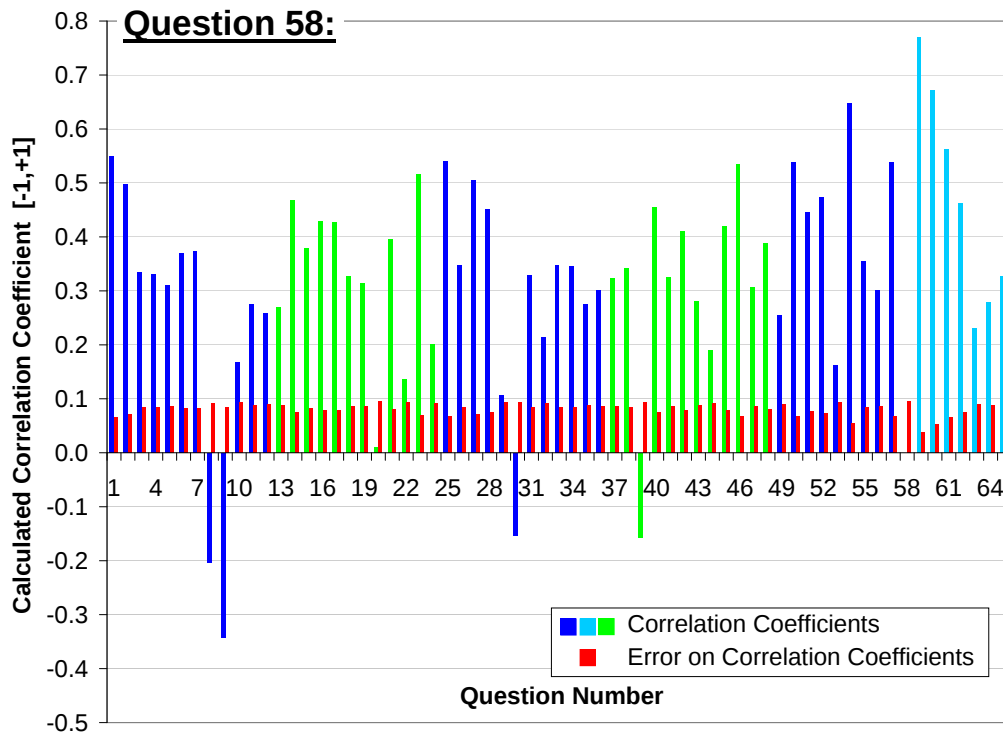


Figure 5.116: Correlation coefficients for Question 58: *Explains how the team fits into the project or company objectives.*

No content overlaps or causal correlations exist between Question 58 and the mentioned questions or any other question within the questionnaire. Therefore, Question 58 does not need to be further modified.

5.5.11 Question 59

Question 59⁴⁹⁶ asks if the team leader explains the purpose of the company's policies to the team.

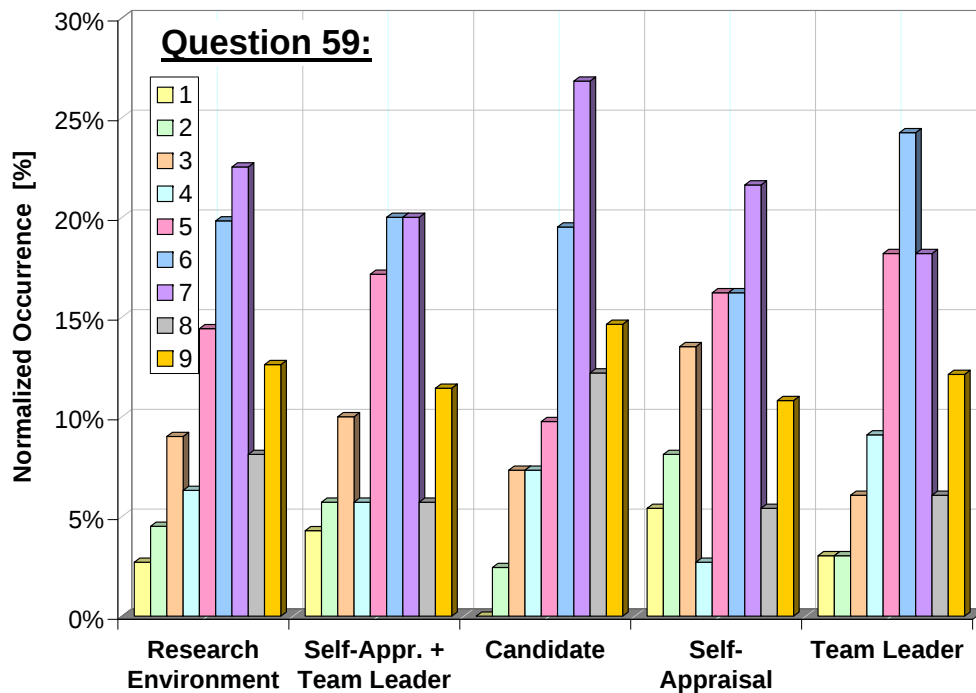


Figure 5.117: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 59: **Explains the purpose of the company's policies to the team.**

Explaining the purpose of the company's decisions and underlying policies can have considerable positive effects on the motivation and personal feelings of the individual team members. If team members do not understand the decisions made by the company or research project management, then they might feel powerless and exposed to their team's management. These feelings of insecurity and being out of control or not even being able to understand one's own fate might cause frustrations, tensions, conflicts, and in the worst case drop motivation and overall performance of the team itself. Therefore, it is important for a team leader to explain the purposes of the company's policies to their team members.

The obtained occurrence distributions⁴⁹⁷ show a considerably different pattern for all

⁴⁹⁶**Question 59:** Explains the purpose of the company's policies to the team.

⁴⁹⁷see Figure 5.117

groups: different maximum peaks distributed over the whole performance key spectrum. The participants perceived occurrence values are given in Table 5.6. The pattern for the candidate (9.8 - 36.6 - 53.7)⁴⁹⁸ indicates that she/he knows and understands both how frustrating it can be and how team members feel if they don't understand the purpose of the company's policies or the decisions based on those policies. Therefore, she/he tries to explain the company's policies to her/his team members so that frustration is avoided and motivation and performance are optimized.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)
Candidate	9.8%	36.6%	53.7%
Self-Appraisal	27.0%	35.1%	37.8%
Supervisor	12.1%	51.5%	36.4%

Table 5.6: Obtained occurrence values for Question 59.

The pattern for the participants themselves (27.0 - 35.1 - 37.8)⁴⁹⁹ is almost equally distributed over the whole performance key spectrum with distinctive peaks in each of the three summarized categories⁵⁰⁰. This means that the team members either do not understand the purposes of the company's policies themselves and therefore are not capable of explaining them to their team members or that they are not sure if they are allowed to interpret or communicate their perceived opinions about those policy purposes. Nevertheless, the reasons for these beliefs go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

The pattern for the supervisor group (12.1 - 51.5 - 36.4)⁵⁰¹ indicates that the supervisors Occasionally (= 4 to 6) explain purposes of the company's policies. Again, the reasons for these beliefs of the participants go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

The calculated correlation coefficients⁵⁰² for Question 59⁵⁰³ are smaller than 0.6, except

⁴⁹⁸see first line in Table 5.6

⁴⁹⁹see second line in Table 5.6

⁵⁰⁰Never to Seldom (= 1 to 3), Occasionally (= 4 to 6), and Often to Always (= 7 to 9).

⁵⁰¹see third line in Table 5.6

⁵⁰²see Figure 5.118

⁵⁰³**Question 59:** Explains the purpose of the company's policies to the team.

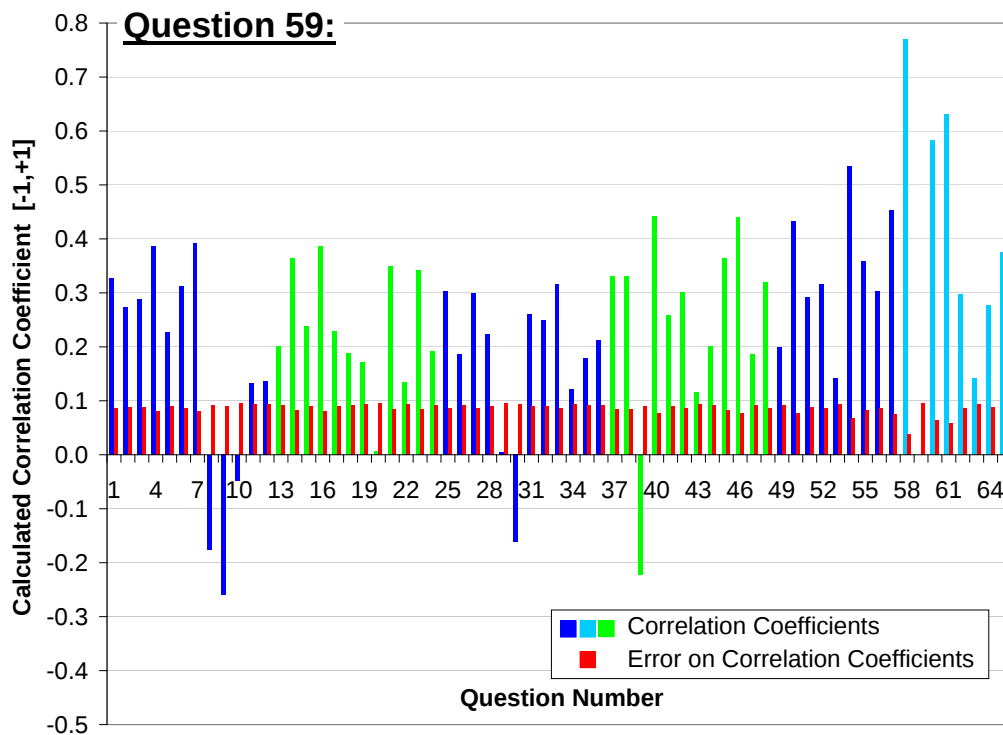


Figure 5.118: *Correlation coefficients for Question 59: Explains the purpose of the company's policies to the team.*

for Question 58⁵⁰⁴ (0.770) and Question 61⁵⁰⁵ (0.631). Question 60⁵⁰⁶ (0.583) has a correlation coefficient close to 0.6.

The causes for the high correlation coefficients between Question 59, 58, and 60 have already been discussed in the previous Section.⁵⁰⁷ No causal correlation exists between Question 59 and the rest of the mentioned questions or any other question within the questionnaire. Therefore, those questions do not need to be modified.

⁵⁰⁴**Question 58:** *Explains how the team fits into the project or company objectives.*

⁵⁰⁵**Question 61:** *Explains (personal and company) decisions, actions, and goals.*

⁵⁰⁶**Question 60:** *Explains rules and expectations.*

⁵⁰⁷see Section 5.5.10, page 212

5.5.12 Question 60

Question 60⁵⁰⁸ asks if the team leader explains rules and expectations.

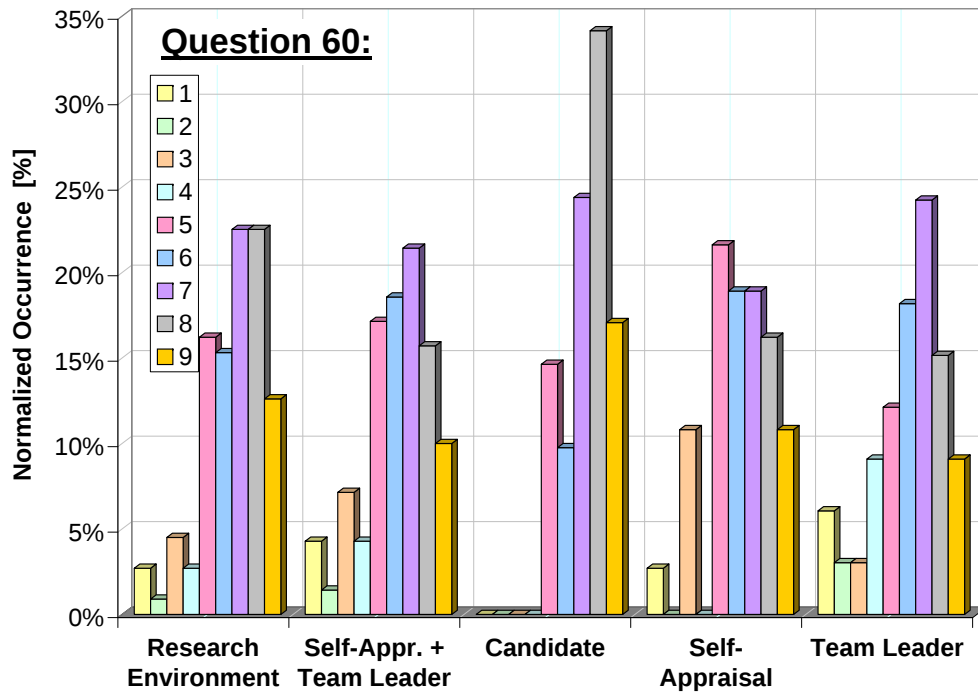


Figure 5.119: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 60: **Explains rules and expectations.**

Explaining rules and expectations helps the team members to understand what they are supposed to do and to better define their personal goals, actions and decisions. It also brings some sort of order and discipline into the team that facilitates the life of all team members. On the other hand, not explaining rules and expectations might create chaos and drop moral and overall team performance considerably.

The obtained occurrence distributions⁵⁰⁹ show a considerably different pattern for all groups: different maximum peaks distributed over the whole performance key spectrum. The participants perceived occurrence values are given in Table 5.7. The pattern for the candidate (0.0 - 24.4 - 75.6)⁵¹⁰ indicates that she/he is a rather “hands-on” person who

⁵⁰⁸ **Question 60:** Explains rules and expectations.

⁵⁰⁹ see Figure 5.119

⁵¹⁰ see first line in Table 5.7

likes to be directly involved into the specific tasks, even if she/he leads the team. Thus, she/he knows and understands how important it is for team members to be aware of rules and expectations. The candidate also knows what effect it might have if team members do not understand what is expected of them or if they don't follow some sort of rules that help to avoid conflicts in stressful situations.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)
Candidate	0.0%	24.4%	75.6%
Self-Appraisal	13.5%	40.5%	45.9%
Supervisor	12.1%	39.4%	48.5%

Table 5.7: Obtained occurrence values for Question 60.

The pattern for the participants themselves (13.5 - 40.5 - 45.9)⁵¹¹ and the supervisors group (12.1 - 39.4 - 48.5)⁵¹² are almost identical. This means that team members (self-appraisal group) and supervisors are aware that it is necessary to explain rules and expectations to their team members, but their motivation to explain these rules and expectations is considerably lower than the motivation of the candidate. This might be explained by the fact that team members either do not carry a lot of responsibility for the discipline and the performance of their teams or that supervisors have enough formal power to either lead or even to bring the team back on track if moral, discipline, or performance should drop. The candidate, on the other hand, has no formal power at all and therefore relies mainly on her/his capability to explain rules and expectations to the team members and thereby motivating them to keep discipline and performance on a high level. Again, the reasons for this behavior are not an objective of this questionnaire and should be investigated in more detail by the individual team leaders.

The calculated correlation coefficients⁵¹³ for Question 60⁵¹⁴ are smaller than 0.6, except for Question 54⁵¹⁵ (0.611), Question 58⁵¹⁶ (0.672), and Question 61⁵¹⁷ (0.657).

⁵¹¹see second line in Table 5.7

⁵¹²see third line in Table 5.7

⁵¹³see Figure 5.120

⁵¹⁴**Question 60:** *Explains rules and expectations.*

⁵¹⁵**Question 54:** *Helps the team to focus on goals and objectives.*

⁵¹⁶**Question 58:** *Explains how the team fits into the project or company objectives.*

⁵¹⁷**Question 61:** *Explains (personal and company) decisions, actions, and goals.*

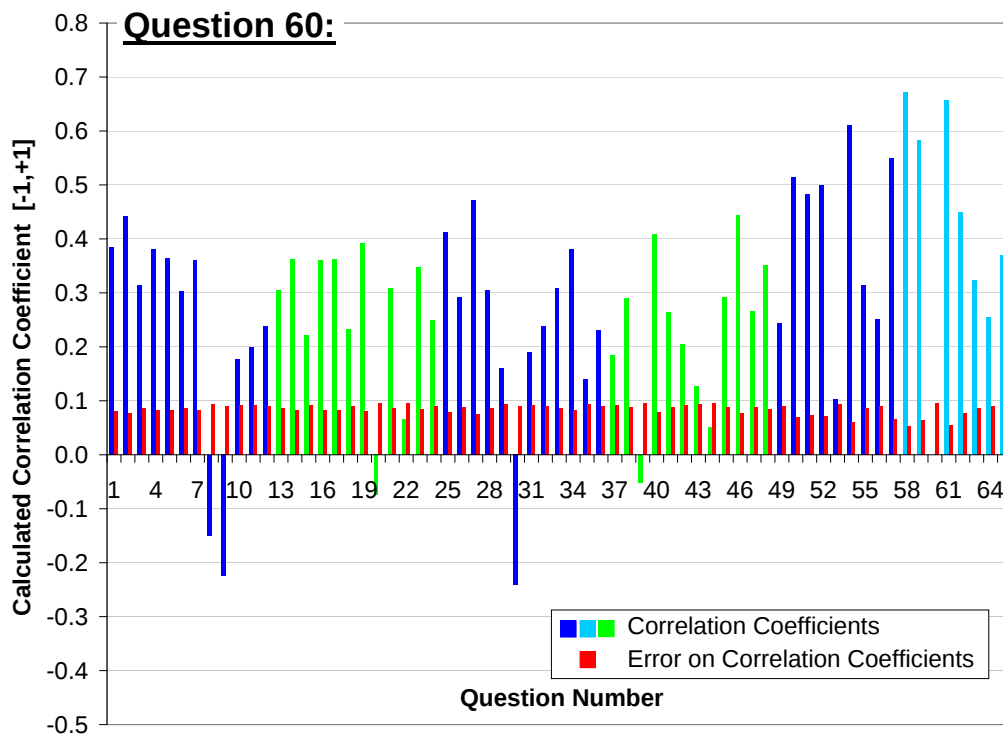


Figure 5.120: Correlation coefficients for Question 60: *Explains rules and expectations*.

Question 57⁵¹⁸ (0.550) and Question 59⁵¹⁹ (0.583) have a correlation coefficient close to 0.6.

The causes for the high correlation coefficients between Question 60, 58, and 59 have already been discussed in a previous Section.⁵²⁰ No causal correlation exists between Question 60 and the rest of the mentioned questions or any other question within the questionnaire. Therefore, those questions do not need to be modified.

⁵¹⁸**Question 57:** *Spends time effectively teaching or mentoring team members.*

⁵¹⁹**Question 59:** *Explains the purpose of the company's policies to the team.*

⁵²⁰see Section 5.5.10, page 212

5.5.13 Question 61

Question 61⁵²¹ asks if the team leader explains (personal and company) decisions, actions, and goals.

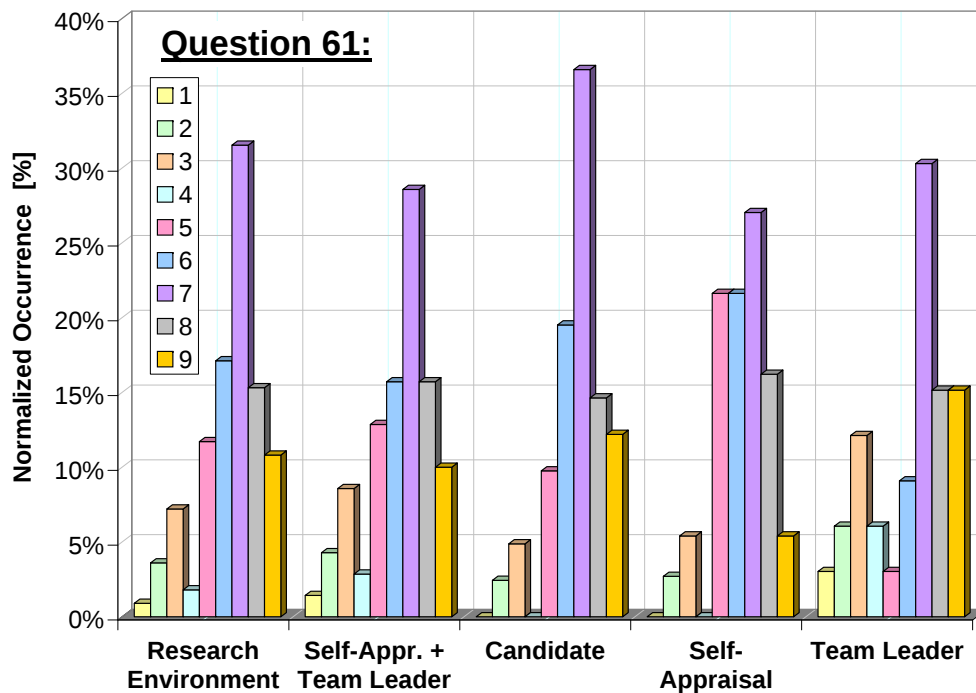


Figure 5.121: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 61: **Explains** (personal and company) decisions, actions, and goals.

The obtained occurrence distributions⁵²² show a considerably different pattern for all groups: different maximum peaks spread all over the performance key spectrum. The participants perceived occurrence values are given in Table 5.8. The pattern for the candidate (7.3 - 29.3 - 63.4)⁵²³ indicate that she/he is a rather “hands-on” person who likes to be directly involved in the specific tasks and with the individual team members, even if she/he leads the team. Thus, she/he is well aware that it is necessary to explain decisions, actions, and goals to her/his team members. The candidate also has no formal power and therefore needs to explain almost every single action to her/his team members to avoid conflicts.

⁵²¹**Question 61:** Explains (personal and company) decisions, actions, and goals.

⁵²²see Figure 5.121

⁵²³see first line in Table 5.8

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)
Candidate	7.3%	29.3%	63.4%
Self-Appraisal	8.1%	43.2%	48.6%
Supervisor	21.2%	18.2%	60.6%

Table 5.8: Obtained occurrence values for Question 61.

The pattern for the participants themselves (8.1 - 43.2 - 48.6)⁵²⁴ is similar to the candidate distribution. The slight differences might be explained by the fact that team members usually do not have to make decisions, take actions, or define goals that possibly affect the whole team. Therefore, they do not explain actions and decisions to their team members as often as the candidate or their supervisors.

The pattern for the supervisor group (21.2 - 18.2 - 60.6)⁵²⁵ given by the three summarized categories⁵²⁶ is almost identical to the candidate pattern. The difference between the supervisor group and the candidate is visualized in Figure 5.121: the candidate pattern has only one maximum peak at 7 (= Often), while the supervisor group shows two distinctive maxima, one at 3 (= Seldom) and the other one at 7 (= Often). The participants believe that their supervisors explain Never (= 1) to Seldom (= 3/4) decisions, actions, and goals in more than 27% of all cases, while, on the other hand, almost 70% believe that their supervisors Often (= 6/7) to Always (= 9) give an explanation. This means that the candidate gives an explanation whenever it is possible for her/him, because of her/his lack of formal power and to motivate her/his team members. The supervisors, on the other hand, only explain the things they need to explain to their team, while in about 27% of all cases explanations are not communicated. The reasons for this behavior are not an objective of this questionnaire and should be investigated in more detail by the individual team leaders.

The calculated correlation coefficients⁵²⁷ for Question 61⁵²⁸ are smaller than 0.6, except for

⁵²⁴see second line in Table 5.8

⁵²⁵see third line in Table 5.8

⁵²⁶Never to Seldom (= 1 to 3), Occasionally (= 4 to 6), and Often to Always (= 7 to 9).

⁵²⁷see Figure 5.122

⁵²⁸**Question 61:** Explains (personal and company) decisions, actions, and goals.

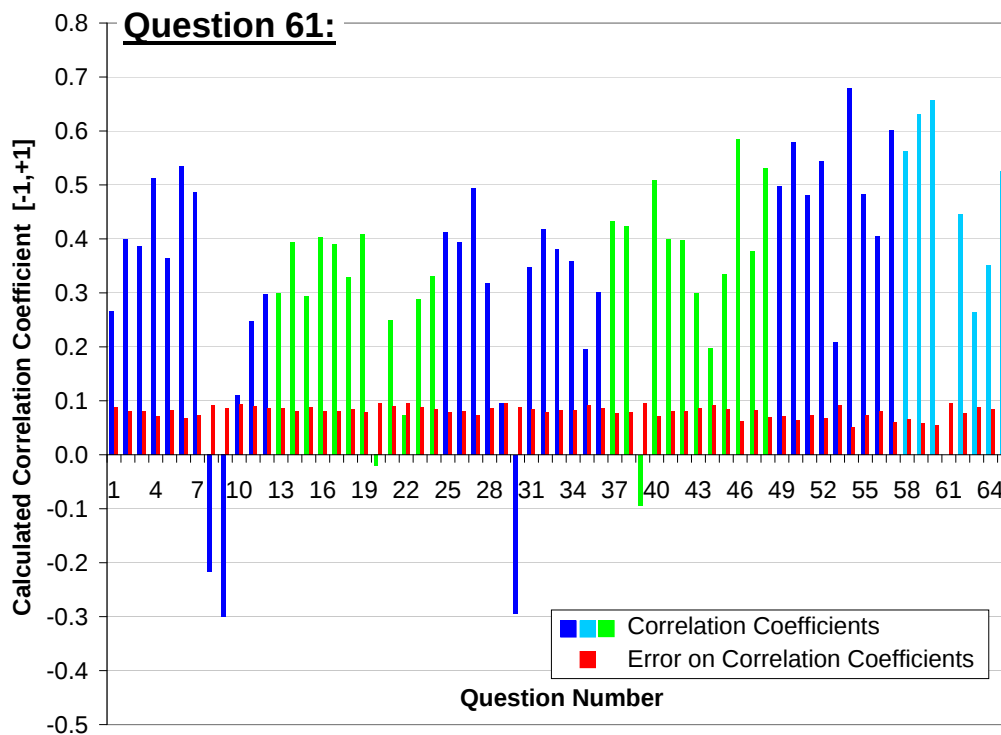


Figure 5.122: *Correlation coefficients for Question 61: Explains (personal and company) decisions, actions, and goals.*

Question 54⁵²⁹ (0.678), Question 57⁵³⁰ (0.602), Question 59⁵³¹ (0.631), and Question 60⁵³² (0.657). Question 46⁵³³ (0.584), Question 50⁵³⁴ (0.580), and Question 58⁵³⁵ (0.561) have a correlation coefficient close to 0.6.

Helping the team to focus on goals and explaining (personal and company) decisions, actions, and goals has no content overlap, because helping the team to focus on goals differs from solely explaining decisions, actions and goals. Thus, no causal correlation exists between Question 61 and 54.

⁵²⁹**Question 54:** *Helps the team to focus on goals and objectives.*

⁵³⁰**Question 57:** *Spends time effectively teaching or mentoring team members.*

⁵³¹**Question 59:** *Explains the purpose of the company's policies to the team.*

⁵³²**Question 60:** *Explains rules and expectations.*

⁵³³**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

⁵³⁴**Question 50:** *Pays attention to team's performance. Supports and gives feedback.*

⁵³⁵**Question 58:** *Explains how the team fits into the project or company objectives.*

On the other hand, explaining rules and expectations and explaining (personal and company) decisions, actions, and goals have content overlap. Therefore, Question 61 has to be modified to the following formulation to emphasize the leader's goals and not the company's objectives as already covered by Question 58*:

Question 61*: *Explains personal decisions and actions.*

No causal correlation exists between Question 61 and the rest of the mentioned questions or any other question within the questionnaire. Therefore, those questions do not need to be modified.

5.5.14 Question 62

Question 62⁵³⁶ asks if the team leader openly shares information with others.

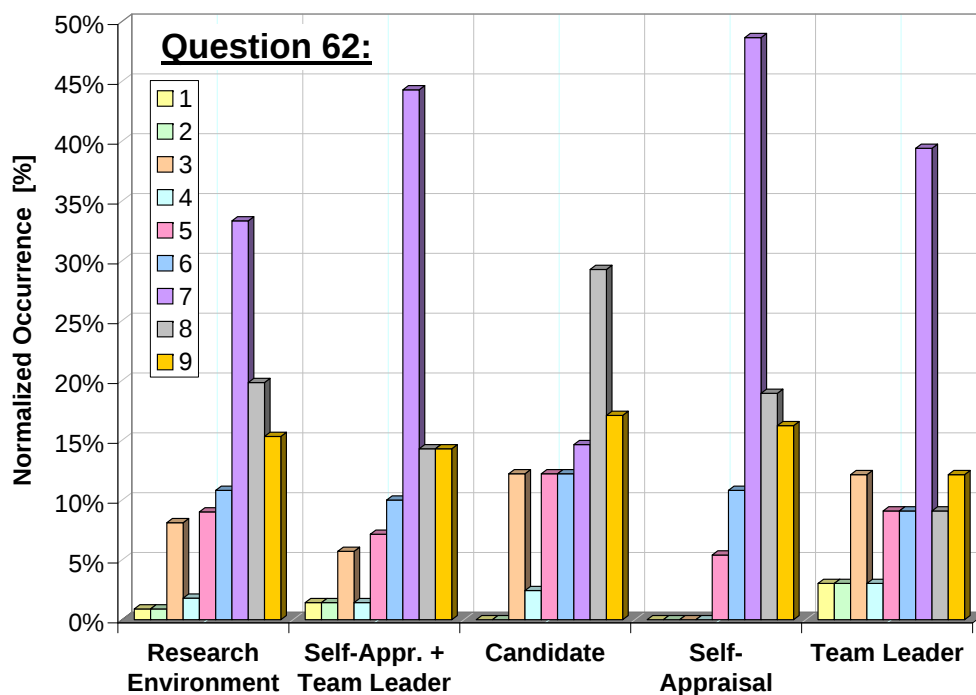


Figure 5.123: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 62: *Openly shares information with others.*

⁵³⁶ Question 62: *Openly shares information with others.*

Sharing information openly with others is a delicate issue in scientific research projects. As already mentioned in a previous section⁵³⁷, research projects are usually finished by publishing obtained results in journals or presenting them at conferences, or by writing a Master or PhD thesis. In all cases, the obtained results have to be kept confidential until they are published and mutual trust between the team leader and team members is essential. Thus, the leader has to make sure that the obtained results are kept confidential until they are published by the team or the particular person who has obtained the results.

On the other hand, relevant and important information that affects the work and the life of team members should be shared openly with others. The team leader has to make sure that information and knowhow is quickly transferred to the places where they are needed and that all involved people have access to the information. Unfortunately, sometimes both types of information sharing are mixed and misunderstood and the team leader has to communicate clearly that confidential information will not be released until it necessary and relevant for all team members. Therefore, Question 62 should be modified to the following formulation:

Question 62*: *Shares relevant and important information openly with others.*

The obtained occurrence distributions⁵³⁸ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The candidate (12.2% - 26.8% - 61.0%) and the supervisor (18.2% - 21.2% - 60.6%) groups show an almost identical pattern for the three summarized categories⁵³⁹. The participants, on the other hand, believe that they Often (= 7) to Always (= 9) openly share information with others in almost 84% of all cases. A possible explanation for these differences might be the fact that the meaning of Question 62 was misunderstood in the sense that also confidential information and not only relevant and important information should be shared with all team members. This fact is confirmed by the higher occurrence values for the self-appraisal group, who do not always possess confidential information that they could share with others, while their supervisors (and also the candidate) also have to coordinate and secure obtained results. Nevertheless, the reasons for these beliefs and behaviors go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

⁵³⁷see Section 5.3.4, page 131

⁵³⁸see Figure 5.123

⁵³⁹Never to Seldom (= 1 to 3), Occasionally (= 4 to 6), and Often to Always (= 7 to 9).

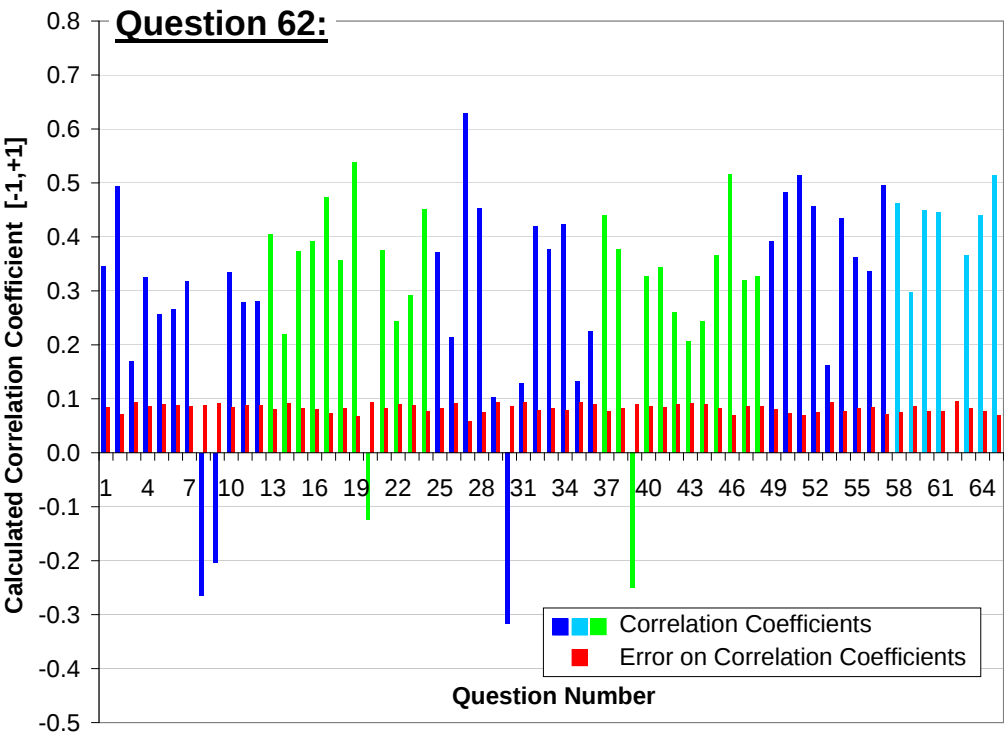


Figure 5.124: *Correlation coefficients for Question 62: **Openly shares information with others.***

The calculated correlation coefficients⁵⁴⁰ for Question 62⁵⁴¹ are within the interval $[-0.5, +0.5]$, except for Question 19⁵⁴² (0.539), Question 27⁵⁴³ (0.628), Question 46⁵⁴⁴ (0.515), Question 51⁵⁴⁵ (0.515), and Question 65⁵⁴⁶ (0.514).

No causal correlation at all exists between Question 62, the modified Question 27*,⁵⁴⁷ the other (above) mentioned questions, or any other question within the questionnaire. Therefore, Question 62 does not need to be modified.

⁵⁴⁰see Figure 5.124

⁵⁴¹**Question 62:** *Openly shares information with others.*

⁵⁴²**Question 19:** *Gives team members honest and fair answers.*

⁵⁴³**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

⁵⁴⁴**Question 46:** *There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.*

⁵⁴⁵**Question 51:** *Likes to use her/his leadership power to help subordinates grow.*

⁵⁴⁶**Question 65:** *Handles difficult people and situations effectively.*

⁵⁴⁷see Section 5.3.3, page 128

5.5.15 Question 63

Question 63⁵⁴⁸ asks if the team leader deals with issues in a straightforward manner.

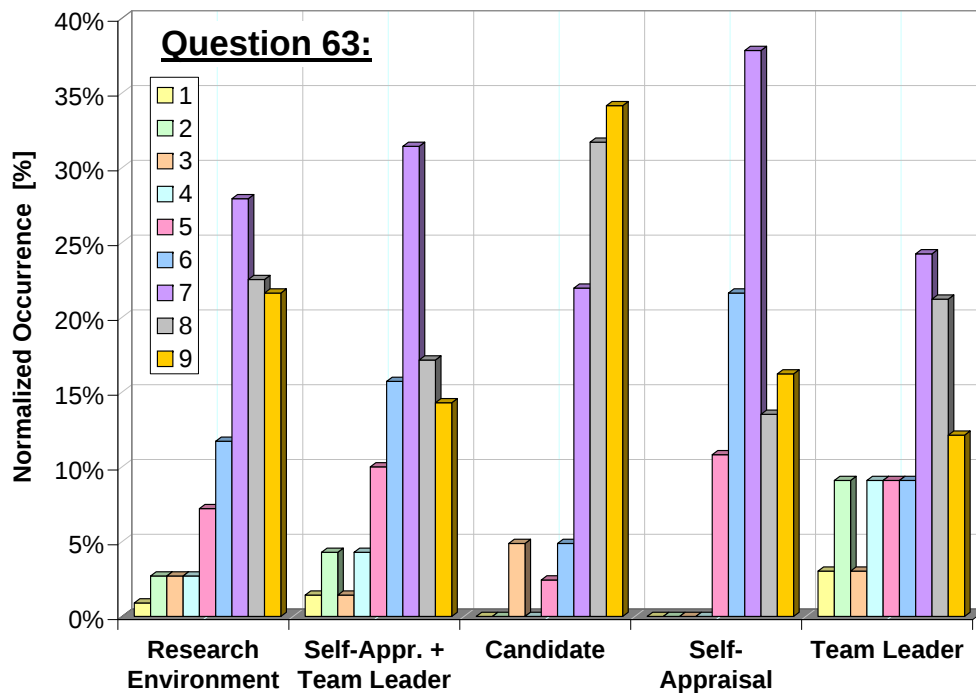


Figure 5.125: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 63: *Deals with issues in a straightforward manner.*

Communication and interaction between individual team members in international scientific research projects might be affected by different country related habits, cultural differences, language skills, or various other reasons⁵⁴⁹. Therefore, it is important that team leaders and team members communicate and treat issues in a straightforward manner so that nobody in the team might suspect ulterior motives behind the transferred message. This method builds up trust, reduces rumors, and helps the team members to communicate on an equal and open basis.

The obtained occurrence distributions⁵⁵⁰ show a similar pattern for all groups: distinctive maximum peaks within the upper three categories from 7 (= Often) to 9 (= Always). The

⁵⁴⁸**Question 63:** *Deals with issues in a straightforward manner.*

⁵⁴⁹see [17], Geert HOFSTEDÉ, “Cultural Dimensions”, <http://www.geert-hofstede.com/>, September 2008.

⁵⁵⁰see Figure 5.125

participants believe that the candidate deals Often (= 7) to Always (= 9) with issues in a straightforward manner in almost 88% of all cases, while their supervisors are perceived in only 58% of all cases as dealing in a straightforward manner. The team members see themselves in 68% of all cases handling issues in a straightforward manner. The reasons for these beliefs and behaviors go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

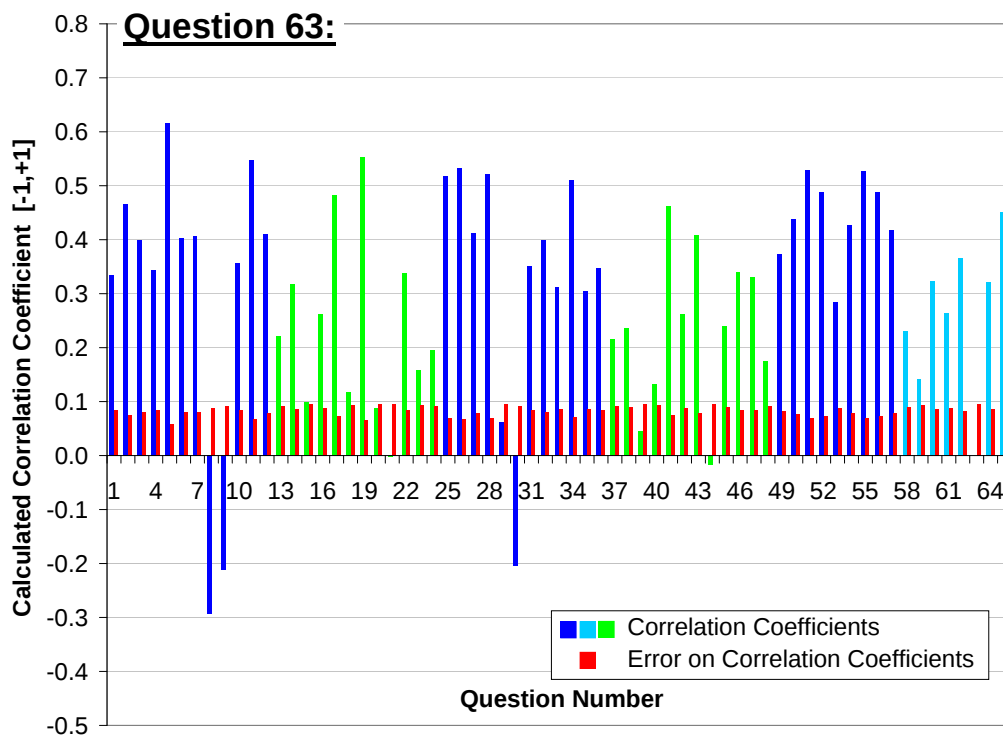


Figure 5.126: Correlation coefficients for Question 63: *Deals with issues in a straightforward manner*.

The calculated correlation coefficients⁵⁵¹ for Question 63⁵⁵² are smaller than 0.6, except for Question 05⁵⁵³ (0.617). Question 11⁵⁵⁴ (0.547) and Question 19⁵⁵⁵ (0.553) have a correlation coefficient close to 0.6. No causal correlation exists between Question 63 and the mentioned questions or any other question within the questionnaire. Therefore, Question 63 does not need to be modified.

⁵⁵¹see Figure 5.126

⁵⁵²**Question 63:** *Deals with issues in a straightforward manner*.

⁵⁵³**Question 05:** *Recognizes what needs to be done and takes the initiative to make it happen*.

⁵⁵⁴**Question 11:** *Is good at making things work and completing the assigned tasks*.

⁵⁵⁵**Question 19:** *Gives team members honest and fair answers*.

5.5.16 Question 64

Question 64⁵⁵⁶ asks if the team leader is able to calm others in stressful situations.

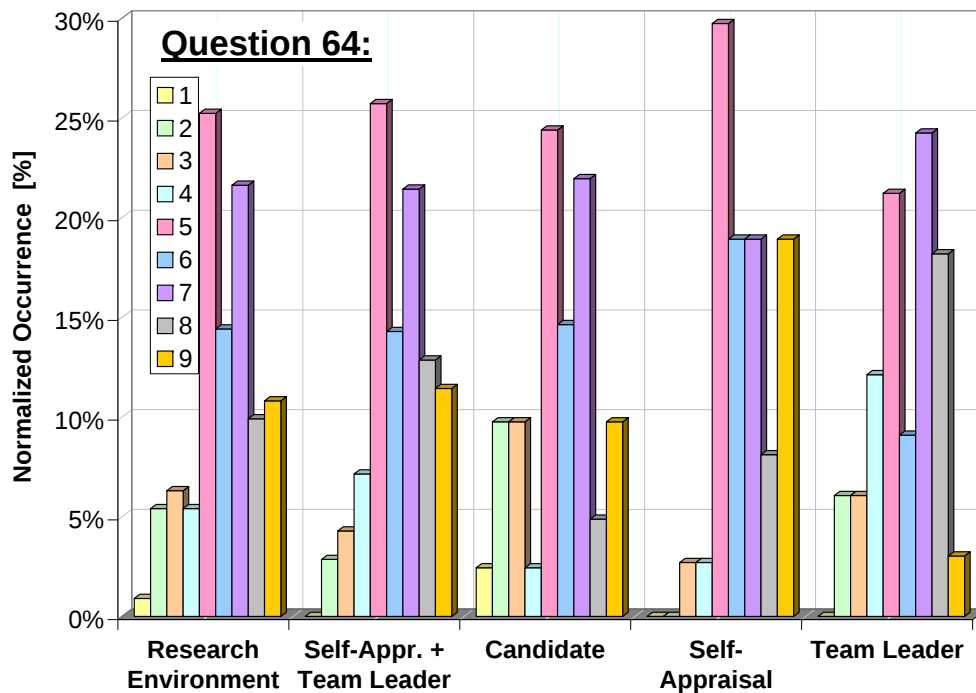


Figure 5.127: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 64: **Able to calm others in stressful situations.**

As already mentioned in previous sections⁵⁵⁷, scientific research projects are composed of many different and rather complex tasks and typically nobody is capable of handling all these tasks to the same quality level and effectiveness as individual specialists or team members. Typically at the end of a scientific research project only a limited time window is available to perform all the required tests and experiments. Time pressure combined with complicated tasks which are carried out by individual specialists who also have to interact and communicate with each other can sometimes create very stressful situations for all personnel involved. Team leaders therefore have to decide if they either replace a person in distress with another less qualified team member or if they try to reduce the stress levels of the person in question in time so that she/he can carry on with her/his tasks. In both cases, the whole experiment is at risk and also the relationships between

⁵⁵⁶**Question 64:** Able to calm others in stressful situations.

⁵⁵⁷see Section 5.4.6, page 169 and Section 5.4.8, page 174

the team members might be affected if the team leader makes the wrong decision. It is a delicate and critical task to decide if a person should be replaced or if one should try to reduce the stress levels of that person and bring her/him back on track. Question 64 therefore asks about the team leaders capability of calming others in stressful situations.

The obtained occurrence distributions⁵⁵⁸ show a considerably different pattern for all groups: different maximum peaks distributed over the whole performance key spectrum. The participants perceived occurrence values are given in Table 5.9. The pattern for the candidate (22.0 - 41.5 - 36.6)⁵⁵⁹ indicates that she/he is seen by more than one third of the participants to be efficient in calming others in stressful situations. More than 41% believe that the candidate is Occasionally (= 5) capable of calming others, while almost one quarter of the participants believe that the candidate is Never (= 1) to Seldom (= 3) able of calming others in stressful situations. The reason for these perceptions might be that the candidate is a rather “hands-on” person who is able to perform most of the specific tasks by herself/himself, even if she/he leads the team. Thus, she/he would rather step in and replace a person in distress or panic than try to calm that person. The candidate should reduce her/his strong task focus and therefore increase the relationship behavior level, because sometimes it is more important to show trust in team members than to accomplish a task to 100%.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)
Candidate	22.0%	41.5%	36.6%
Self-Appraisal	2.7%	51.4%	45.9%
Supervisor	12.1%	42.4%	45.5%

Table 5.9: Obtained occurrence values for Question 64.

The pattern for the participants themselves (2.7 - 51.4 - 45.9)⁵⁶⁰ is almost identical to their supervisors distribution (12.1 - 42.4 - 45.5)⁵⁶¹. Team leaders are typically occupied by managerial tasks and not directly involved in the specific tasks. Thus, they tend to delegate those tasks to their specialists in the team. If a critical situation arises during an experiment with a limited time window, then they try to calm this particular person and bring her/him back on track so that she/he can perform her/his tasks. However,

⁵⁵⁸see Figure 5.127

⁵⁵⁹see first line in Table 5.9

⁵⁶⁰see second line in Table 5.9

⁵⁶¹see third line in Table 5.9

this behavior is the only option for the supervisor or the team members, because — unlike the candidate — most of the supervisors are not specialized enough to replace the person in question themselves or to find another team member who has enough capacity to perform two tasks at the same time and who is in addition skilled enough to replace the person in distress. Nevertheless, the reasons for this behavior are not an objective of this questionnaire and should be investigated in more detail by the individual team leaders.

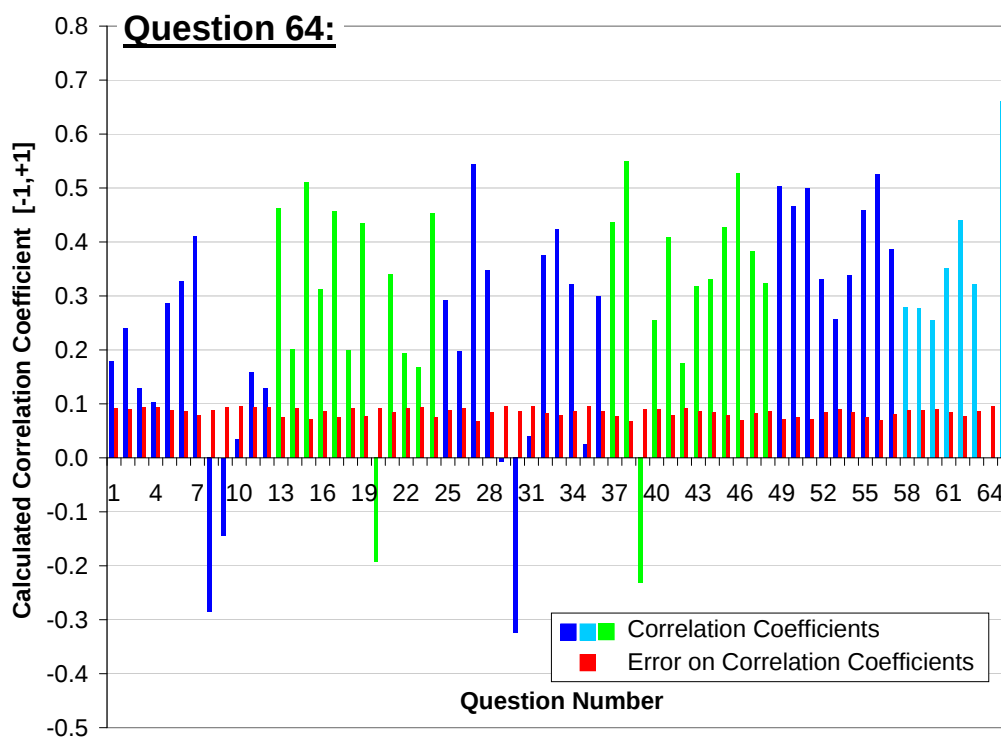


Figure 5.128: Correlation coefficients for Question 64: *Able to calm others in stressful situations*.

The calculated correlation coefficients⁵⁶² for Question 64⁵⁶³ are smaller than 0.6, except for Question 65⁵⁶⁴ (0.661). Question 27⁵⁶⁵ (0.544) and Question 38⁵⁶⁶ (0.549) have a correlation coefficient close to 0.6.

⁵⁶²see Figure 5.128

⁵⁶³**Question 64:** *Able to calm others in stressful situations*.

⁵⁶⁴**Question 65:** *Handles difficult people and situations effectively*.

⁵⁶⁵**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation*.

⁵⁶⁶**Question 38:** *Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them*.

Being able to calm others in stressful situations and handling difficult people and situations effectively have large content overlaps. Thus, Questions 64 and 65 should be merged into one single question:

Question 64*: *Able to calm others in stressful situations. Handles difficult people and situations effectively.*

No causal correlation exists between Question 64 and the rest of the mentioned questions or any other question within the questionnaire. Therefore, those questions do not need to be modified.

5.5.17 Question 65

Question 65⁵⁶⁷ asks if the team leader handles difficult people and situations effectively.

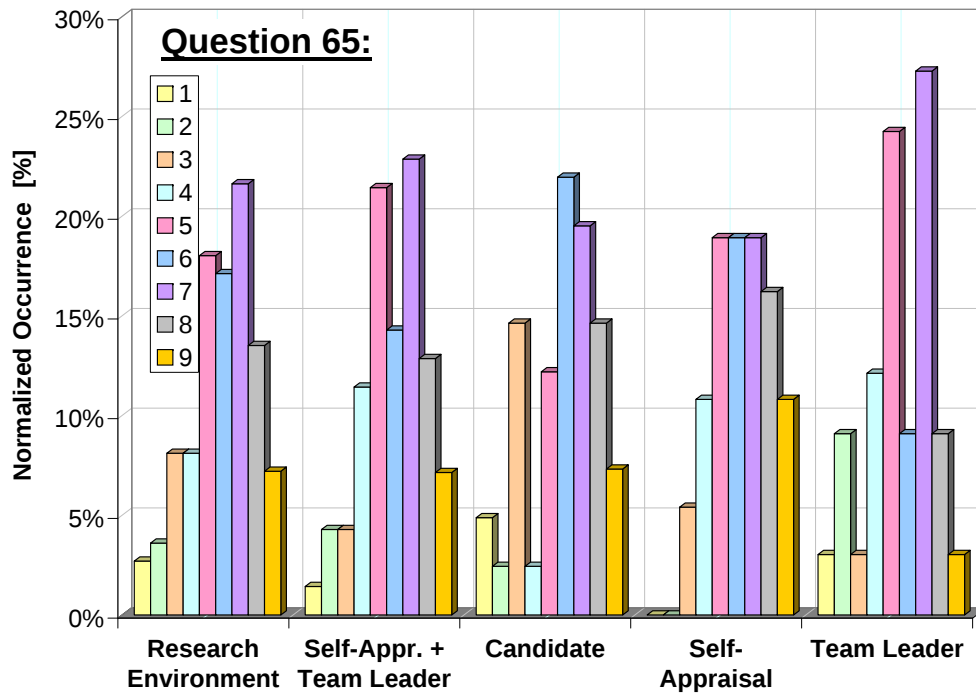


Figure 5.129: Comparison of the answer occurrence (1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.) between different participant groups for Question 65: *Handles difficult people and situations effectively.*

As already mentioned in a previous section⁵⁶⁸, communication and interaction between individual team members in international scientific research projects might be affected by different country related habits, cultural differences, language skills, or various other reasons⁵⁶⁹. Therefore, it is important that team leaders are able to understand and accept all their team members and also handle difficult people effectively. If they don't succeed in handling difficult people then the whole team might suffer and the only available option would be to exclude that person from the team. However, even in this case, the relationships within the team and the trust in the team leader might be heavily affected. Thus, team leaders should train their communication skills and also extend their cultural horizons to understand country specific habits and cultural differences.

⁵⁶⁷ **Question 65:** *Handles difficult people and situations effectively.*

⁵⁶⁸ see Section 5.5.15, page 227

⁵⁶⁹ see [17], Geert HOFSTEDE, "Cultural Dimensions", <http://www.geert-hofstede.com/>, September 2008.

The obtained occurrence distributions⁵⁷⁰ show a considerably different pattern for all groups: different maximum peaks distributed over the whole performance key spectrum. The participants perceived occurrence values are given in Table 5.10. The pattern for the candidate (22.0 - 36.6 - 41.5)⁵⁷¹ indicates that the participants believe that in more than 41% of all cases she/he handles Often (= 7) to Always (= 9) difficult people effectively. On the contrary, the participants believe that in 22% of all cases the candidate is not capable of handling difficult people effectively.

This behavior might be explained by the fact that the candidate is a rather “hands-on” person who likes to be directly involved into the specific tasks, even if she/he leads the team. Therefore, most of the team members might respect and trust her/his task related skills and her/his technical knowledge, which allows her/him to some extent to compensate for weaker relationship behaviors. On the other hand, if the candidate is confronted with a person who is convinced that she/he might act correctly and not change her/his behavior, then the lack of communication skills (or the will to communicate) and her/his pride in her/his technical skills might cause the problems to escalate. Therefore, the candidate should learn to improve her/his relationship related skills and focus less on her/his technical knowledge.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)
Candidate	22.0%	36.6%	41.5%
Self-Appraisal	5.4%	48.6%	45.9%
Supervisor	15.2%	45.5%	39.4%

Table 5.10: Obtained occurrence values for Question 65.

The pattern for the supervisors group (15.2 - 45.5 - 39.4)⁵⁷² is almost identical to the candidate pattern, except that the participants believe that their supervisors are Occasionally (= 5) capable of handling difficult people effectively in 45.5% of all cases and in only 15.2% they Never (= 1) to Seldom (= 3) succeed. Surprisingly, the occurrence value for failure in handling difficult people effectively is for the supervisors group only 7% smaller than for the candidate. The reasons for these beliefs and behaviors go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

⁵⁷⁰see Figure 5.129

⁵⁷¹see first line in Table 5.10

⁵⁷²see third line in Table 5.10

The pattern for the participants themselves (5.4 - 48.6 - 45.9)⁵⁷³ shows a much higher self-confidence in their own capability of handling difficult people effectively. The participants believe that in only 5.4% of all cases they Never (= 1) to Seldom (= 3) succeed, while in almost 46% of all cases they Often (= 7) to Always (= 9) manage to handle difficult people effectively. Again, the reasons for these beliefs and behaviors go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

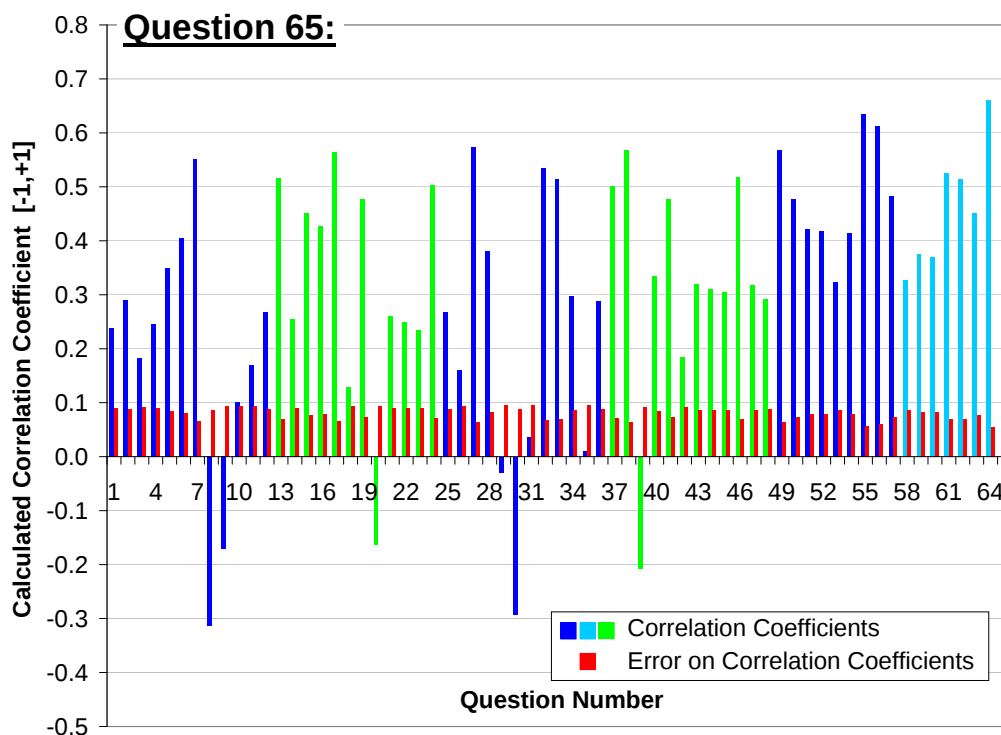


Figure 5.130: *Correlation coefficients for Question 65: **Handles difficult people and situations effectively.***

The calculated correlation coefficients⁵⁷⁴ for Question 65⁵⁷⁵ are smaller than 0.6, except for Question 55⁵⁷⁶ (0.634), Question 56⁵⁷⁷ (0.613), and Question 64⁵⁷⁸ (0.661).

⁵⁷³see second line in Table 5.10

⁵⁷⁴see Figure 5.130

⁵⁷⁵**Question 65:** *Handles difficult people and situations effectively.*

⁵⁷⁶**Question 55:** *Gets team members to look at problems from many different angles.*

⁵⁷⁷**Question 56:** *Identifies causes of resistance and finds ways to overcome them.*

⁵⁷⁸**Question 64:** *Able to calm others in stressful situations.*

Question 07⁵⁷⁹ (0.551), Question 17⁵⁸⁰ (0.564), Question 27⁵⁸¹ (0.574), Question 38⁵⁸² (0.567), and Question 49⁵⁸³ (0.567) have a correlation coefficient close to 0.6.

The high correlation coefficient between Question 65 and 64 was already discussed in the previous Section.⁵⁸⁴ No causal correlation exists between Question 65 and the rest of the mentioned questions or any other question within the questionnaire. Therefore, those questions do not need to be modified.

5.6 Summary of the Evaluation & Validation and Final Questionnaire

In the previous sections⁵⁸⁵ the causal correlation and content overlap between all questions was investigated. If the correlation between two individual questions was too high, then one of the questions was either modified or the questions were merged into one single question. The resulting final questionnaire is given in Appendix D (page 383). This final questionnaire consisting of 62 mutual independent questions should be used for any further work or study.

⁵⁷⁹**Question 07:** *Effectively allocates available resources, e.g., time, people, money.*

⁵⁸⁰**Question 17:** *Acknowledges her/his own mistakes and takes corrective action.*

⁵⁸¹**Question 27:** *Models positive team attributes such as mutual respect, open communication, and full participation.*

⁵⁸²**Question 38:** *Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.*

⁵⁸³**Question 49:** *Recognizes the potential of her/his team members.*

⁵⁸⁴see Section 5.5.16, page 229.

⁵⁸⁵from Section 5.1, page 63 to Section 5.5, page 187

6

Analysis of the Leadership Dimensions

In the following sections¹, an analysis of the obtained data is performed. The results for the five different leadership dimensions² are analyzed in terms of the various groups³. The performance key categories are summarized into three groups⁴ to facilitate the interpretation of the individual plots⁵.

A graphical comparison similar to the two-dimensional plots of the situational leadership theory [3] or the managerial grid⁶ are not possible because of the five dimensions used for the underlying questionnaire. Hence, either the individual groups or the individual dimensions are analyzed and compared with each other.

¹from Section 6.1, page 238, to Section 6.5, page 249

²Task Focus, Relationship Behavior, Leading by Example, Participative Behavior, Informing & Coaching.

³Research Environment, Self-Appraisal & Supervisor, Candidate, Self-Appraisal, and Supervisor

⁴Never to Seldom (= 1 to 3), Occasionally (= 4 to 6), and Often to Always (= 7 to 9)

⁵see Figure 6.1, page 239, to Figure 6.5, page 250

⁶see Figure 2.5, page 20

As already mentioned⁷, the obtained data-sets for the candidate, the self-appraisal, and the supervisor groups are summarized in two additional groups representing the work environment: the research environment group and the self-appraisal & supervisor group. The research environment group contains all collected data-sets, while the self-appraisal & supervisor group shows the difference if the candidate's results are not included in the work environment picture.⁸ All data are normalized to their group's total number of data-sets.

6.1 Dimension 01 — Task Focus

The first dimension deals with the team leader's task focus and her/his achievement orientation. The dimension investigates the team leader's readiness to develop and suggest a plan of action for the group and if she/he makes suggestions about how to solve problems. Accomplishing a goal or task in time and to ensure that large and complicated projects are broken into small manageable tasks are also prerequisites for a team leader in an international scientific research laboratory. In addition, a team leader should be able to recognize what needs to be done and take the initiative to make it happen. The first dimension also examines the team leader's capability to identify and prioritize key objectives and if she/he effectively allocates available resources. Explaining tasks and topics properly to team members and making technical relevant suggestions during meetings or discussions is another qualification that team leaders should possess. A team member's motivation also depends on the team leader's thoroughness and her/his willingness solve and complete even difficult tasks and if the team leader knows and understands how to do basic things. Finally, a team leader's technical knowledge and skills are important assets that are judged by her/his readiness to make technical relevant suggestions during meetings or discussions. If the team leader does not participate at all just to avoid any embarrassment or exposure of her/his lack of knowledge and technical background, then this behavior will reduce trust and moral within the team. All those leadership traits are covered by the first dimension and analyzed by the first twelve questions of the leadership questionnaire.

The obtained occurrence distributions⁹ for the task focus dimension show similar pattern for almost all groups: maximum values for the category 7 (= Often), except for the candidate group, which has a double peak for Often/Always (= 8) and Always (= 9).

The participants perceived occurrence values are summarized in Table 6.1. The pattern

⁷see Chapter 5, page 61

⁸see Table 5.1, page 62

⁹see Figure 6.1

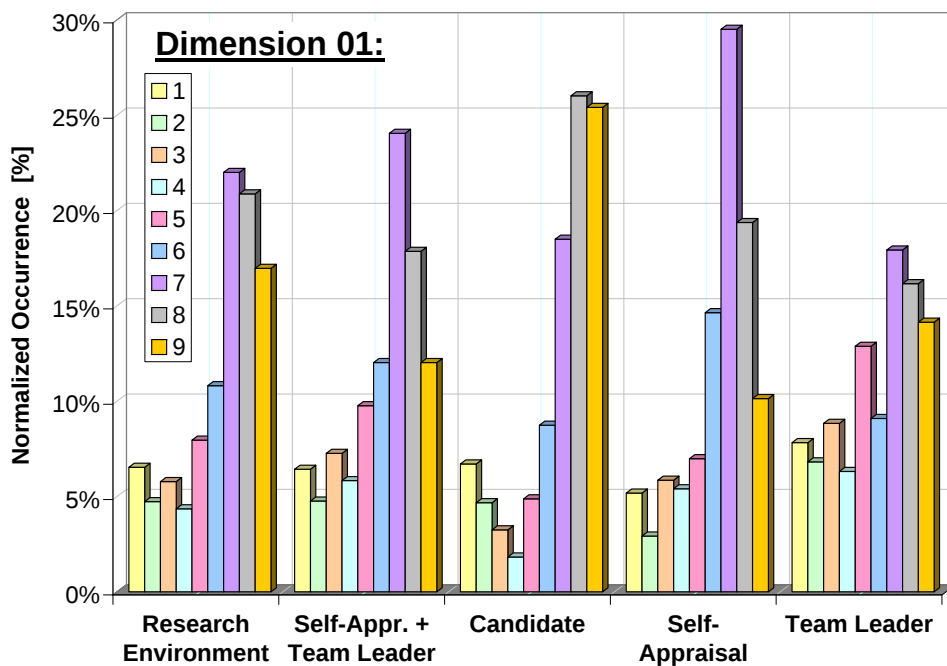


Figure 6.1: Comparison of the obtained occurrence values for Dimension 01: *Task Focus*.

Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

for the research environment¹⁰ and the self-appraisal & supervisor¹¹ groups are quite similar and indicate that almost more than 54% of all participants believe that their team members and team leaders have Often (= 7) to Always (= 9) a strong task focus. The supervisor¹² group falls below this average value, while the self-appraisal¹³ group shows a stronger task focus than the typical work environment in an international scientific research laboratory. The candidate¹⁴ is an exception in terms of task focus: almost 70% of all participants believe that she/he has Often (= 7) to Always (= 9) a strong task focus and thereby exceeds the average task behavior by +16%.

This occurrence pattern with a pronounced task focus can be explained by the fact that the candidate is a rather “hands-on” person who likes to be directly involved into the specific tasks, even if she/he leads the team. Team leaders, on the other hand, are typically occupied by managerial and organizational tasks and therefore less involved in

¹⁰see first line in Table 6.1

¹¹see second line in Table 6.1

¹²see fifth line in Table 6.1

¹³see forth line in Table 6.1

¹⁴see third line in Table 6.1

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)	Average Value
Research Environment	17.0%	23.1%	59.8%	6.29
Self-Appraisal & Supervisor	18.5%	27.6%	53.9%	6.01
Candidate	14.6%	15.4%	69.9%	6.76
Self-Appraisal	14.0%	27.0%	59.0%	6.26
Supervisor	23.5%	28.3%	48.2%	5.74

Table 6.1: Obtained occurrence values for Dimension 01: *Task Focus*.

task oriented duties during an experiment compared to the rest of the team.

From these observed occurrence pattern, which are characteristic for the technical work environment in scientific research projects, it can be concluded that the twelve questions in dimension task focus describe complete and correctly the task related behavior in international scientific research laboratories. The specific questions¹⁵ within this dimension provide further information about the detailed task related behaviors. But the reasons for this behavior are not an objective of this questionnaire and should be investigated in more detail by the individual team leaders through the conduction of personal interviews.

6.2 Dimension 02 — Relationship Behavior

The second dimension analyzes the team leader's relationship behavior, her/his interaction with the team, and the efforts and motivation to show concern about the relationships within the team. The dimension explores if the team leader cares for the personal problems and well being of others and if she/he helps others — and especially newcomers — to feel comfortable in the group. Awareness and exact knowledge about the work that is being done within the group is essential for a team leader of a scientific research project. The team leader should also possess a strong motivation to communicate actively and treat people as equals, fairly and consistently. Behaving predictably, acknowledging one's own mistakes and taking corrective action instead of blaming others are basic requirements for the work in international scientific research laboratories. Team leaders should also be open and try to avoid disclosing thoughts and feelings to group members. Giving team members honest and fair answers and being concerned about jeopardizing

¹⁵see Section 5.1, page 63

relationships when correcting mistakes builds up trust and improves the motivation considerably. Awareness of other people's personal boundaries and honoring those boundaries are valuable leadership asset that any team leader should possess. Achieving “win-win” outcomes and the ability to identify and promote opportunities for collaboration expands the range and scope of work. Finally, the team leader's awareness of the consequences of her/his managerial decisions and if she/he is concerned with how her/his decisions affect the lives of others are essential for the work of a team leader in international scientific research laboratories. All those leadership attributes in interacting with the team members are summarized in the second dimension of the leadership questionnaire.

The obtained occurrence distributions¹⁶ for the relationship behavior dimension show similar pattern for almost all groups: maximum values for the category 7 (= Often), except for the candidate group, which has a double peak for Often (= 7) and Often/Always (= 8).

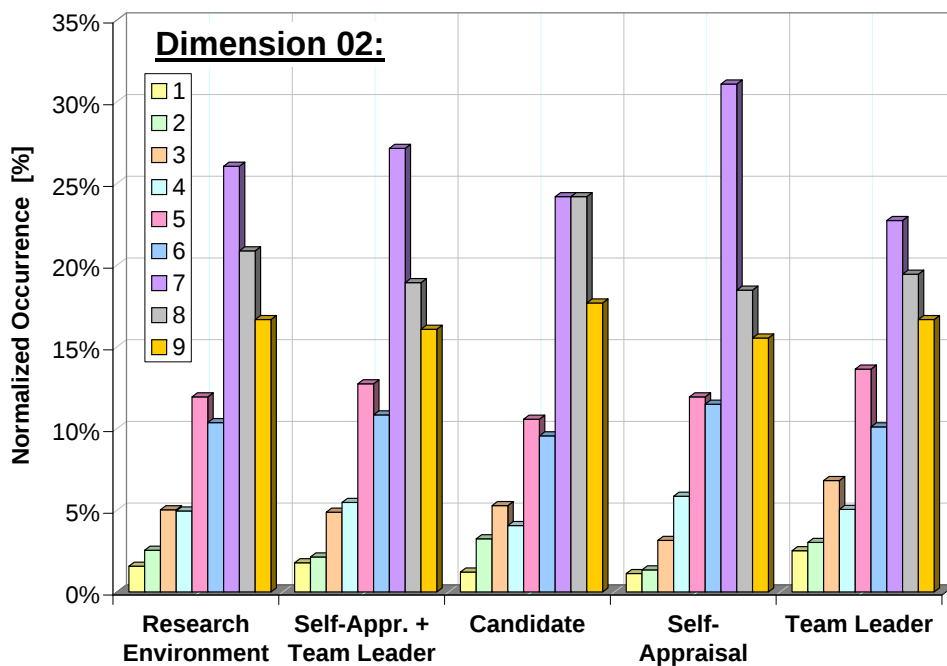


Figure 6.2: Comparison of the obtained occurrence values for Dimension 02: *Relationship Behavior*. Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

The participants perceived occurrence values are given in Table 6.2. The pattern and also

¹⁶see Figure 6.2

the arithmetic average values for the research environment¹⁷ and the self-appraisal & supervisor¹⁸ groups are almost identical. More than 62% of all participants believe that their team members and team leaders show Often (= 7) to Always (= 9) a good relationship behavior towards their colleagues. The supervisor¹⁹ group falls below this average value, while the self-appraisal²⁰ and the candidate²¹ groups shows a better relationship behavior than the typical work environment in an international scientific research laboratory. On the other hand, the participants believe that in almost 10% of all cases the team members are not satisfied with the candidate's relationship behavior. The value for the supervisor group is even above 12%. The participants believe that they show a better relationship behavior than their supervisors and that in only 5.6% of all cases their colleagues are Never (= 1) to Seldom (= 3) satisfied with their relationship behavior.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)	Average Value
Research Environment	9.2%	27.3%	63.6%	6.63
Self-Appraisal & Supervisor	8.8%	29.0%	62.1%	6.57
Candidate	9.8%	24.2%	66.1%	6.72
Self-Appraisal	5.6%	29.3%	65.1%	6.70
Supervisor	12.4%	28.8%	58.8%	6.43

Table 6.2: Obtained occurrence values for Dimension 02: *Relationship Behavior*.

The higher values for both the self-appraisal and the candidate groups in the categories 7–9 can be explained that by the fact that both groups are directly involved with their colleagues in planning, designing, implementing, and finally executing an experiment. Therefore, they either know what kind of behavior their colleagues expect from them or they have to show at least a certain level of positive relationship behavior to get things done in a more pleasant and agreeable way. Their supervisors, on the other hand, delegate most of their tasks to their team members and have to make sure that goals are being achieved. Thus, they might sometimes appear not as pleasant as the rest of the team, although the candidate shows the highest level of relationship behavior. The higher values for the candidate and the supervisor groups compared to the self-appraisal group in

¹⁷see first line in Table 6.2

¹⁸see second line in Table 6.2

¹⁹see fifth line in Table 6.2

²⁰see forth line in Table 6.2

²¹see third line in Table 6.2

terms of not being satisfied with their relationship behavior (categories 1–3) might be explained by some sort of overestimation of their colleagues' happiness with their presence.

The specific questions²² can provide further information about the detailed relationship behavior in international scientific research laboratories. The reasons for this behavior are not an objective of this questionnaire and should be investigated in more detail by the individual team leaders by means of personal interviews.

²²see Section 5.2, page 93

6.3 Dimension 03 — Leading by Example

The third dimension explores the team leader's integrity and if she/he is "leading by example", i.e., motivating team members by exercising personally the expected behavior and desired attitudes. A team leader in an international scientific research laboratory should set high and clear standards for others by her/his own behavior and work at least as hard as anyone else in the work group so that the team members are being motivated to achieve and stretch their performance. Modeling positive team attributes such as mutual respect, open communication, and full participation also increase the team's motivation. Furthermore, the team leader should have high moral standards and should never try to take credit for other people's ideas or showing favoritism in an unfair amount towards some team members. Being aware of one's own strengths & weaknesses and being open to feedback from others is essential for a team leader of a scientific research project. The team leader should enjoy establishing challenging goals for herself/himself to motivate the team members to follow her/his example. Learning from her/his own experiences — and also those of others — and seeking opportunities for self-development are basic traits for any team leader or team member working on a scientific research project. Speaking up even when one's own opinion is in the minority and being capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions are essential for the work of a team leader in international scientific research laboratories. All those leadership traits of integrity and leading by example are summarized and analyzed by the third dimension of the leadership questionnaire.

The obtained occurrence distributions²³ for the leading by example dimension show similar pattern for almost all groups: maximum values for the categories 7 (= Often) or Often/Always (= 8), except for the candidate group, which has a distinctive peak for the category Always (= 9). This pronounced peak also boosts the Always (= 9) value in the research environment group to a slightly higher peak than for the other categories.

More than 64% of the participants believe that their team leaders and team members (research environment²⁴ and self-appraisal & supervisor²⁵ groups) are leading by example Often (= 7) to Always (= 9), which means working at least as hard as anyone else in the team, having high moral standards, or modeling positive team attributes such as mutual respect, open communication, and full participation. The team members (self-appraisal²⁶

²³see Figure 6.3

²⁴see first line in Table 6.3

²⁵see second line in Table 6.3

²⁶see forth line in Table 6.3

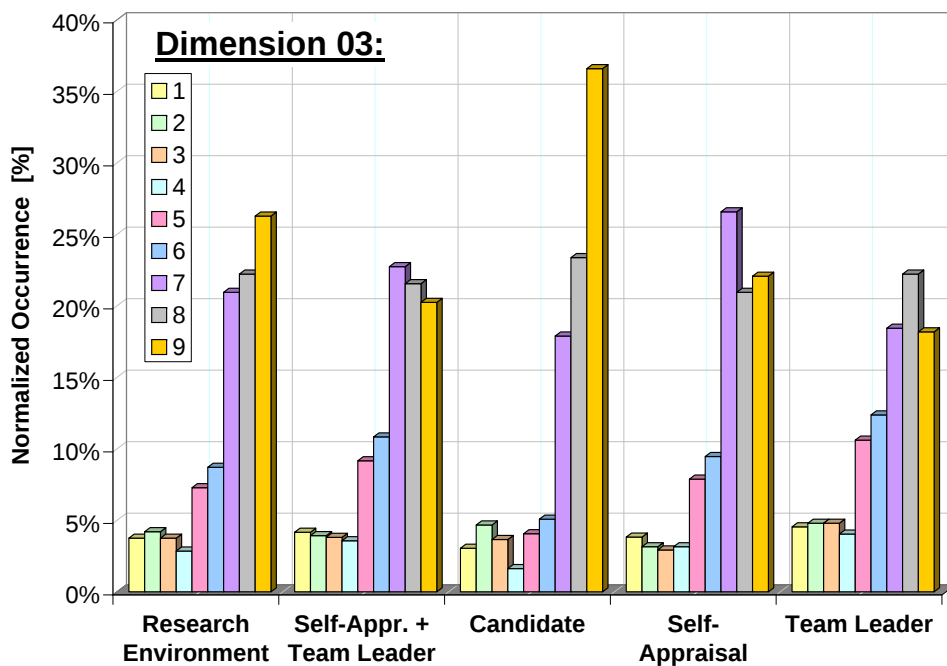


Figure 6.3: Comparison of the obtained occurrence values for Dimension 03: *Leading by Example*.
Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

group) believe that they match or slightly exceed the average value, while their supervisors²⁷, have a lower occurrence value in showing the team a behavior that inspires them to follow her/his example. Again, the candidate²⁸ is exception to this behavior. She/he exceeds the teams average value by more than +13%. The Never (= 1) to Seldom (= 3) categories have only small differences in their occurrence values, while bigger variations occur for the Occasionally (= 4 to 6) category. The participants believe that in 27% of all cases their supervisors behave only occasionally in an exemplary manner, while the team members themselves in more than 20% show sometimes an exemplary behavior. Again, the candidate is an exception from this pattern. In only less than 11% of all cases she/he behaves only occasionally in an exemplary manner.

This occurrence pattern can be explained by the fact that the candidate is a rather “hands-on” person who likes to be directly involved into the specific tasks, even if she/he leads the team. To fulfill both, her/his managerial duties and also to participate in the specific tasks directly, she/he has to work at least as hard as anyone else in the group and

²⁷see fifth line in Table 6.3

²⁸see third line in Table 6.3

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)	Average Value
Research Environment	11.7%	18.8%	69.4%	6.84
Self-Appraisal & Supervisor	11.9%	23.6%	64.5%	6.62
Candidate	11.4%	10.8%	77.8%	7.22
Self-Appraisal	9.9%	20.5%	69.6%	6.80
Supervisor	14.1%	27.0%	58.8%	6.42

Table 6.3: Obtained occurrence values for Dimension 03: *Leading by Example*.

needs exceptional motivation. Team leaders, who are occupied with managerial duties and less involved in specific tasks, might appear behaving not in an exemplary manner in a scientific research environment.

These obtained pattern are characteristic for the work environment and the teams working on scientific research projects. Therefore, the twelve questions in the dimension leading by example describe complete and correctly the task related behavior in international scientific research laboratories. The specific questions²⁹ can provide further information about the detailed exemplary behavior.

6.4 Dimension 04 — Participative Behavior

The fourth dimension analyzes the team leader's participative behavior and democratic decision-making characteristics. The participative behavior dimension asks if the team leader encourages team members to express their ideas and suggestions and if she/he gives all team members a chance to voice their opinions. Listening receptively to team members ideas & suggestions and considering the team's ideas even when the team leader herself/himself disagrees with them is an important leadership trait in a scientific research environment. A team leader should try to make decisions that are based on the team's ideas and she/he should consult with team members when facing an upcoming task or problem. The main concern of a team leader in any organization should be to fix problems and not to lay blame when things go wrong and she/he should also be capable of juggling multiple demands. The team leader should also be capable to shift priorities when the situation calls for it and she/he should be able to deal with rapid change easily and

²⁹see Section 5.3, page 122

effectively. Scientific research projects are composed of many different and rather complex tasks that are interconnected with each other. Therefore, it is essential that team leaders allow their team members to determine what needs to be done and how to do it, because team members are specialists in their topics and know best how to do their specific tasks. Within international collaborations a team leader should also be able to share her/his leadership power with colleagues and subordinates and create a feeling of teamwork in the team so that the team members feel that they are part of the project or organization. Motivating team members so that they feel a real responsibility to make things work and acknowledging others for their contributions and celebrating in their successes are essential for the work of a team leader in international scientific research laboratories. All those leadership attributes of participative behavior towards team members and democratic decision-making characteristics are summarized in the fourth dimension of the leadership questionnaire.

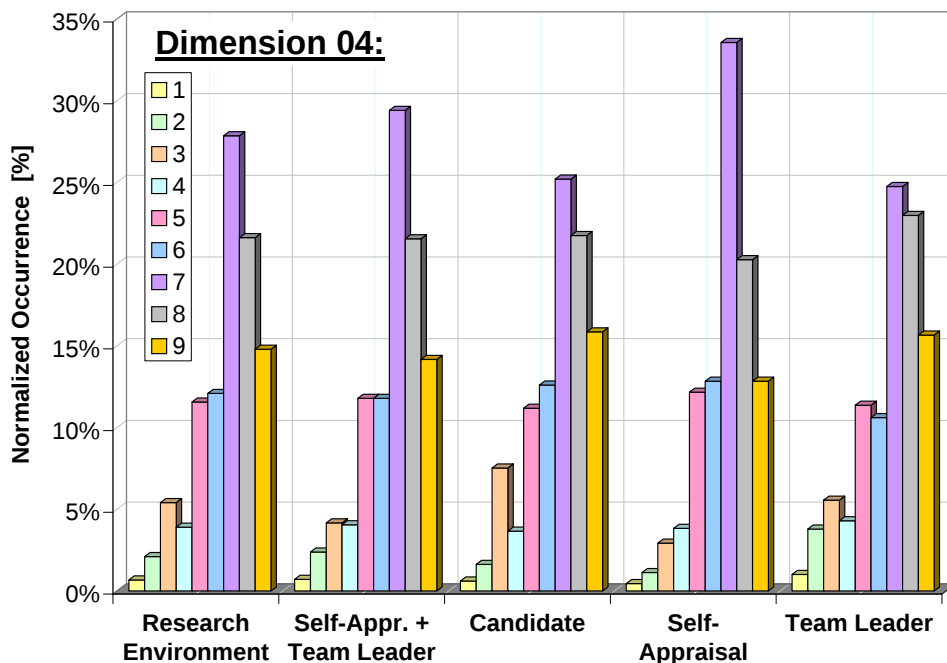


Figure 6.4: Comparison of the obtained occurrence values for Dimension 04: **Participative Behavior**. Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

The obtained occurrence distributions³⁰ for the participative behavior dimension show

³⁰see Figure 6.4

almost identical pattern for all groups for nearly all performance key categories. The pattern have also the same maximum values for all groups for the category 7 (= Often). The participants perceived occurrence values are summarized in Table 6.4.

Scientific research projects are composed of many different and rather complex tasks that are interconnected with each other. Typically, nobody is capable to handle all these tasks up to the same quality level and effectiveness as individual specialists or team members. Therefore, most of the participants are almost “forced” to show participative behavior in the whole project, because otherwise all team members contribution would be at risk. On the other hand, almost nobody is capable to replace an individual specialist in a team. Thus, the observed occurrence pattern is typical for a scientific research environment with a high level (around 65%) of participation from all team members, but which has its limits due to the specialized tasks.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)	Average Value
Research Environment	8.2%	27.6%	64.3%	6.68
Self-Appraisal & Supervisor	7.3%	27.6%	65.1%	6.70
Candidate	9.8%	27.4%	62.8%	6.66
Self-Appraisal	4.5%	28.8%	66.7%	6.77
Supervisor	10.4%	26.3%	63.4%	6.61

Table 6.4: Obtained occurrence values for Dimension 04: *Participative Behavior*.

The twelve questions in dimension participative behavior describe complete and correctly the task related behavior in international scientific research laboratories. The specific questions³¹ can provide further information about the detailed task related behavior. But the reasons for this behavior are not an objective of this questionnaire and should be investigated in more detail by the individual team leaders trough the conduction of personal interviews.

³¹see Section 5.4, page 156

6.5 Dimension 05 — Informing and Coaching

The first part of the fifth dimension examines the team leader's competencies to coach team members, develop others, and to initiate intellectual stimulation. The informing and coaching dimension asks if the team leader recognizes the potential of her/his team members and if she/he pays attention to team's performance. Supporting and giving feedback to team members and using leadership power to help subordinates grow are essential leadership traits in international scientific research laboratories. Team leader's should be willing to develop others by explaining or demonstrating relevant skills and to encourage team members to solve problems on their own, since the individual tasks are sometimes very specialized. Scientific research projects are composed of many different and rather complex tasks that are interconnected with each other. Therefore, it is essential that team leaders help their team's to focus on goals and objectives and to get team members to look at problems from many different angles. Team leader's of multi-cultural teams in international research projects are confronted daily with cultural differences, clashes concerning work attitudes and work routines, and various other misunderstandings. Thus, they should be able to identify causes of resistance and find ways to overcome them. The team leader's in international scientific research laboratories also have to face projects or tasks that have never been done before and which causes a lot of stress for some team members. Therefore, team leaders should spend time effectively teaching or mentoring team members to reduce the stress of individuals and to avoid overloading or burn-out syndromes.

The second part of the fifth dimension deals with the team leaders readiness to inform team members, her/his communication finesse, her/his conflict management skills, and leader-member exchange challenges. Team leader's capability to explain how the team fits into the project or company objectives are essential to help team members to understand their positions, tasks, and goals in a better way. Also the team leader's competency to explain the purpose of the company's policies to the team, and, furthermore, to explain rules and expectations is an elementary leadership trait. International scientific research laboratories are big or even huge administrative institutions with many thousands of researchers and employees. Even the simplest tasks within these organizations are sometimes hampered by strict regulations and complicated administrative procedures. Lacking direct control of their own proximate environment increases illusory pattern perceptions of team members, and might lead to aggressions and conflicts. Thus, a team leader's willingness to explain personal and company decisions, actions, and goals is an important leadership attribute. Sharing openly information with others and dealing with issues in a straightforward manner are elementary leadership qualities which are required

to lead international scientific research teams, and, in addition, they increase trust and moral within the team considerably. The ability to calm others in stressful situations and the aptitude to handle difficult people and situations effectively are essential for the work of a team leader in international scientific research laboratories. All those leadership traits and attributes of coaching and informing team members are summarized in the fifth dimension of the leadership questionnaire.

The obtained occurrence distributions³² for the informing and coaching dimension show almost identical pattern for all groups for nearly all performance key categories. The pattern have also the same maximum values for all groups for the category 7 (= Often).

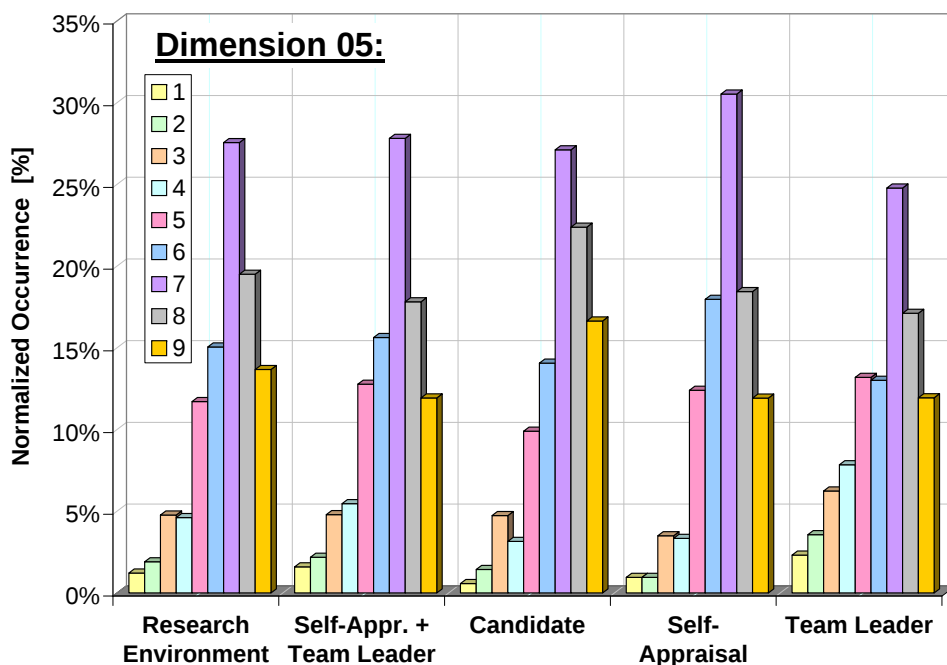


Figure 6.5: Comparison of the obtained occurrence values for Dimension 05: *Informing and Coaching*. Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

The participants perceived occurrence values are summarized in Table 6.5. The pattern for the research environment³³ and the self-appraisal & supervisor³⁴ groups are almost identical and indicate that more than 57% of all participants believe that their team

³²see Figure 6.5

³³see first line in Table 6.5

³⁴see second line in Table 6.5

members and team leaders are Often (= 7) to Always (= 9) inform and coach the team.

The supervisor³⁵ group falls below this average value, while the self-appraisal³⁶ group shows a stronger task focus than the typical work environment in an international scientific research laboratory. The candidate³⁷ is an exception in terms of informing and coaching: more than 66% of all participants believe that she/he has Often (= 7) to Always (= 9) a strong strong attitude towards informing and coaching and thereby exceeds the average task behavior by +8.6%.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)	Average Value
Research Environment	7.9%	31.4%	60.7%	6.59
Self-Appraisal & Supervisor	8.6%	33.9%	57.6%	6.44
Candidate	6.7%	27.1%	66.1%	6.83
Self-Appraisal	5.4%	33.7%	60.9%	6.65
Supervisor	12.1%	34.0%	53.8%	6.21

Table 6.5: Obtained occurrence values for Dimension 05: *Informing and Coaching*.

This occurrence pattern can be explained by the fact that the candidate is a rather “hands-on” person who likes to be directly involved into the specific tasks, even if she/he leads the team. Therefore, it is natural for the candidate to inform and coach her/his team members and support them on the spot. Participants (self-appraisal group) typically are still involved and carry out task related functions and therefore are also coaching and informing their colleagues. Team leaders, on the other hand, are less involved into task oriented duties and hence show a lower occurrence value than the average or the candidate.

These obtained pattern are characteristic for the work environment and the team leaders and team members working on scientific research projects. Therefore, the questions in the dimension informing and coaching describe complete and correctly the task related behavior in international scientific research laboratories. The specific questions³⁸ can provide further information about the detailed informing and coaching behavior. But the reasons for this behavior are not an objective of this questionnaire and should be investigated in

³⁵see fifth line in Table 6.5

³⁶see forth line in Table 6.5

³⁷see third line in Table 6.5

³⁸see Section 5.5, page 187

more detail by the individual team leaders through the conduction of personal interviews.

6.6 Summary of the Leadership Dimension Analysis

It was found that the average values vary only slightly³⁹ between individual dimensions or groups of the investigated sample provided by the 43 participants. The reasons for this rather small variations are beyond the scope of this work and should be investigated more in detail by using different or larger samples. A possible explanation might be that the team members and team leaders working in international scientific research laboratories represent a group with high adaptability which possesses not only a high degree to adjust to new projects and big challenges, but also to deal with new team members and changing working conditions easily and effectively.

However, an analysis of the obtained occurrence pattern for the five dimensions or the individual questions allows to study thoroughly the behavior, personality, and character attributes of a project or experiment team leader in an international scientific research laboratory during the planning, design, implementation, and execution of the project itself.

³⁹Arithmetic average value = 6.56; maximum value = 7.22; minimum value = 5.74; difference between maximum and minimum value = 1.48.

7

Analysis of the Individual Groups

In the following sections¹, the results for the different investigated groups² are analyzed in terms of the five leadership dimensions³. The performance key categories are summarized into three groups⁴ to facilitate the interpretation of the individual plots⁵.

As already mentioned⁶, a graphical comparison similar to the two-dimensional plots of the situational leadership theory [3] or the managerial grid⁷ are not possible because of the five dimensions used for the underlying questionnaire. The results for the individual dimensions are compared with each other to perform the analysis of a particular group. All data are normalized to their group's total number of data-sets.

¹from Section 7.1, page 254 to Section 7.4, page 259

²Self-Appraisal & Supervisor, Candidate, Self-Appraisal, and Supervisor.

³Task Focus, Relationship Behavior, Leading by Example, Participative Behavior, and Informing & Coaching.

⁴Never to Seldom (= 1 to 3), Occasionally (= 4 to 6), and Often to Always (= 7 to 9)

⁵see Figure 7.1, page 254, to Figure 7.4, page 259

⁶see Chapter 6, page 237

⁷see Figure 2.5, page 20

7.1 Self-Appraisal & Supervisor Group

In the following section the obtained results for the self-appraisal and supervisor group were totaled to show the global behavior and attributes of team members and team leaders in international scientific research laboratories. The results of this appraisal are given in Figure 7.1 and summarized in Table 7.1.

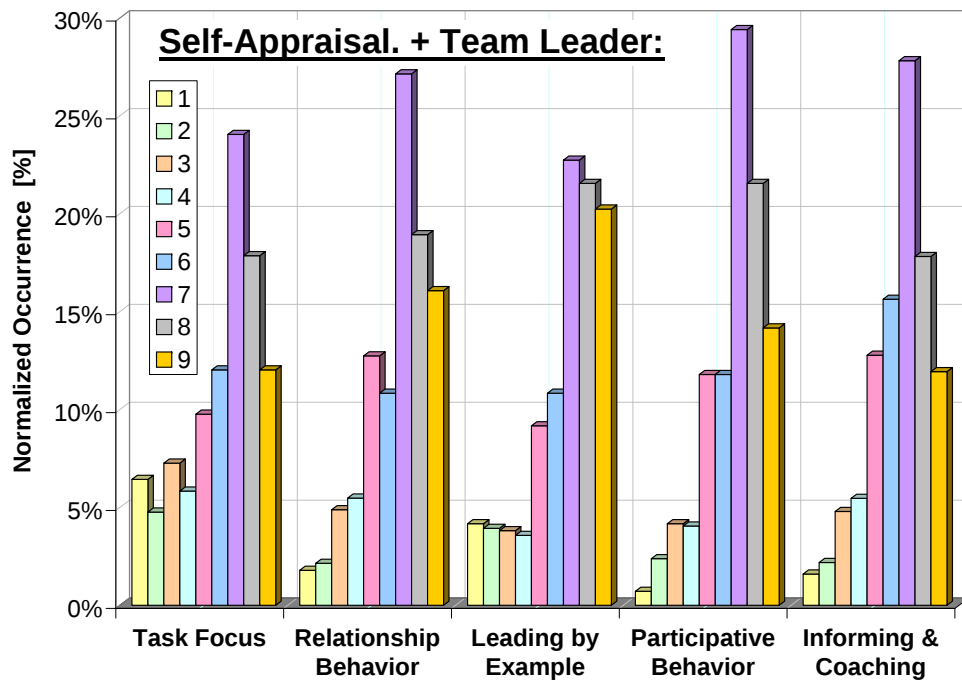


Figure 7.1: Comparison of the obtained occurrence values for the *Self-Appraisal & Supervisor* group.

Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

According to Table 7.1, participants believe that the task focus is the least important trait for a team leader in an international scientific research laboratory. This observation can be explained by the fact that scientific research projects consist of many different and rather complex tasks that have to be delegated to individual team members. Therefore, the task focus for a team leader can be reduced to a global understanding of the whole project without knowing all the specifics of the subtasks in detail.

Informing and coaching and relationship behavior are seen to be more important attributes than task focus, but still less important than leading by example and participative behavior. Informing and coaching of team members is necessary in scientific research projects with many newcomers and people who have never worked together as a

team. However, team leaders tend to delegate these tasks to the individual specialists in their team. A strong relationship behavior is important for the information exchange in meetings and discussions in which the team leader directly interacts with her/his team. Participants believe that leading by example and participative behavior are the most important leadership attributes for a team leader in an international scientific research laboratory. If team members admire and look up to the team leader, then they are more willing to follow her/him. Therefore, leading by example is an important instrument for a team leader to motivate team members to follow her/his instructions and ideas in the absence of any strong hierarchical structure.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)	Average Value
Task Focus	18.5%	27.6%	53.9%	6.01
Relationship Behavior	8.8%	29.0%	62.1%	6.57
Leading by Example	11.9%	23.6%	64.5%	6.62
Participative Behavior	7.3%	27.6%	65.1%	6.70
Informing & Coaching	8.6%	33.9%	57.6%	6.44

Table 7.1: Obtained occurrence values for the *Self-Appraisal & Supervisor* group. Performance key spectrum for the average values: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

A team leader has to show a strong participative behavior and strictly avoid to exclude any of her/his team members. If a team member feels excluded from the team and its work, then her/his moral and motivation will drop and might also affect other team members. Thus, team leaders in international scientific research laboratories have to show strong participative behavior to be successful in leading their teams and to keep both performance and moral at a high level.

7.2 Candidate Group

The candidate group contains the participants opinion about the leadership skills of the candidate. The participants were asked to compare themselves and their supervisors leadership traits to the candidate's attributes. The results of this appraisal are given in Figure 7.2 and summarized in Table 7.2.

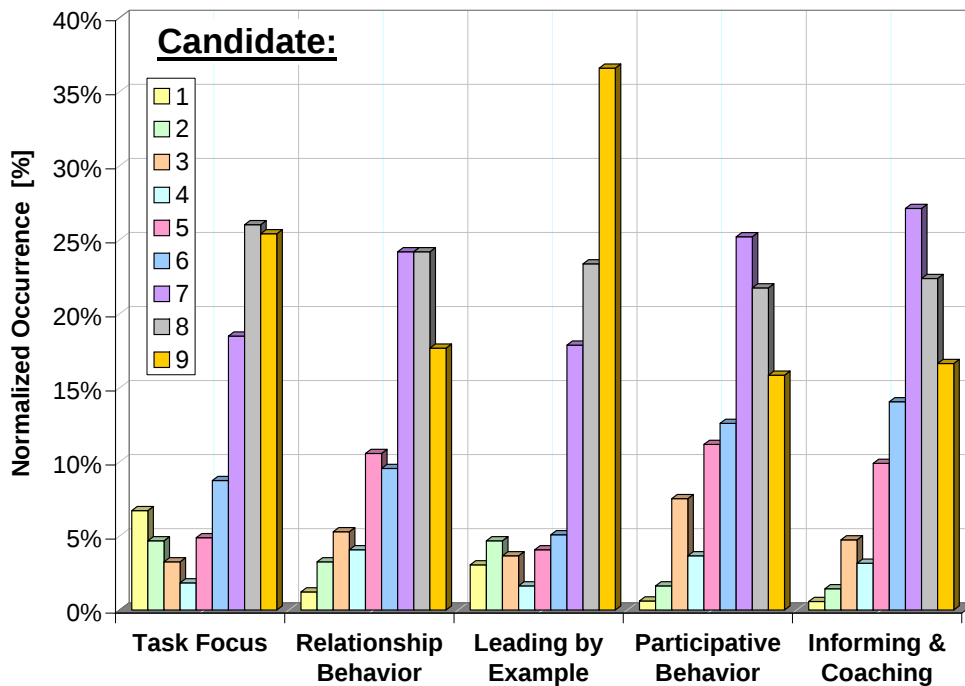


Figure 7.2: Comparison of the obtained occurrence values for the *Candidate* group.

Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

The candidate possesses a very strong task focus, relationship behavior, and informing and coaching. However, all the candidate's average values for the five dimensions exceed the environment's results⁸, except for participative behavior, which is the candidate's weakest attribute. This lack of participative behavior can be explained by the fact that the candidate is a rather "hands-on" person who likes to be directly involved into the specific tasks, even if she/he leads the team. Some team members consider this as an interference with their own tasks and do not appreciate this behavior at any time.

On the other hand, the candidate's strongest trait is that she/he is leading by example

⁸see Section 7.1 (page 254) and also last column in Table 7.2.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)	Average Value	compared to Environment (see Table 7.1)
Task Focus	14.6%	15.4%	69.9%	6.76	6.01
Relationship Behavior	9.8%	24.2%	66.1%	6.72	6.57
Leading by Example	11.4%	10.8%	77.8%	7.22	6.62
Participative Behavior	9.8%	27.4%	62.8%	6.66	6.70
Informing & Coaching	6.7%	27.1%	66.1%	6.83	6.44

Table 7.2: Obtained occurrence values for the **Candidate** group. Performance key spectrum for the average values: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

most of time. Unfortunately, the participative behavior — one of the most important attributes for a team leader in an international scientific research laboratory — is the candidate's weakest leadership trait, but it is still above the environments average values. Therefore, the candidate should try to improve her/his participative behavior to match it better into the overall picture of her/his other very sophisticated leadership traits, which score all far above the average values for the required leadership attributes of a project leader in a scientific research environment.

7.3 Self-Appraisal Group

The self-appraisal group summarizes each individual participant's opinion about their own leadership skills. Participants were asked to assess their own behavior in situations where they applied leadership skills as described by the questionnaire. The results of this self-appraisal are given in Figure 7.3 and summarized in Table 7.3.

The self-appraisal's group possess a strong leading by example behavior (6.80), but it is by far less than the candidate's result for the leading by example dimension (7.22). The participants participative behavior and relationship behavior are also quite strong and above the average value of their environment. Their relationship behavior is comparable to the candidate's result for the relationship behavior dimension, but the participants participative behavior is much stronger than the one for the candidate. The weakest attributes of the self-appraisal group are their informing and coaching behavior and their task focus, but both results are still above the average values obtained for the environment.

These two lower values might be explained by the fact that scientific research projects are composed of many different and rather complex tasks and typically nobody is capable of

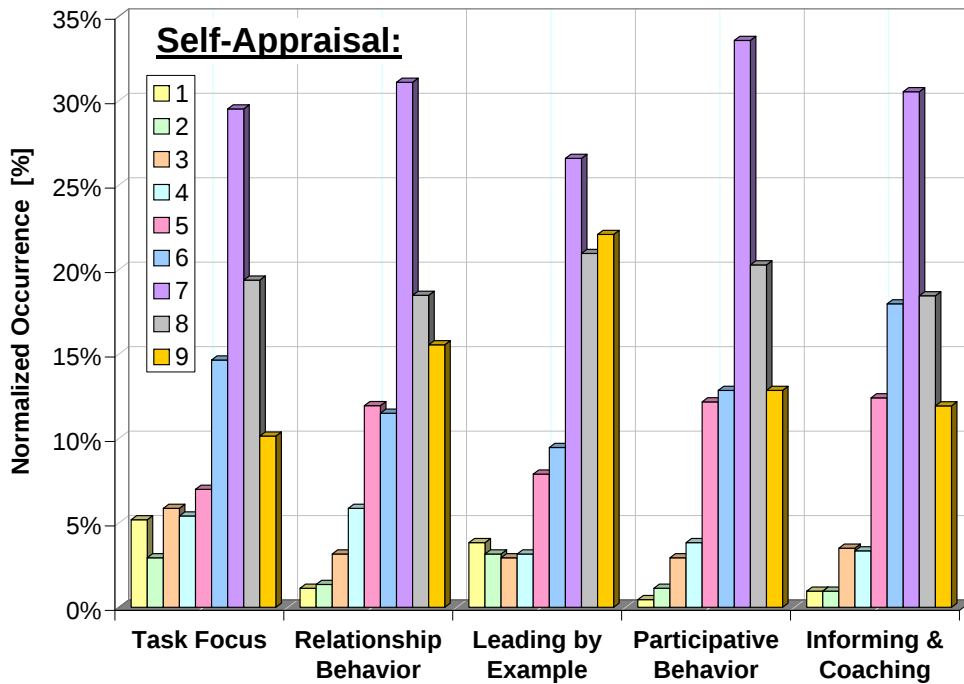


Figure 7.3: Comparison of the obtained occurrence values for the *Self-Appraisal* group.
Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)	Average Value	compared to Environment (see Table 7.1)
Task Focus	14.0%	27.0%	59.0%	6.26	6.01
Relationship Behavior	5.6%	29.3%	65.1%	6.70	6.57
Leading by Example	9.9%	20.5%	69.6%	6.80	6.62
Participative Behavior	4.5%	28.8%	66.7%	6.77	6.70
Informing & Coaching	5.4%	33.7%	60.9%	6.65	6.44

Table 7.3: Obtained occurrence values for the *Self-Appraisal* group. Performance key spectrum for the average values: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

handling all these tasks to the same quality level and effectiveness as individual specialists or team members. Also the participants informing and coaching duties are restricted to their individual topic or research area and therefore the value for this dimension is lower than most of their other leadership dimension scores.

Nevertheless, the reasons for these beliefs and behaviors go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

7.4 Supervisor Group

The participants were asked to compare their supervisors' leadership traits to the candidate's attributes and also to their own behavior. The results of this appraisal are given in Figure 7.4 and summarized in Table 7.4.

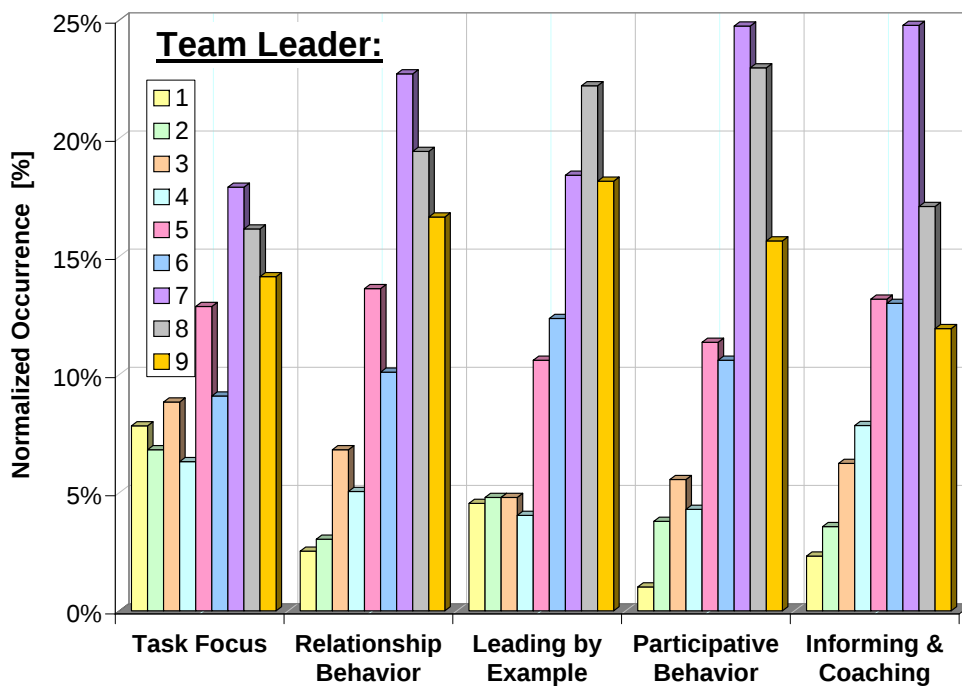


Figure 7.4: Comparison of the obtained occurrence values for the *Supervisor* group.

Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

	Never to Seldom (1 to 3)	Occasionally (4 to 6)	Often to Always (7 to 9)	Average Value	compared to Environment (see Table 7.1)
Task Focus	23.5%	28.3%	48.2%	5.74	6.01
Relationship Behavior	12.4%	28.8%	58.8%	6.43	6.57
Leading by Example	14.1%	27.0%	58.8%	6.42	6.62
Participative Behavior	10.4%	26.3%	63.4%	6.61	6.70
Informing & Coaching	12.1%	34.0%	53.8%	6.21	6.44

Table 7.4: Obtained occurrence values for the *Supervisor* group. Performance key spectrum for the average values: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

The supervisors strongest trait is their participative behavior, but it is still below the average value of their environment. Their relationship behavior and leading by example are also strong, but again still below the values of their team members and the candidate's behavior. The participants also believe that their supervisors weakest attributes are their informing & coaching skills and their task focus. The lack in both traits can be explained by the fact that supervisors are typically occupied with managerial duties and therefore they are not directly involved in the specific tasks of the project or the direct informing and coaching of individual team members. However, the reasons for these beliefs and behaviors go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

7.5 Summary of the Analysis of the Individual Groups

The five dimensions of the established leadership questionnaire allow an easy and thorough analysis of the behavior, personality, and character attributes of a project or experiment team leader in an international scientific research laboratory during the planning, design, implementation, and execution of the project itself. The individual groups and the comparison to the typical behavior and leadership traits in scientific research projects⁹ facilitate the investigation of strengths and weaknesses of individual persons or even groups of supervisors. However, an interpretation of the obtained results or the reasons for the participants beliefs go beyond the scope of this questionnaire and should be investigated in more detail by personal interviews.

⁹see Section 7.1, page 254

8

Summary and Conclusion

A five dimensional leadership questionnaire for a project leader in an international scientific research laboratory was designed and the independency of the individual questions from each other was verified statistically to ensure low overlap in content and meaning by achieving low correlation coefficients. This leadership questionnaire can be applied to examine the behavior, personality, and character attributes of a project or experiment team leader in an international scientific research laboratory as perceived by her/his team members during the planning, design, implementation, and execution of the project itself.

The individual questions of the leadership questionnaire have been evaluated and validated. If the correlation between two individual questions was too high, then one of the questions was either modified or the questions were merged into one single question. The resulting final questionnaire consisting of 62 mutual independent questions is given in Appendix D (page 383). The individual questions of the leadership questionnaire have been used to successfully analyze the leadership traits of a candidate, a group of team members (self-appraisal), and their supervisors.

It was also shown that the chosen 360-degree/threefold feedback scheme allows to increase the statistics and reduce the statistical variance of the outcome for a low number of participants. Also a MATLAB[®] script is provided to facilitate the statistical analysis and

the processing of the obtained coding-matrix.

Changes and challenges put pressure on teams. If the vision and its benefits are not communicated correctly and complete, then the rate of resistances and conflicts might rise and the motivation would drop and affect the performance of the whole team. Therefore, a clear and complete understanding of a leader's behavior and character attributes as well as the induced perception of her/his personality by her/his team members is essential for the daily work in international scientific research laboratories. This understanding is provided by the established leadership questionnaire in this underlying work.

8.1 Future Directions

The underlying work and the established final five-dimensional leadership questionnaire¹ provide the first empirical accounts of a new type of leadership questionnaire for international scientific research laboratories. Further comparisons of the established five dimensions with others in the leadership literature is needed. However, the existing questionnaire already provides a detailed analysis of the behavior and attributes of a team leader in an international scientific research laboratory and can be applied to study the behavior of both team leaders and team members working in scientific research projects and also analyze the requirements of the work environment as well.

¹see Appendix D, page 383

¹This work was written with the typesetting program L^AT_EX [18, 19].

Appendix A

Leadership Questionnaire

This first leadership questionnaire consists of 65 questions distributed over the following five leadership dimensions:

- 1.) **Task Focus:** Questions 1 to 12 focus on task focus, directing, and achievement orientation.
- 2.) **Relationship Behavior:** Questions 13 to 24 deal with relationship behavior, showing concern, and interaction with the team.
- 3.) **Leading by Example:** Questions 25 to 36 study integrity and “leading by example”.
- 4.) **Participative Behavior:** Questions 37 to 48 examine participative behavior and democratic decision-making.
- 5.) **Informing and Coaching:** Questions 49 to 65 analyze informing and coaching. This fifth dimension can be divided into two sub-dimensions:
 - (a) Questions 49 to 57 look into coaching, developing others, and intellectual stimulation.
 - (b) Questions 58 to 65 explore informing, communication, conflict management, and leader-member exchange.

This leadership questionnaire was given to the participants of the sample group. In addition to the questionnaire, a letter was sent by e-mail explaining to all participants the motivation and the required information to fill in the questionnaire.

Leadership Questionnaire

Please note the time that you need to fill in the questionnaire!

Thanks a lot!

**Your data will be treated
ABSOLUTELY CONFIDENTIALLY
and will NOT be given to third persons!!!**

Performance Key:

1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

Does the person in question:

01:	Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).		seldom					often					
			never	occasionally					always				
		Candidate	1	2	3	4	5	6	7	8	9		
		Self-Appraisal	1	2	3	4	5	6	7	8	9		
		Supervisor	1	2	3	4	5	6	7	8	9		
02:	Makes suggestions about how to solve problems and sets standards of performance for group members.		seldom					often					
			never	occasionally					always				
		Candidate	1	2	3	4	5	6	7	8	9		
		Self-Appraisal	1	2	3	4	5	6	7	8	9		
		Supervisor	1	2	3	4	5	6	7	8	9		
03:	Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.		seldom					often					
			never	occasionally					always				
		Candidate	1	2	3	4	5	6	7	8	9		
		Self-Appraisal	1	2	3	4	5	6	7	8	9		
		Supervisor	1	2	3	4	5	6	7	8	9		

04:	Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.		seldom	often						
			never	occasionally	always					
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9
05:	Recognizes what needs to be done and takes the initiative to make it happen.		seldom	often						
			never	occasionally	always					
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9
06:	Prioritizes key objectives and focuses the groups activity on them.		seldom	often						
			never	occasionally	always					
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9
07:	Effectively allocates available resources, e.g., time, people, money.		seldom	often						
			never	occasionally	always					
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9
08:	Gives vague or misleading explanations to team members.		seldom	often						
			never	occasionally	always					
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9
09:	Makes NO suggestions (because she/he has no clue at all).		seldom	often						
			never	occasionally	always					
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9

10:	Enjoys getting into the details of how things work.		seldom		often				
			never	occasionally	always				
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

11:	Is good at making things work and completing the assigned tasks.		seldom		often				
			never	occasionally	always				
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

12:	Knows and understands how to do basic things.		seldom		often				
			never	occasionally	always				
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

13:	Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.		seldom		often				
			never	occasionally	always				
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

14:	Knows (exactly and in detail) what work is being done in the team.		seldom		often				
			never	occasionally	always				
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

15:	Treats people as equals, fairly and consistently (behaves predictably).		seldom		often				
			never	occasionally	always				
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

16:	Communicates actively (i.e., starts conversations) with team members.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
17:	Acknowledges her/his own mistakes and takes corrective action.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
18:	Discloses thoughts and feelings to group members.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
19:	Gives team members honest and fair answers.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
20:	Does not worry about jeopardizing relationships when correcting mistakes.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
21:	Honors other people's (personal) boundaries.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

22:	Regularly achieves “win-win” outcomes.					seldom		often	
						never	occasionally	always	
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

23:	Identifies and promotes opportunities for collaboration.					seldom		often	
						never	occasionally	always	
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

24:	Is concerned with how her/his decisions affect the lives of others.					seldom		often	
						never	occasionally	always	
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

25:	Sets high and clear standards for others by her/his own behavior.					seldom		often	
						never	occasionally	always	
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

26:	Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.					seldom		often	
						never	occasionally	always	
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

27:	Models positive team attributes such as mutual respect, open communication, and full participation.					seldom		often	
						never	occasionally	always	
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

28:	Has high moral standards. Can be trusted with confidential information.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
29:	Would never try to take credit for other people's ideas.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
30:	Shows favoritism (in an unfair amount) towards some people.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
31:	Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
32:	Possesses awareness of her/his own strengths and weaknesses.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
33:	Is open to feedback from others. Encourages others to give feedback.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

34:	Learns from own experiences and also those of others. Seeks opportunities for self-development.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
35:	Speaks up even when her/his opinion is in the minority.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
36:	Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
37:	Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
38:	Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
39:	Makes decisions that are based only on his/her own ideas.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

40:	Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
41:	When things go wrong, the main concern is to fix it, not to lay blame.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
42:	Is capable of juggling multiple demands.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
43:	Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
44:	Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
45:	Likes to share her/his leadership power with subordinates.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

There is a real feeling of teamwork in the team.				seldom				often	
46:	Team members feel they are part of the project or organization.	never	occasionally				always		
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

The team members feel a real responsibility to make things work.				seldom				often	
47:		never	occasionally				always		
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

Acknowledges others for their contributions and celebrates in their successes.				seldom				often	
48:		never	occasionally				always		
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

Recognizes the potential of her/his team members.				seldom				often	
49:		never	occasionally				always		
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

Pays attention to team's performance. Supports and gives feedback.				seldom				often	
50:		never	occasionally				always		
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

Likes to use her/his leadership power to help subordinates grow.				seldom				often	
51:		never	occasionally				always		
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

52:	Develops others by explaining or demonstrating relevant skills.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
53:	Encourages team members to solve problems on their own.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
54:	Helps the team to focus on goals and objectives.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
55:	Gets team members to look at problems from many different angles.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
56:	Identifies causes of resistance and finds ways to overcome them.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
57:	Spends time effectively teaching or mentoring team members.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

58:	Explains how the team fits into the project or company objectives.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
59:	Explains the purpose of the company's policies to the team.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
60:	Explains rules and expectations.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
61:	Explains (personal and company) decisions, actions, and goals.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
62:	Openly shares information with others.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
63:	Deals with issues in a straightforward manner.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

		seldom				often			
		never	occasionally				always		
64:	Able to calm others in stressful situations.								
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

		seldom				often			
		never	occasionally				always		
65:	Handles difficult people and situations effectively.								
	Candidate	1	2	3	4	5	6	7	8 9
	Self-Appraisal	1	2	3	4	5	6	7	8 9
	Supervisor	1	2	3	4	5	6	7	8 9

Time needed to answer the questionnaire:

Thanks a lot for your participation and help!!!

Appendix B

Statistical Analysis: MATLAB® Script

A MATLAB® [15] script was written to facilitate the statistical analysis of the collected questionnaire data. The coding of the collected data was done by entering the results (by hand) into a Microsoft® Office EXCEL sheet. Then the coded data were stored as a so-called “tab-delimited *.txt” ASCII file and finally processed by the following MATLAB® script. The collected and processed raw-data are visualized in Appendix C.¹

```
%*****
%*****
% Statistical Analysis - MATLAB Script
% for Mathworks MATLAB (Copyright)
% by
% Roman WILFINGER
% August 2008
%*****
%*****

%*****
```

¹Figure C.1 (page 298) to C.85 (page 382).


```

%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g
\t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g
\t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \n', C(i,1),
C(i,2), C(i,3), C(i,4), C(i,5), C(i,6), C(i,7), C(i,8), C(i,9), C(i,10),
C(i,11), C(i,12), C(i,13), C(i,14), C(i,15), C(i,16), C(i,17), C(i,18),
C(i,19), C(i,20), C(i,21), C(i,22), C(i,23), C(i,24), C(i,25), C(i,26),
C(i,27), C(i,28), C(i,29), C(i,30), C(i,31), C(i,32), C(i,33), C(i,34),
C(i,35), C(i,36), C(i,37), C(i,38), C(i,39), C(i,40), C(i,41), C(i,42),
C(i,43), C(i,44), C(i,45), C(i,46), C(i,47), C(i,48), C(i,49), C(i,50),
C(i,51), C(i,52), C(i,53), C(i,54), C(i,55), C(i,56), C(i,57), C(i,58),
C(i,59), C(i,60), C(i,61), C(i,62), C(i,63), C(i,64), C(i,65));
end;
fclose(fidw);

%*****

fidw = fopen('Calculated-Covariance.txt','w');
for i = 1:Questions
fprintf(fidw,'%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g
\t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g
\t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \n', D(i,1),
D(i,2), D(i,3), D(i,4), D(i,5), D(i,6), D(i,7), D(i,8), D(i,9), D(i,10),
D(i,11), D(i,12), D(i,13), D(i,14), D(i,15), D(i,16), D(i,17), D(i,18),
D(i,19), D(i,20), D(i,21), D(i,22), D(i,23), D(i,24), D(i,25), D(i,26),
D(i,27), D(i,28), D(i,29), D(i,30), D(i,31), D(i,32), D(i,33), D(i,34),
D(i,35), D(i,36), D(i,37), D(i,38), D(i,39), D(i,40), D(i,41), D(i,42),
D(i,43), D(i,44), D(i,45), D(i,46), D(i,47), D(i,48), D(i,49), D(i,50),
D(i,51), D(i,52), D(i,53), D(i,54), D(i,55), D(i,56), D(i,57), D(i,58),
D(i,59), D(i,60), D(i,61), D(i,62), D(i,63), D(i,64), D(i,65));
end;
fclose(fidw);

```

```

%*****

fidw = fopen('Calculated-Spectrum.txt','w');
for i = 1:10
fprintf(fidw,'%2.0g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
\t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g
\t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
\t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \n',
(i-1), E(i,1), E(i,2), E(i,3), E(i,4), E(i,5), E(i,6), E(i,7), E(i,8), E(i,9),
E(i,10), E(i,11), E(i,12), E(i,13), E(i,14), E(i,15), E(i,16), E(i,17),
E(i,18), E(i,19), E(i,20), E(i,21), E(i,22), E(i,23), E(i,24), E(i,25),
E(i,26), E(i,27), E(i,28), E(i,29), E(i,30), E(i,31), E(i,32), E(i,33),
E(i,34), E(i,35), E(i,36), E(i,37), E(i,38), E(i,39), E(i,40), E(i,41),
E(i,42), E(i,43), E(i,44), E(i,45), E(i,46), E(i,47), E(i,48), E(i,49),
E(i,50), E(i,51), E(i,52), E(i,53), E(i,54), E(i,55), E(i,56), E(i,57),
E(i,58), E(i,59), E(i,60), E(i,61), E(i,62), E(i,63), E(i,64), E(i,65));
end;
fclose(fidw);

%*****
% Spectrum of correlation Coefficients Occurence
%*****

BarVar1(1:80) = 0;

for i = 1:Questions
for j = 1:Questions

Variable2 = C(i,j);

if (Variable2 > -1.0) & (Variable2 < -0.975)
    BarVar1(1) = BarVar1(1) + 1;
elseif (Variable2 > -0.975) & (Variable2 < -0.950)

```

```
BarVar1(2) = BarVar1(2) + 1;
elseif (Variable2 > -0.950) & (Variable2 < -0.925)
    BarVar1(3) = BarVar1(3) + 1;
elseif (Variable2 > -0.925) & (Variable2 < -0.900)
    BarVar1(4) = BarVar1(4) + 1;
elseif (Variable2 > -0.900) & (Variable2 < -0.875)
    BarVar1(5) = BarVar1(5) + 1;
elseif (Variable2 > -0.875) & (Variable2 < -0.850)
    BarVar1(6) = BarVar1(6) + 1;
elseif (Variable2 > -0.850) & (Variable2 < -0.825)
    BarVar1(7) = BarVar1(7) + 1;
elseif (Variable2 > -0.825) & (Variable2 < -0.800)
    BarVar1(8) = BarVar1(8) + 1;
elseif (Variable2 > -0.800) & (Variable2 < -0.775)
    BarVar1(9) = BarVar1(9) + 1;
elseif (Variable2 > -0.775) & (Variable2 < -0.750)
    BarVar1(10) = BarVar1(10) + 1;
elseif (Variable2 > -0.750) & (Variable2 < -0.725)
    BarVar1(11) = BarVar1(11) + 1;
elseif (Variable2 > -0.725) & (Variable2 < -0.700)
    BarVar1(12) = BarVar1(12) + 1;
elseif (Variable2 > -0.700) & (Variable2 < -0.675)
    BarVar1(13) = BarVar1(13) + 1;
elseif (Variable2 > -0.675) & (Variable2 < -0.650)
    BarVar1(14) = BarVar1(14) + 1;
elseif (Variable2 > -0.650) & (Variable2 < -0.625)
    BarVar1(15) = BarVar1(15) + 1;
elseif (Variable2 > -0.625) & (Variable2 < -0.600)
    BarVar1(16) = BarVar1(16) + 1;
elseif (Variable2 > -0.600) & (Variable2 < -0.575)
    BarVar1(17) = BarVar1(17) + 1;
elseif (Variable2 > -0.575) & (Variable2 < -0.550)
    BarVar1(18) = BarVar1(18) + 1;
elseif (Variable2 > -0.550) & (Variable2 < -0.525)
    BarVar1(19) = BarVar1(19) + 1;
elseif (Variable2 > -0.525) & (Variable2 < -0.500)
    BarVar1(20) = BarVar1(20) + 1;
elseif (Variable2 > -0.500) & (Variable2 < -0.475)
```

```
BarVar1(21) = BarVar1(21) + 1;
elseif (Variable2 > -0.475) & (Variable2 < -0.450)
    BarVar1(22) = BarVar1(22) + 1;
elseif (Variable2 > -0.450) & (Variable2 < -0.425)
    BarVar1(23) = BarVar1(23) + 1;
elseif (Variable2 > -0.425) & (Variable2 < -0.400)
    BarVar1(24) = BarVar1(24) + 1;
elseif (Variable2 > -0.400) & (Variable2 < -0.375)
    BarVar1(25) = BarVar1(25) + 1;
elseif (Variable2 > -0.375) & (Variable2 < -0.350)
    BarVar1(26) = BarVar1(26) + 1;
elseif (Variable2 > -0.350) & (Variable2 < -0.325)
    BarVar1(27) = BarVar1(27) + 1;
elseif (Variable2 > -0.325) & (Variable2 < -0.300)
    BarVar1(28) = BarVar1(28) + 1;
elseif (Variable2 > -0.300) & (Variable2 < -0.275)
    BarVar1(29) = BarVar1(29) + 1;
elseif (Variable2 > -0.275) & (Variable2 < -0.250)
    BarVar1(30) = BarVar1(30) + 1;
elseif (Variable2 > -0.250) & (Variable2 < -0.225)
    BarVar1(31) = BarVar1(31) + 1;
elseif (Variable2 > -0.225) & (Variable2 < -0.200)
    BarVar1(32) = BarVar1(32) + 1;
elseif (Variable2 > -0.200) & (Variable2 < -0.175)
    BarVar1(33) = BarVar1(33) + 1;
elseif (Variable2 > -0.175) & (Variable2 < -0.150)
    BarVar1(34) = BarVar1(34) + 1;
elseif (Variable2 > -0.150) & (Variable2 < -0.125)
    BarVar1(35) = BarVar1(35) + 1;
elseif (Variable2 > -0.125) & (Variable2 < -0.100)
    BarVar1(36) = BarVar1(36) + 1;
elseif (Variable2 > -0.100) & (Variable2 < -0.075)
    BarVar1(37) = BarVar1(37) + 1;
elseif (Variable2 > -0.075) & (Variable2 < -0.050)
    BarVar1(38) = BarVar1(38) + 1;
elseif (Variable2 > -0.050) & (Variable2 < -0.025)
    BarVar1(39) = BarVar1(39) + 1;
elseif (Variable2 > -0.025) & (Variable2 < 0.000)
```

```
BarVar1(40) = BarVar1(40) + 1;
elseif (Variable2 > 0.000) & (Variable2 < 0.025)
    BarVar1(41) = BarVar1(41) + 1;
elseif (Variable2 > 0.025) & (Variable2 < 0.050)
    BarVar1(42) = BarVar1(42) + 1;
elseif (Variable2 > 0.050) & (Variable2 < 0.075)
    BarVar1(43) = BarVar1(43) + 1;
elseif (Variable2 > 0.075) & (Variable2 < 0.100)
    BarVar1(44) = BarVar1(44) + 1;
elseif (Variable2 > 0.100) & (Variable2 < 0.125)
    BarVar1(45) = BarVar1(45) + 1;
elseif (Variable2 > 0.125) & (Variable2 < 0.150)
    BarVar1(46) = BarVar1(46) + 1;
elseif (Variable2 > 0.150) & (Variable2 < 0.175)
    BarVar1(47) = BarVar1(47) + 1;
elseif (Variable2 > 0.175) & (Variable2 < 0.200)
    BarVar1(48) = BarVar1(48) + 1;
elseif (Variable2 > 0.200) & (Variable2 < 0.225)
    BarVar1(49) = BarVar1(49) + 1;
elseif (Variable2 > 0.225) & (Variable2 < 0.250)
    BarVar1(50) = BarVar1(50) + 1;
elseif (Variable2 > 0.250) & (Variable2 < 0.275)
    BarVar1(51) = BarVar1(51) + 1;
elseif (Variable2 > 0.275) & (Variable2 < 0.300)
    BarVar1(52) = BarVar1(52) + 1;
elseif (Variable2 > 0.300) & (Variable2 < 0.325)
    BarVar1(53) = BarVar1(53) + 1;
elseif (Variable2 > 0.325) & (Variable2 < 0.350)
    BarVar1(54) = BarVar1(54) + 1;
elseif (Variable2 > 0.350) & (Variable2 < 0.375)
    BarVar1(55) = BarVar1(55) + 1;
elseif (Variable2 > 0.375) & (Variable2 < 0.400)
    BarVar1(56) = BarVar1(56) + 1;
elseif (Variable2 > 0.400) & (Variable2 < 0.425)
    BarVar1(57) = BarVar1(57) + 1;
elseif (Variable2 > 0.425) & (Variable2 < 0.450)
    BarVar1(58) = BarVar1(58) + 1;
elseif (Variable2 > 0.450) & (Variable2 < 0.475)
```

```
BarVar1(59) = BarVar1(59) + 1;
elseif (Variable2 > 0.475) & (Variable2 < 0.500)
    BarVar1(60) = BarVar1(60) + 1;
elseif (Variable2 > 0.500) & (Variable2 < 0.525)
    BarVar1(61) = BarVar1(61) + 1;
elseif (Variable2 > 0.525) & (Variable2 < 0.550)
    BarVar1(62) = BarVar1(62) + 1;
elseif (Variable2 > 0.550) & (Variable2 < 0.575)
    BarVar1(63) = BarVar1(63) + 1;
elseif (Variable2 > 0.575) & (Variable2 < 0.600)
    BarVar1(64) = BarVar1(64) + 1;
elseif (Variable2 > 0.600) & (Variable2 < 0.625)
    BarVar1(65) = BarVar1(65) + 1;
elseif (Variable2 > 0.625) & (Variable2 < 0.650)
    BarVar1(66) = BarVar1(66) + 1;
elseif (Variable2 > 0.650) & (Variable2 < 0.675)
    BarVar1(67) = BarVar1(67) + 1;
elseif (Variable2 > 0.675) & (Variable2 < 0.700)
    BarVar1(68) = BarVar1(68) + 1;
elseif (Variable2 > 0.700) & (Variable2 < 0.725)
    BarVar1(69) = BarVar1(69) + 1;
elseif (Variable2 > 0.725) & (Variable2 < 0.750)
    BarVar1(70) = BarVar1(70) + 1;
elseif (Variable2 > 0.750) & (Variable2 < 0.775)
    BarVar1(71) = BarVar1(71) + 1;
elseif (Variable2 > 0.775) & (Variable2 < 0.800)
    BarVar1(72) = BarVar1(72) + 1;
elseif (Variable2 > 0.800) & (Variable2 < 0.825)
    BarVar1(73) = BarVar1(73) + 1;
elseif (Variable2 > 0.825) & (Variable2 < 0.850)
    BarVar1(74) = BarVar1(74) + 1;
elseif (Variable2 > 0.850) & (Variable2 < 0.875)
    BarVar1(75) = BarVar1(75) + 1;
elseif (Variable2 > 0.875) & (Variable2 < 0.900)
    BarVar1(76) = BarVar1(76) + 1;
elseif (Variable2 > 0.900) & (Variable2 < 0.925)
    BarVar1(77) = BarVar1(77) + 1;
elseif (Variable2 > 0.925) & (Variable2 < 0.950)
```

```

        BarVar1(78) = BarVar1(78) + 1;
    elseif (Variable2 > 0.950) & (Variable2 < 0.975)
        BarVar1(79) = BarVar1(79) + 1;
    elseif (Variable2 > 0.975) & (Variable2 < 1.000)
        BarVar1(80) = BarVar1(80) + 1;
    end
end
end

%*****
% Output of correlation Coeff. - "Bar-Diagram"
%*****

fidw = fopen('Calculated-Sorted-Correl-Bar-Diagr.txt','w');
for i = 1:80
    xdata1(i) = (i-1)/40 - 0.9875;
    BarVar2(i) = BarVar1(i) / 2.0;
    fprintf(fidw,'%7.5g \t %7.5g \n', xdata1(i), BarVar2(i));
end
fclose(fidw);

%*****
% Gaussian Fit for correlation Coeff. Occurence
%*****

xdata = transpose(xdata1);
ydata = real(BarVar2(:));
fitresult0 = fit(xdata,ydata,'gauss1','Normalize','off')

%*****
% Output of correlation Coeff. - "XY-Bar-Diagram"
%*****

Const2 = 2000;
max3 = 2.0;

fidw = fopen('Calculated-Sorted-Correl-XY.txt','w');
```

```

for i = 1:Const2

Variable4 = (max3*(i-1)/Const2) - 1.0;

if (Variable4 > -1.0) & (Variable4 < -0.975)
    IntegerVar4 = BarVar2(1);
elseif (Variable4 > -0.975) & (Variable4 < -0.950)
    IntegerVar4 = BarVar2(2);
elseif (Variable4 > -0.950) & (Variable4 < -0.925)
    IntegerVar4 = BarVar2(3);
elseif (Variable4 > -0.925) & (Variable4 < -0.900)
    IntegerVar4 = BarVar2(4);
elseif (Variable4 > -0.900) & (Variable4 < -0.875)
    IntegerVar4 = BarVar2(5);
elseif (Variable4 > -0.875) & (Variable4 < -0.850)
    IntegerVar4 = BarVar2(6);
elseif (Variable4 > -0.850) & (Variable4 < -0.825)
    IntegerVar4 = BarVar2(7);
elseif (Variable4 > -0.825) & (Variable4 < -0.800)
    IntegerVar4 = BarVar2(8);
elseif (Variable4 > -0.800) & (Variable4 < -0.775)
    IntegerVar4 = BarVar2(9);
elseif (Variable4 > -0.775) & (Variable4 < -0.750)
    IntegerVar4 = BarVar2(10);
elseif (Variable4 > -0.750) & (Variable4 < -0.725)
    IntegerVar4 = BarVar2(11);
elseif (Variable4 > -0.725) & (Variable4 < -0.700)
    IntegerVar4 = BarVar2(12);
elseif (Variable4 > -0.700) & (Variable4 < -0.675)
    IntegerVar4 = BarVar2(13);
elseif (Variable4 > -0.675) & (Variable4 < -0.650)
    IntegerVar4 = BarVar2(14);
elseif (Variable4 > -0.650) & (Variable4 < -0.625)
    IntegerVar4 = BarVar2(15);
elseif (Variable4 > -0.625) & (Variable4 < -0.600)
    IntegerVar4 = BarVar2(16);
elseif (Variable4 > -0.600) & (Variable4 < -0.575)
    IntegerVar4 = BarVar2(17);

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```
elseif (Variable4 > -0.575) & (Variable4 < -0.550)
    IntegerVar4 = BarVar2(18);
elseif (Variable4 > -0.550) & (Variable4 < -0.525)
    IntegerVar4 = BarVar2(19);
elseif (Variable4 > -0.525) & (Variable4 < -0.500)
    IntegerVar4 = BarVar2(20);
elseif (Variable4 > -0.500) & (Variable4 < -0.475)
    IntegerVar4 = BarVar2(21);
elseif (Variable4 > -0.475) & (Variable4 < -0.450)
    IntegerVar4 = BarVar2(22);
elseif (Variable4 > -0.450) & (Variable4 < -0.425)
    IntegerVar4 = BarVar2(23);
elseif (Variable4 > -0.425) & (Variable4 < -0.400)
    IntegerVar4 = BarVar2(24);
elseif (Variable4 > -0.400) & (Variable4 < -0.375)
    IntegerVar4 = BarVar2(25);
elseif (Variable4 > -0.375) & (Variable4 < -0.350)
    IntegerVar4 = BarVar2(26);
elseif (Variable4 > -0.350) & (Variable4 < -0.325)
    IntegerVar4 = BarVar2(27);
elseif (Variable4 > -0.325) & (Variable4 < -0.300)
    IntegerVar4 = BarVar2(28);
elseif (Variable4 > -0.300) & (Variable4 < -0.275)
    IntegerVar4 = BarVar2(29);
elseif (Variable4 > -0.275) & (Variable4 < -0.250)
    IntegerVar4 = BarVar2(30);
elseif (Variable4 > -0.250) & (Variable4 < -0.225)
    IntegerVar4 = BarVar2(31);
elseif (Variable4 > -0.225) & (Variable4 < -0.200)
    IntegerVar4 = BarVar2(32);
elseif (Variable4 > -0.200) & (Variable4 < -0.175)
    IntegerVar4 = BarVar2(33);
elseif (Variable4 > -0.175) & (Variable4 < -0.150)
    IntegerVar4 = BarVar2(34);
elseif (Variable4 > -0.150) & (Variable4 < -0.125)
    IntegerVar4 = BarVar2(35);
elseif (Variable4 > -0.125) & (Variable4 < -0.100)
    IntegerVar4 = BarVar2(36);
```

```
elseif (Variable4 > -0.100) & (Variable4 < -0.075)
    IntegerVar4 = BarVar2(37);
elseif (Variable4 > -0.075) & (Variable4 < -0.050)
    IntegerVar4 = BarVar2(38);
elseif (Variable4 > -0.050) & (Variable4 < -0.025)
    IntegerVar4 = BarVar2(39);
elseif (Variable4 > -0.025) & (Variable4 < 0.000)
    IntegerVar4 = BarVar2(40);
elseif (Variable4 > 0.000) & (Variable4 < 0.025)
    IntegerVar4 = BarVar2(41);
elseif (Variable4 > 0.025) & (Variable4 < 0.050)
    IntegerVar4 = BarVar2(42);
elseif (Variable4 > 0.050) & (Variable4 < 0.075)
    IntegerVar4 = BarVar2(43);
elseif (Variable4 > 0.075) & (Variable4 < 0.100)
    IntegerVar4 = BarVar2(44);
elseif (Variable4 > 0.100) & (Variable4 < 0.125)
    IntegerVar4 = BarVar2(45);
elseif (Variable4 > 0.125) & (Variable4 < 0.150)
    IntegerVar4 = BarVar2(46);
elseif (Variable4 > 0.150) & (Variable4 < 0.175)
    IntegerVar4 = BarVar2(47);
elseif (Variable4 > 0.175) & (Variable4 < 0.200)
    IntegerVar4 = BarVar2(48);
elseif (Variable4 > 0.200) & (Variable4 < 0.225)
    IntegerVar4 = BarVar2(49);
elseif (Variable4 > 0.225) & (Variable4 < 0.250)
    IntegerVar4 = BarVar2(50);
elseif (Variable4 > 0.250) & (Variable4 < 0.275)
    IntegerVar4 = BarVar2(51);
elseif (Variable4 > 0.275) & (Variable4 < 0.300)
    IntegerVar4 = BarVar2(52);
elseif (Variable4 > 0.300) & (Variable4 < 0.325)
    IntegerVar4 = BarVar2(53);
elseif (Variable4 > 0.325) & (Variable4 < 0.350)
    IntegerVar4 = BarVar2(54);
elseif (Variable4 > 0.350) & (Variable4 < 0.375)
    IntegerVar4 = BarVar2(55);
```

```
elseif (Variable4 > 0.375) & (Variable4 < 0.400)
    IntegerVar4 = BarVar2(56);
elseif (Variable4 > 0.400) & (Variable4 < 0.425)
    IntegerVar4 = BarVar2(57);
elseif (Variable4 > 0.425) & (Variable4 < 0.450)
    IntegerVar4 = BarVar2(58);
elseif (Variable4 > 0.450) & (Variable4 < 0.475)
    IntegerVar4 = BarVar2(59);
elseif (Variable4 > 0.475) & (Variable4 < 0.500)
    IntegerVar4 = BarVar2(60);
elseif (Variable4 > 0.500) & (Variable4 < 0.525)
    IntegerVar4 = BarVar2(61);
elseif (Variable4 > 0.525) & (Variable4 < 0.550)
    IntegerVar4 = BarVar2(62);
elseif (Variable4 > 0.550) & (Variable4 < 0.575)
    IntegerVar4 = BarVar2(63);
elseif (Variable4 > 0.575) & (Variable4 < 0.600)
    IntegerVar4 = BarVar2(64);
elseif (Variable4 > 0.600) & (Variable4 < 0.625)
    IntegerVar4 = BarVar2(65);
elseif (Variable4 > 0.625) & (Variable4 < 0.650)
    IntegerVar4 = BarVar2(66);
elseif (Variable4 > 0.650) & (Variable4 < 0.675)
    IntegerVar4 = BarVar2(67);
elseif (Variable4 > 0.675) & (Variable4 < 0.700)
    IntegerVar4 = BarVar2(68);
elseif (Variable4 > 0.700) & (Variable4 < 0.725)
    IntegerVar4 = BarVar2(69);
elseif (Variable4 > 0.725) & (Variable4 < 0.750)
    IntegerVar4 = BarVar2(70);
elseif (Variable4 > 0.750) & (Variable4 < 0.775)
    IntegerVar4 = BarVar2(71);
elseif (Variable4 > 0.775) & (Variable4 < 0.800)
    IntegerVar4 = BarVar2(72);
elseif (Variable4 > 0.800) & (Variable4 < 0.825)
    IntegerVar4 = BarVar2(73);
elseif (Variable4 > 0.825) & (Variable4 < 0.850)
    IntegerVar4 = BarVar2(74);
```

```

elseif (Variable4 > 0.850) & (Variable4 < 0.875)
    IntegerVar4 = BarVar2(75);
elseif (Variable4 > 0.875) & (Variable4 < 0.900)
    IntegerVar4 = BarVar2(76);
elseif (Variable4 > 0.900) & (Variable4 < 0.925)
    IntegerVar4 = BarVar2(77);
elseif (Variable4 > 0.925) & (Variable4 < 0.950)
    IntegerVar4 = BarVar2(78);
elseif (Variable4 > 0.950) & (Variable4 < 0.975)
    IntegerVar4 = BarVar2(79);
elseif (Variable4 > 0.975) & (Variable4 < 1.000)
    IntegerVar4 = BarVar2(80);
else
    IntegerVar4 = 0;
end

fprintf(fidw,'%7.5g \t %7.5g \t %12.9e \n', Variable4, IntegerVar4,
        fitresult0(Variable4));

end

fclose(fidw);

%*****
%           Output - Correlation Coefficients - 2
%*****

fidw = fopen('Calculated-Correlation-Coefficients--NEW.txt','w');
for i = 1:Questions
    fprintf(fidw,'%7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
    %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
    \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
    %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g
    \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
    %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t
    %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \t %7.5g \n', C(i,1),
    C(i,2), C(i,3), C(i,4), C(i,5), C(i,6), C(i,7), C(i,8), C(i,9), C(i,10),
    C(i,11), C(i,12), C(i,13), C(i,14), C(i,15), C(i,16), C(i,17), C(i,18),

```

```

max1 = 11;
max2 = 10.5;

%QuestionNumber = 1;

for QuestionNumber = 1:Questions;

xdata = transpose(xdatatranspose);
ydata = real(E(:,QuestionNumber));

for i = 1:Const1
Variable1 = (max1*(i-1)/Const1) - 0.5;
if (Variable1 > -0.5) & (Variable1 < 0.5)
    IntegerVar1 = ydata(1);
elseif (Variable1 > 0.5) & (Variable1 < 1.5)
    IntegerVar1 = ydata(2);
elseif (Variable1 > 1.5) & (Variable1 < 2.5)
    IntegerVar1 = ydata(3);
elseif (Variable1 > 2.5) & (Variable1 < 3.5)
    IntegerVar1 = ydata(4);
elseif (Variable1 > 3.5) & (Variable1 < 4.5)
    IntegerVar1 = ydata(5);
elseif (Variable1 > 4.5) & (Variable1 < 5.5)
    IntegerVar1 = ydata(6);
elseif (Variable1 > 5.5) & (Variable1 < 6.5)
    IntegerVar1 = ydata(7);
elseif (Variable1 > 6.5) & (Variable1 < 7.5)
    IntegerVar1 = ydata(8);
elseif (Variable1 > 7.5) & (Variable1 < 8.5)
    IntegerVar1 = ydata(9);
elseif (Variable1 > 8.5) & (Variable1 < 9.5)
    IntegerVar1 = ydata(10);
elseif (Variable1 > 9.5) & (Variable1 < max1)
    IntegerVar1 = 0;
else
    IntegerVar1 = 0;
end

```

```

QuestionNumber
fitresult1 = fit(xdata,ydata,'gauss1','Normalize','off')

QuestionNumberStr = num2str(QuestionNumber);

FileName = ['Calculated-Fit-Curves--Question-0',QuestionNumberStr];
fidw = fopen([FileName,'.txt'],'w');
fprintf(fidw,'%s \n', FileName);
fprintf(fidw,'\n');
fprintf(fidw,'\n');
for i = 1:Const1
Variable1 = (max1*(i-1)/Const1) - 0.5;
if (Variable1 > -0.5) & (Variable1 < 0.5)
    IntegerVar1 = ydata(1);
elseif (Variable1 > 0.5) & (Variable1 < 1.5)
    IntegerVar1 = ydata(2);
elseif (Variable1 > 1.5) & (Variable1 < 2.5)
    IntegerVar1 = ydata(3);
elseif (Variable1 > 2.5) & (Variable1 < 3.5)
    IntegerVar1 = ydata(4);
elseif (Variable1 > 3.5) & (Variable1 < 4.5)
    IntegerVar1 = ydata(5);
elseif (Variable1 > 4.5) & (Variable1 < 5.5)
    IntegerVar1 = ydata(6);
elseif (Variable1 > 5.5) & (Variable1 < 6.5)
    IntegerVar1 = ydata(7);
elseif (Variable1 > 6.5) & (Variable1 < 7.5)
    IntegerVar1 = ydata(8);
elseif (Variable1 > 7.5) & (Variable1 < 8.5)
    IntegerVar1 = ydata(9);
elseif (Variable1 > 8.5) & (Variable1 < 9.5)
    IntegerVar1 = ydata(10);
elseif (Variable1 > 9.5) & (Variable1 < max1)
    IntegerVar1 = 0;
else
    IntegerVar1 = 0;
end

```

```

fprintf(fidw,'%12.9e \t %2.0g \t %12.9e \n', Variable1, IntegerVar1,
        fitresult1(Variable1));
end;
fprintf(fidw,'%12.9e \t %2.0g \t %12.9e \n', max1, 0, fitresult1(max1));
fclose(fidw);
end

%*****
% Poisson Fit and Lambda Factor Calculation
%*****

lambda = poissfit(ydata);
YPoisson = poisspdf(1:10,lambda);

QuestionNumber = 28;

lambda(QuestionNumber) = poissfit(real(E(:,QuestionNumber)));

%fitresult3 = fit(xdata,ydata,'poisspdf','Normalize','off');

lambda = poissfit(ydata)
%[M,V] = poisstat(lambda)
YPoisson = poisspdf(ydata,lambda)

%*****
% E N D
%*****

```

Appendix C

Collected Raw Data

A MATLAB® script¹ was used to process the collected data from the answered questionnaires. Each question was analyzed and visualized in bar-diagrams for a different group: Research Environment², Self-Appraisal & Supervisor³, Candidate⁴, Self-Appraisal⁵, and Supervisor⁶. The bar-diagrams (blue line: —) visualize the occurrence spectrum of the collected data for the given performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always. The corresponding arithmetic mean value is given in the legend of each graph. In addition, a gaussian fit (Equation C.1) was calculated⁷ for each spectrum and visualized in the same diagram (red line: —). The mean value μ and standard deviation σ are given in the legend of each graph.

$$\text{Gaussian fit}(x) = A \cdot e^{-\frac{1}{2} \cdot \left(\frac{x-\mu}{\sigma}\right)^2} \quad (\text{C.1})$$

¹see Appendix B, page 277.

²see Section C.1, page 298: Figure C.1 to C.17.

³see Section C.2, page 315: Figure C.18 to C.34.

⁴see Section C.3, page 332: Figure C.35 to C.51.

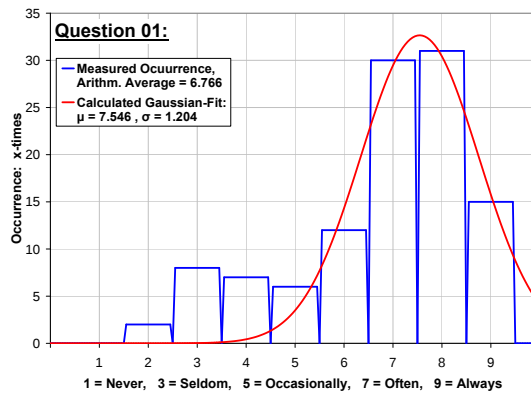
⁵see Section C.4, page 349: Figure C.52 to C.68.

⁶see Section C.5, page 366: Figure C.69 to C.85.

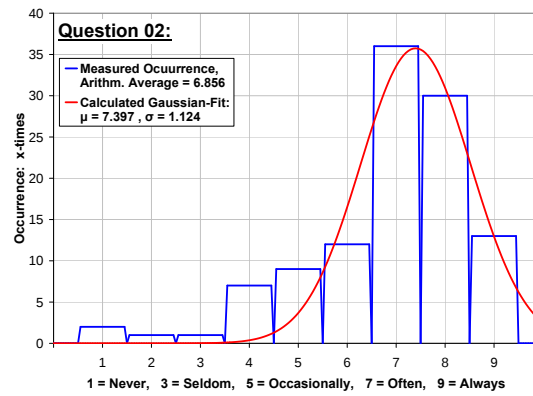
⁷Fit Convergence Criteria: The gaussian fit termination tolerance used on stopping conditions involving the coefficients was set to the default value of 10^{-6} (see [15]).

C.1 Research Environment

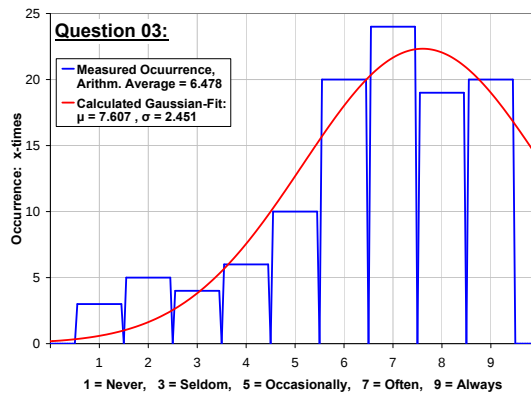
The Research Environment group contains all data collected by the questionnaires. The obtained occurrence values for the candidate, the self-appraisal (“yourself”), and the supervisor (or team-leader) were summed up for each question and performance category and visually presented in the following graphs. The candidate category was included to decrease the statistical errors in the analysis.



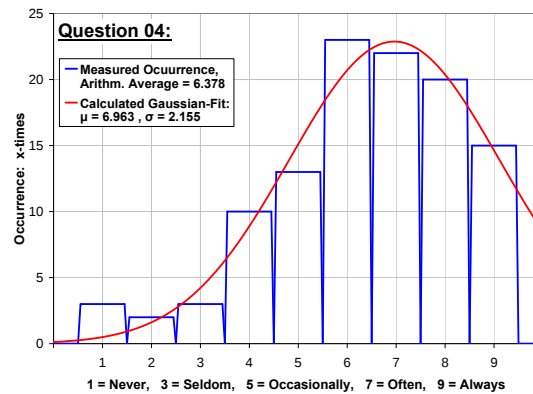
(a) Research Environment: Question 01.



(b) Research Environment: Question 02.



(c) Research Environment: Question 03.



(d) Research Environment: Question 04.

Figure C.1: Question 01: Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).

Question 02: Makes suggestions about how to solve problems and sets standards of performance for group members.

Question 03: Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.

Question 04: Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.

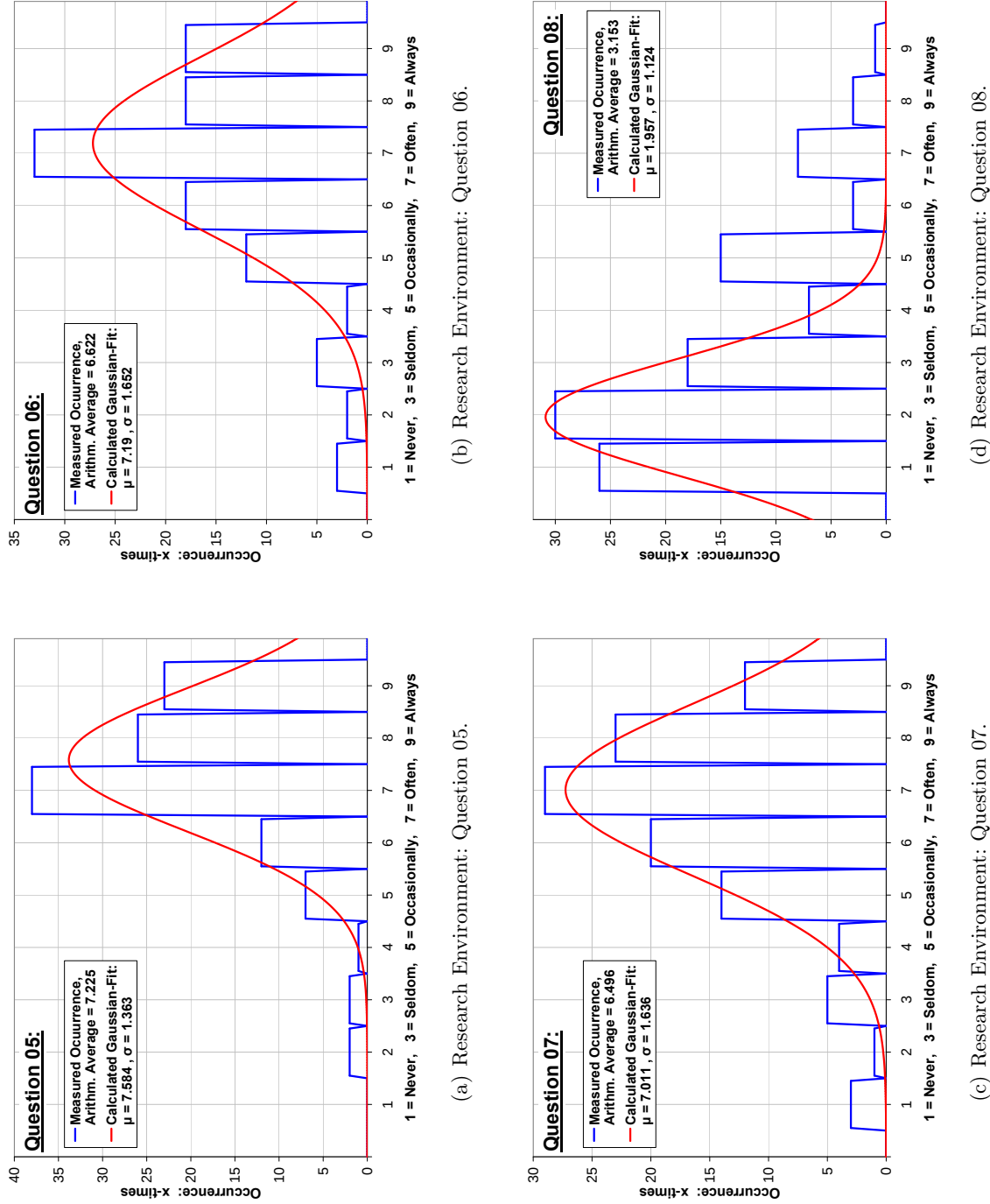


Figure C.2: *Question 05: Recognizes what needs to be done and takes the initiative to make it happen.*

Question 06: Prioritizes key objectives and focuses the groups activity on them.

Question 07: Effectively allocates available resources, e.g., time, people, money.

Question 08: Gives vague or misleading explanations to team members.

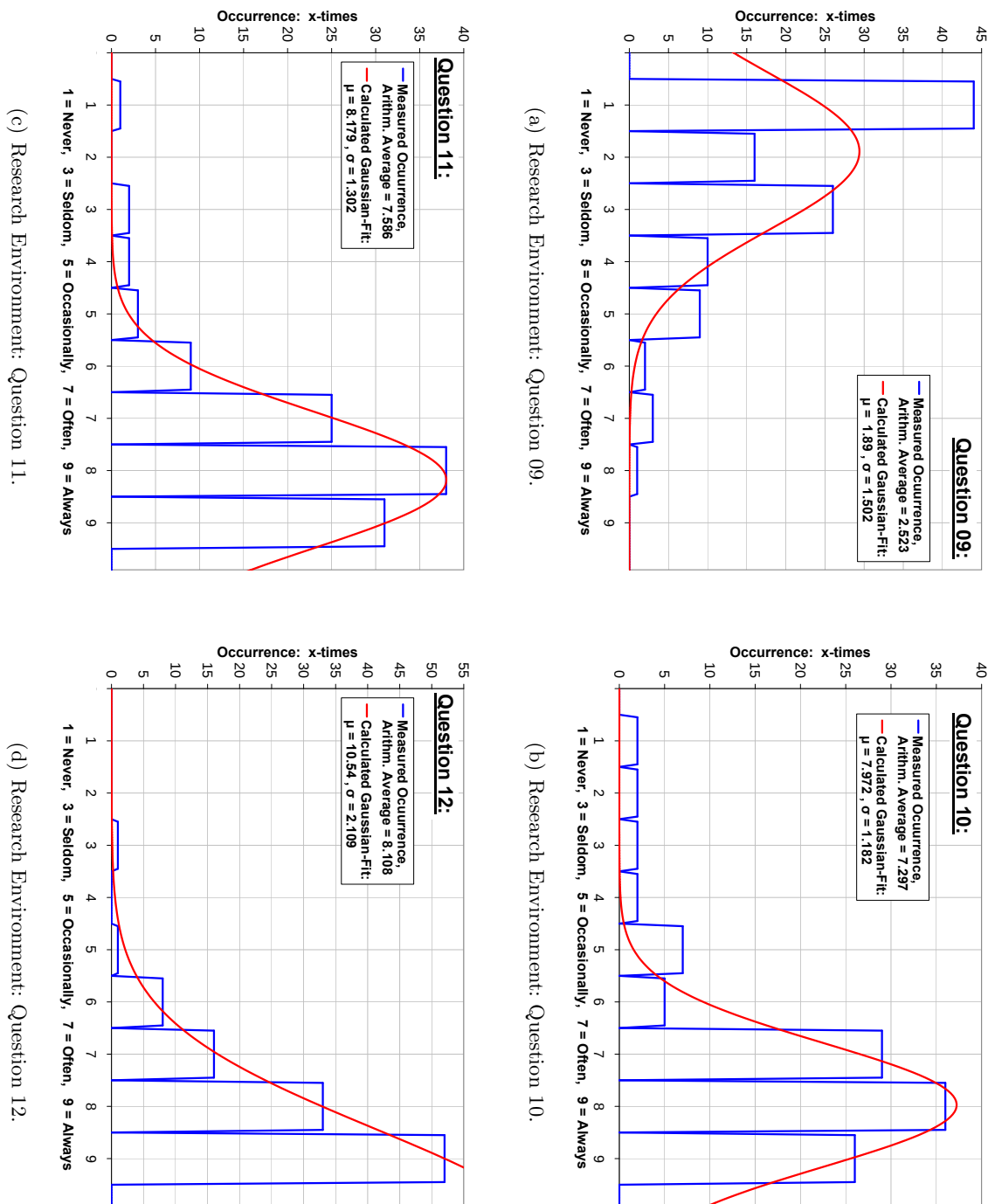


Figure C.3: Question 09: Makes NO suggestions (because she/he has no clue at all).

Question 10: Enjoys getting into the details of how things work.

Question 11: Is good at making things work and completing the assigned tasks.

Question 12: Knows and understands how to do basic things.

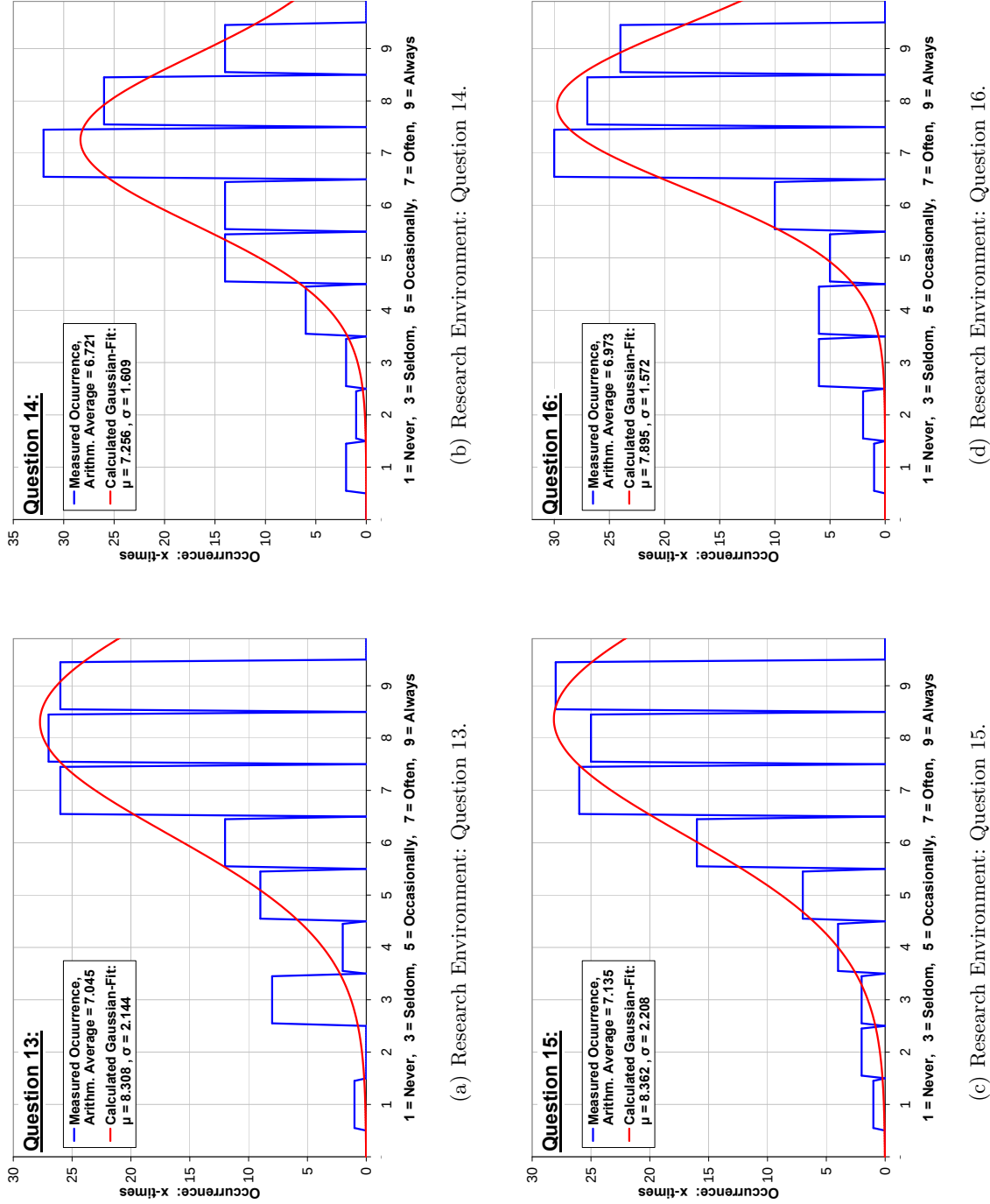


Figure C.4: *Question 13: Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.*

Question 14: Knows (exactly and in detail) what work is being done in the team.

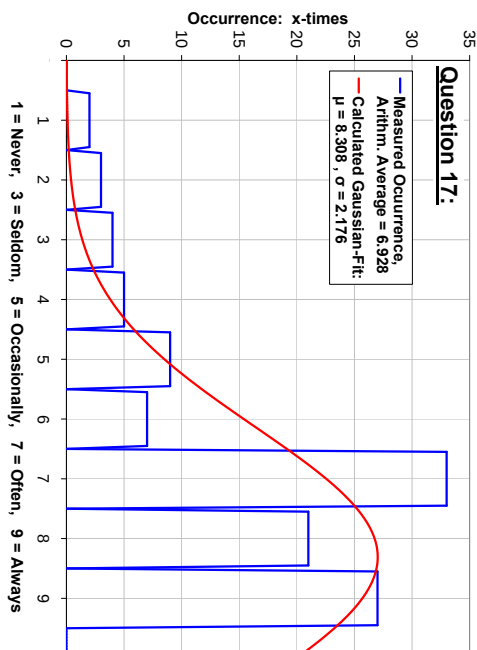
Question 15: Treats people as equals, fairly and consistently (behaves predictably).

Question 16: Communicates actively (i.e., starts conversations) with team members.

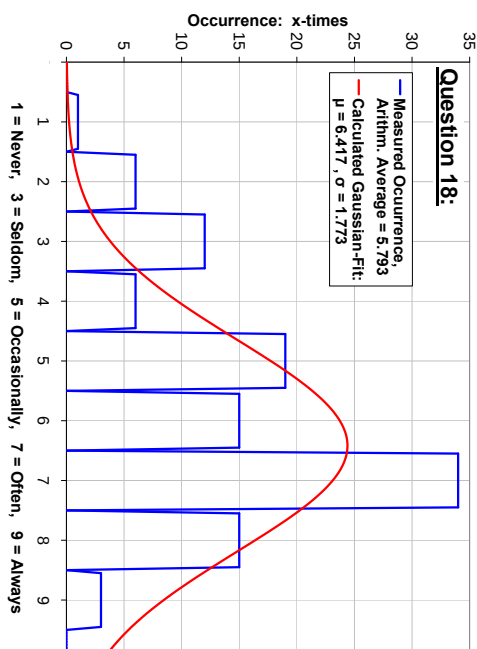
Figure C.5: *Question 17: Acknowledges her/his own mistakes and takes corrective action.*

Question 18: Discloses thoughts and feelings to group members.

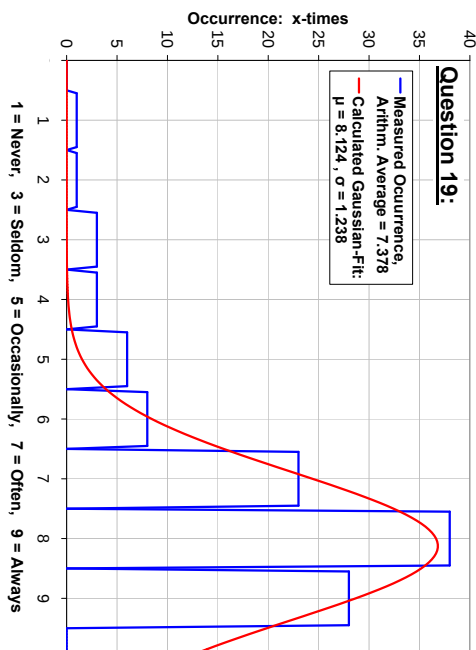
Question 19: Gives team members honest and fair answers.



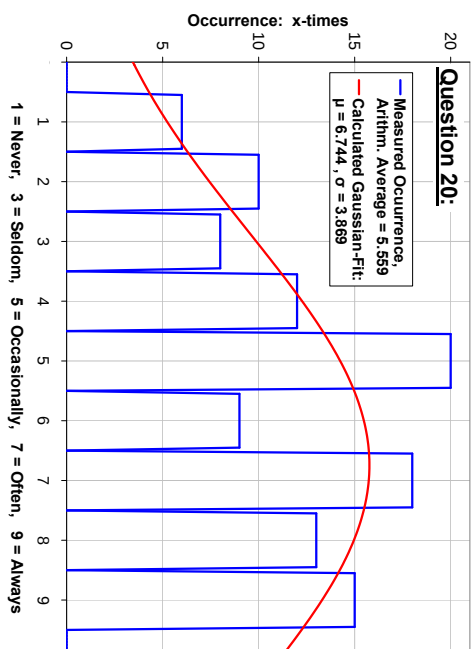
(a) Research Environment: Question 17.



(b) Research Environment: Question 18.



(c) Research Environment: Question 19.



(d) Research Environment: Question 20.

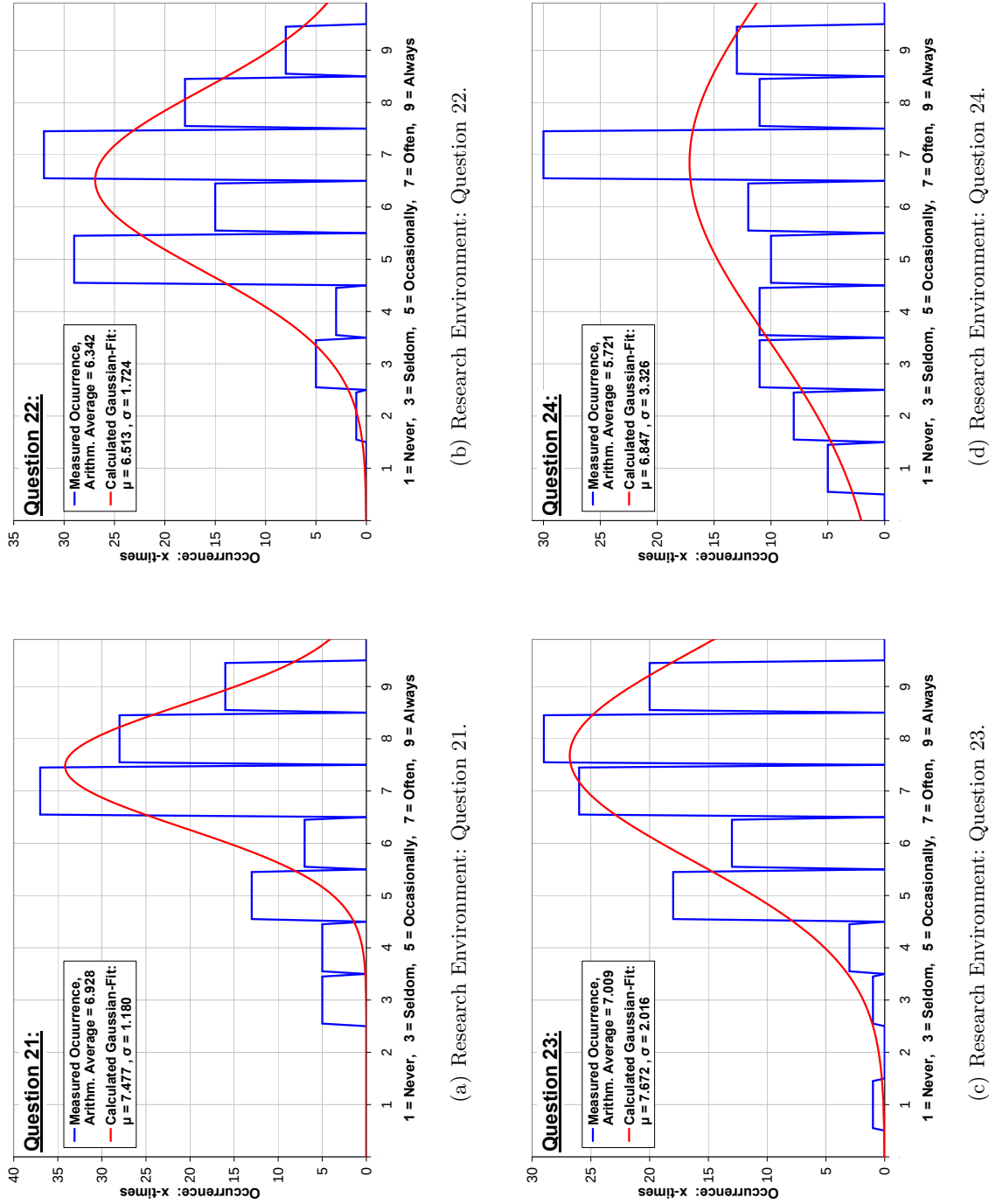


Figure C.6: *Question 21: Honors other people's (personal) boundaries.*

Question 22: Regularly achieves "win-win" outcomes.

Question 23: Identifies and promotes opportunities for collaboration.

Question 24: Is concerned with how her/his decisions affect the lives of others.

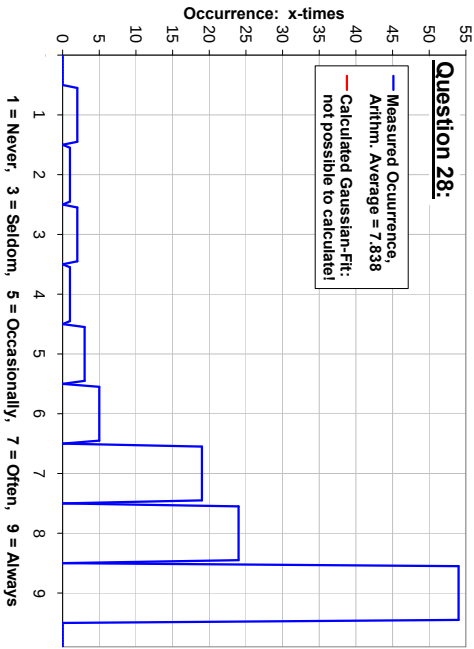
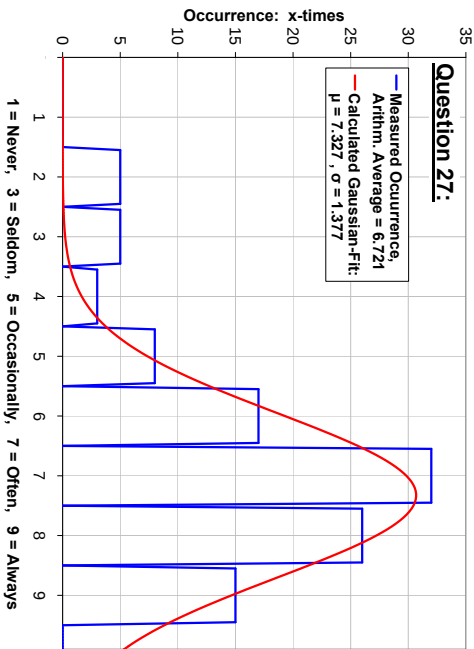
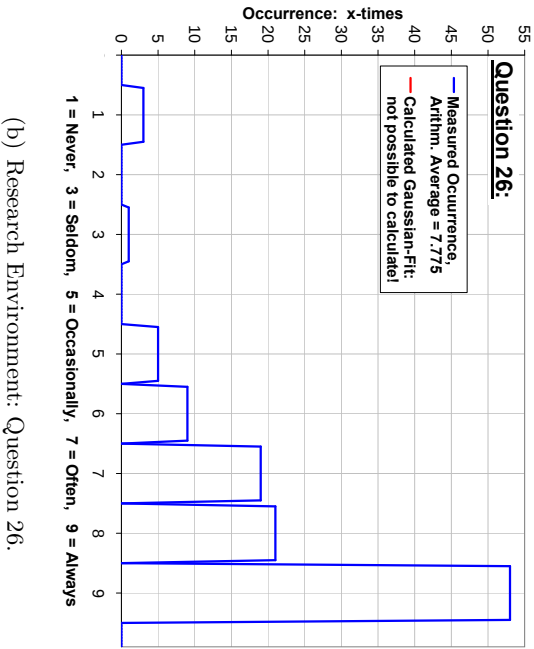
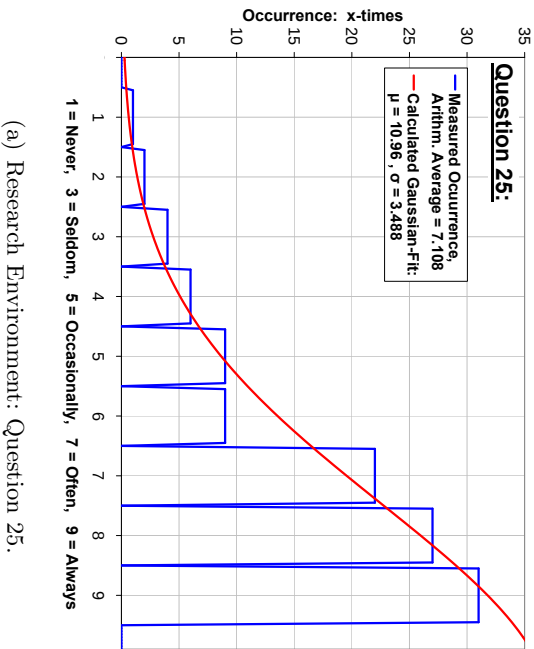
Figure C.7:

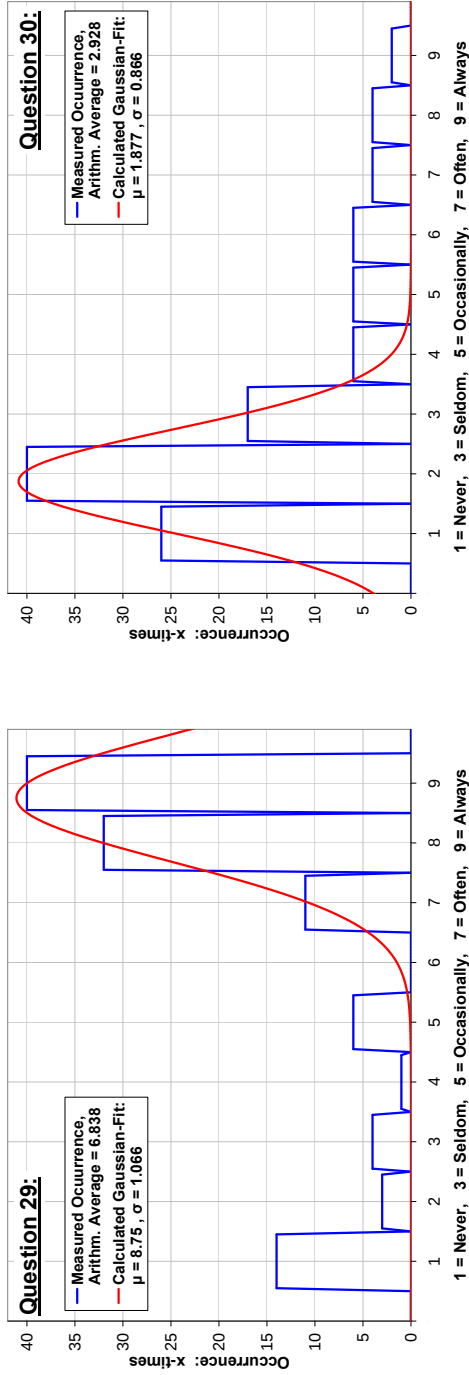
Question 25: Sets high and clear standards for others by her/his own behavior.

Question 26: Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.

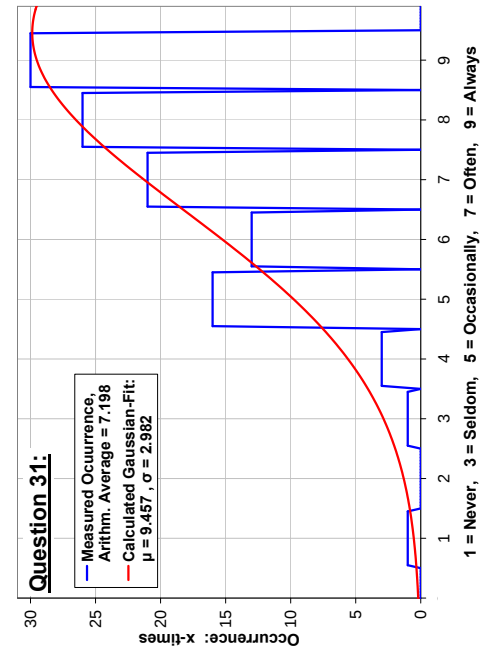
Question 27: Models positive team attributes such as mutual respect, open communication, and full participation.

Question 28: Has high moral standards. Can be trusted with confidential information.

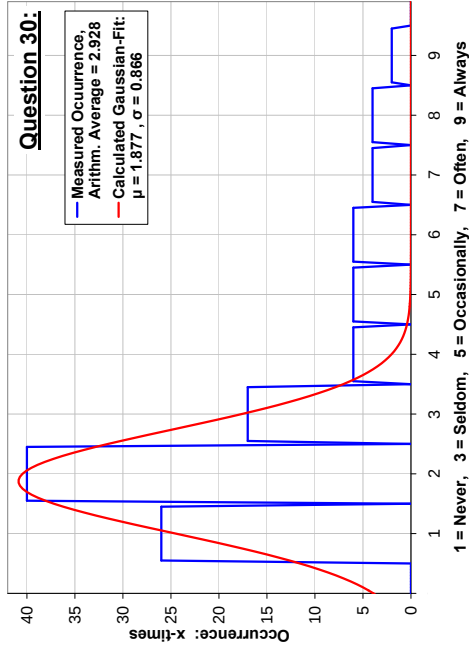




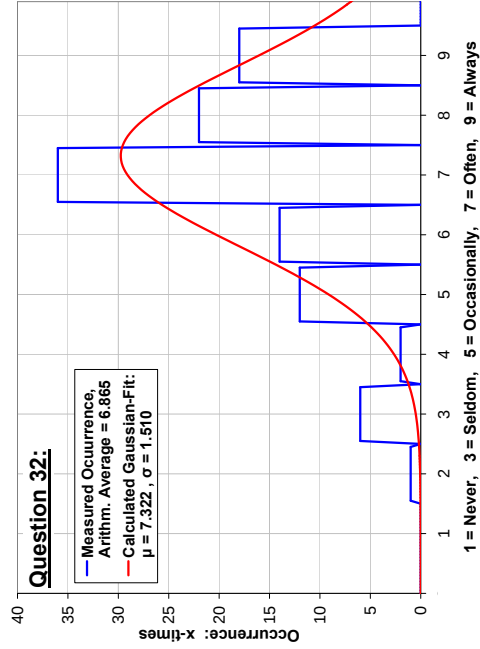
(a) Research Environment: Question 29.



(c) Research Environment: Question 31.



(b) Research Environment: Question 30.



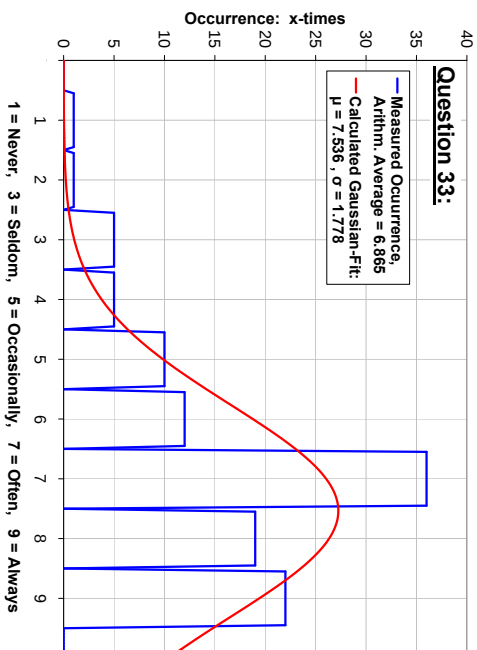
(d) Research Environment: Question 32.

Figure C.8: Question 29: Would never try to take credit for other people's ideas.

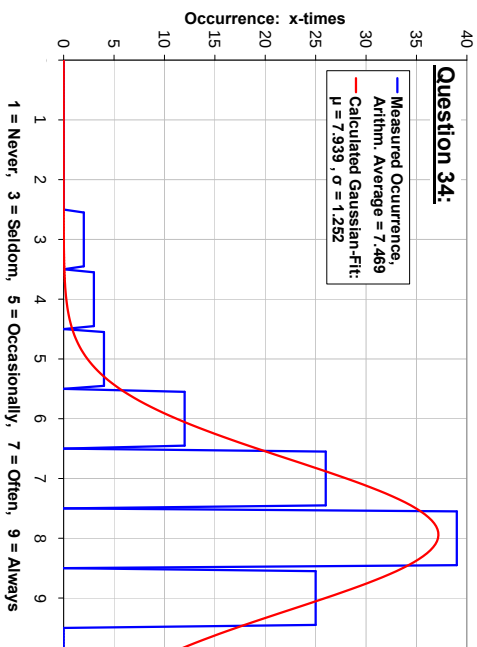
Question 30: Shows favoritism (in an unfair amount) towards some people.

Question 31: Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.

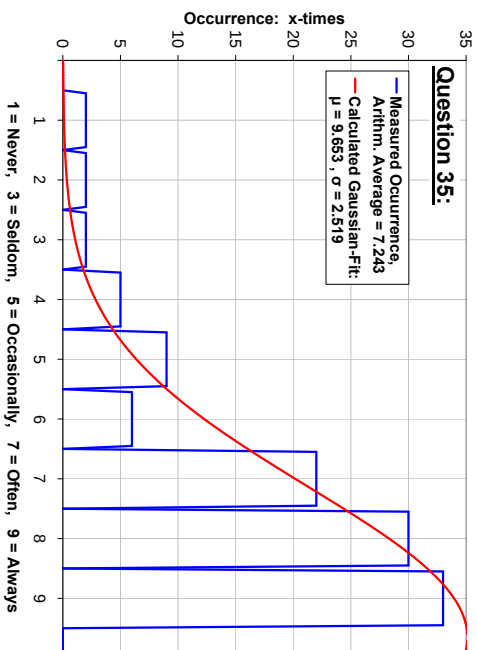
Question 32: Possesses awareness of her/his own strengths and weaknesses.



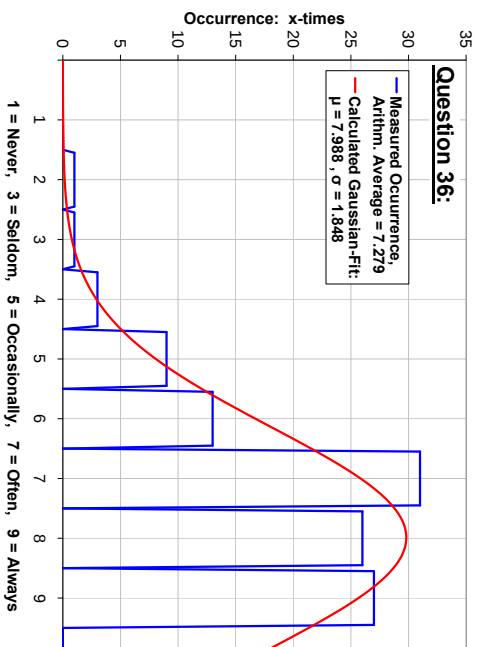
(a) Research Environment: Question 33.



(b) Research Environment: Question 34.



(c) Research Environment: Question 35.



(d) Research Environment: Question 36.

Figure C.9: *Question 33: Is open to feedback from others. Encourages others to give feedback.*

Question 34: Learns from own experiences and also those of others. Seeks opportunities for self-development.

Question 35: Speaks up even when her/his opinion is in the minority.

Question 36: Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.

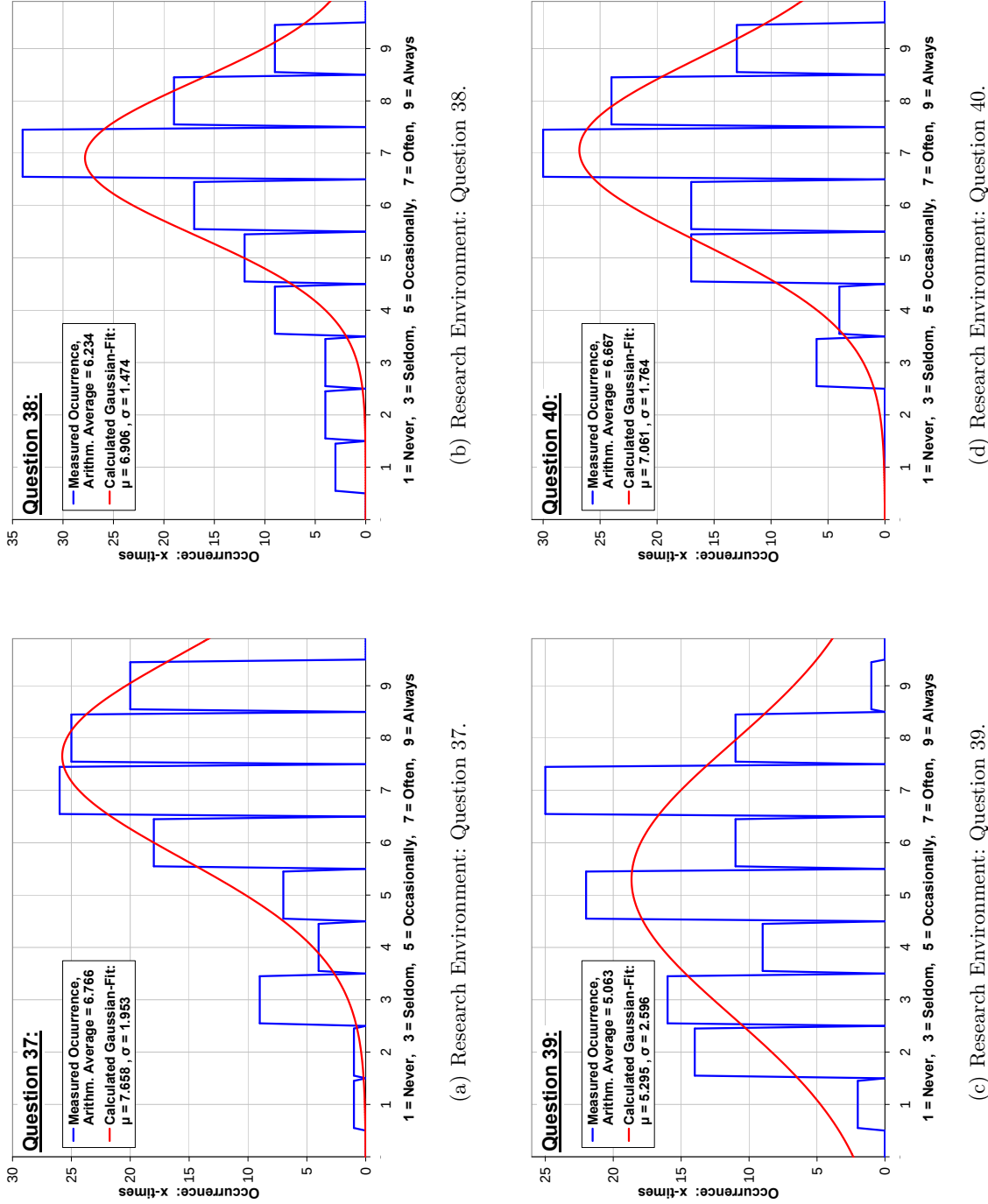
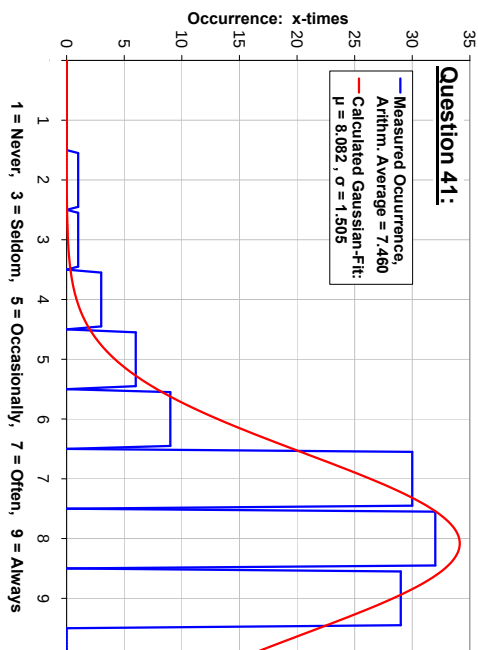


Figure C.10: Question 37: Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.

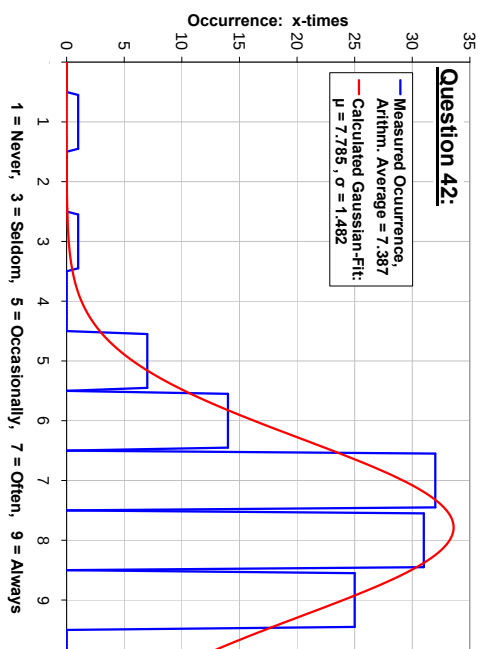
Question 38: Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.

Question 39: Makes decisions that are based only on his/her own ideas.

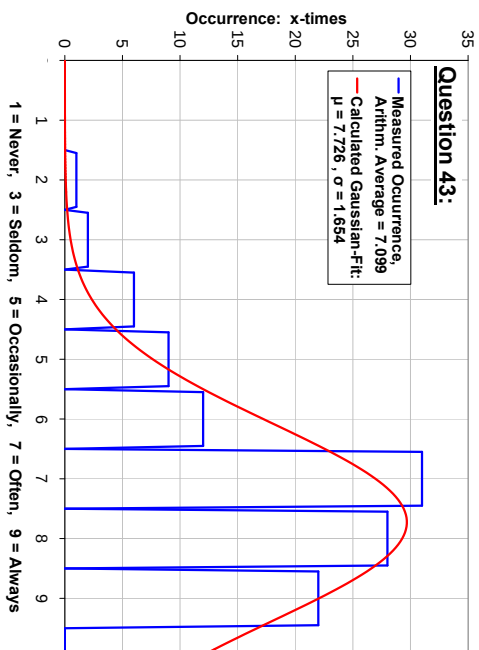
Question 40: Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.



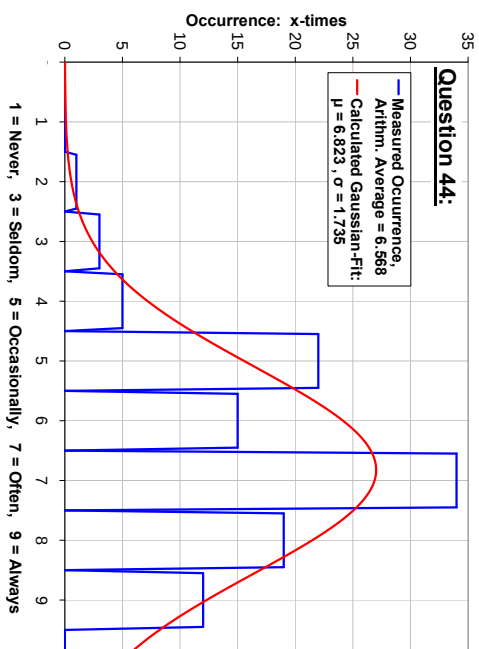
(a) Research Environment: Question 41.



(b) Research Environment: Question 42.



(c) Research Environment: Question 43.



(d) Research Environment: Question 44.

Figure C.11: *Question 41: When things go wrong, the main concern is to fix it, not to lay blame.*

Question 42: Is capable of juggling multiple demands.

Question 43: Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.

Question 44: Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).

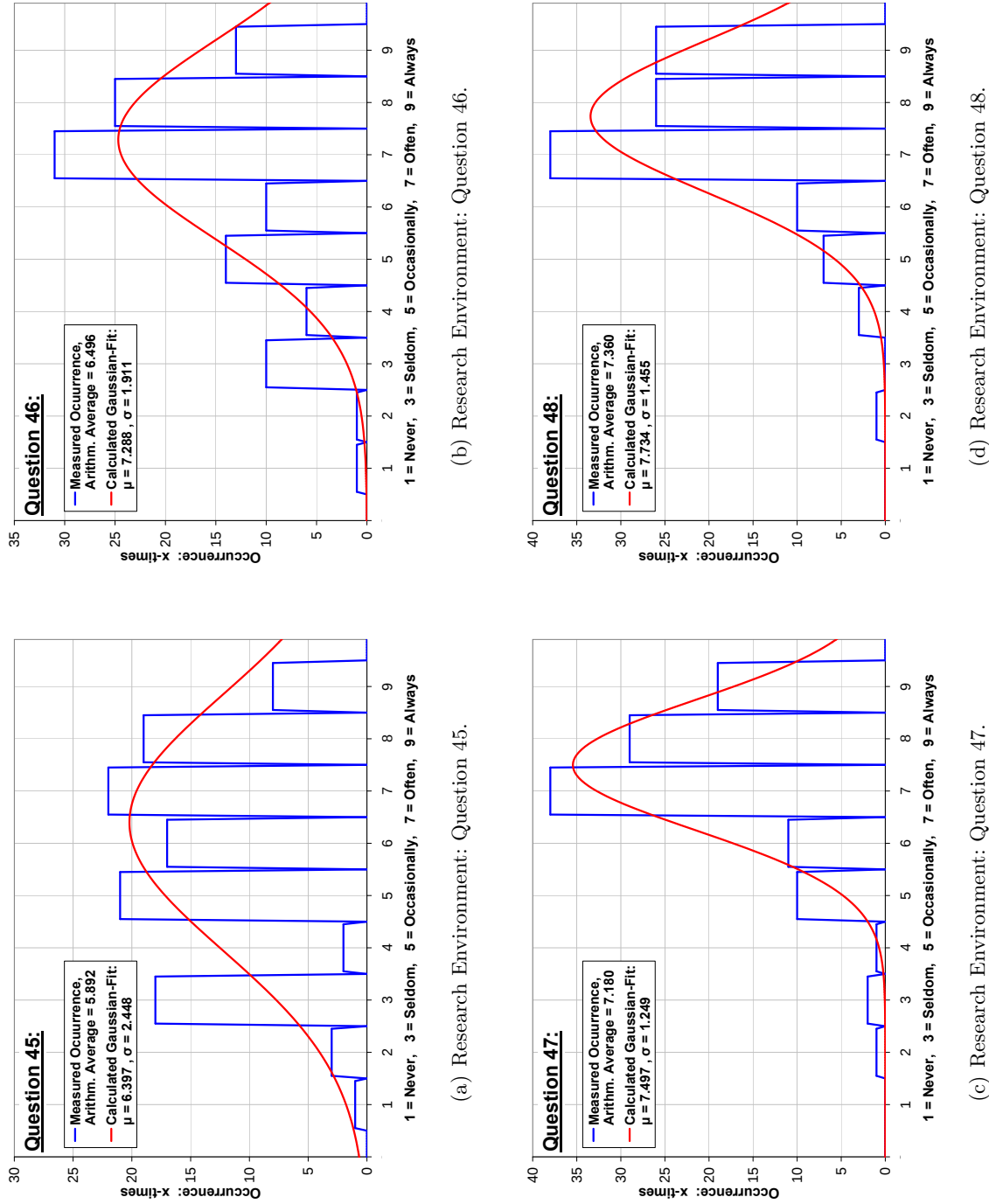


Figure C.12: *Question 45: Likes to share her/his leadership power with subordinates.*
Question 46: There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.
Question 47: The team members feel a real responsibility to make things work.
Question 48: Acknowledges others for their contributions and celebrates in their successes.

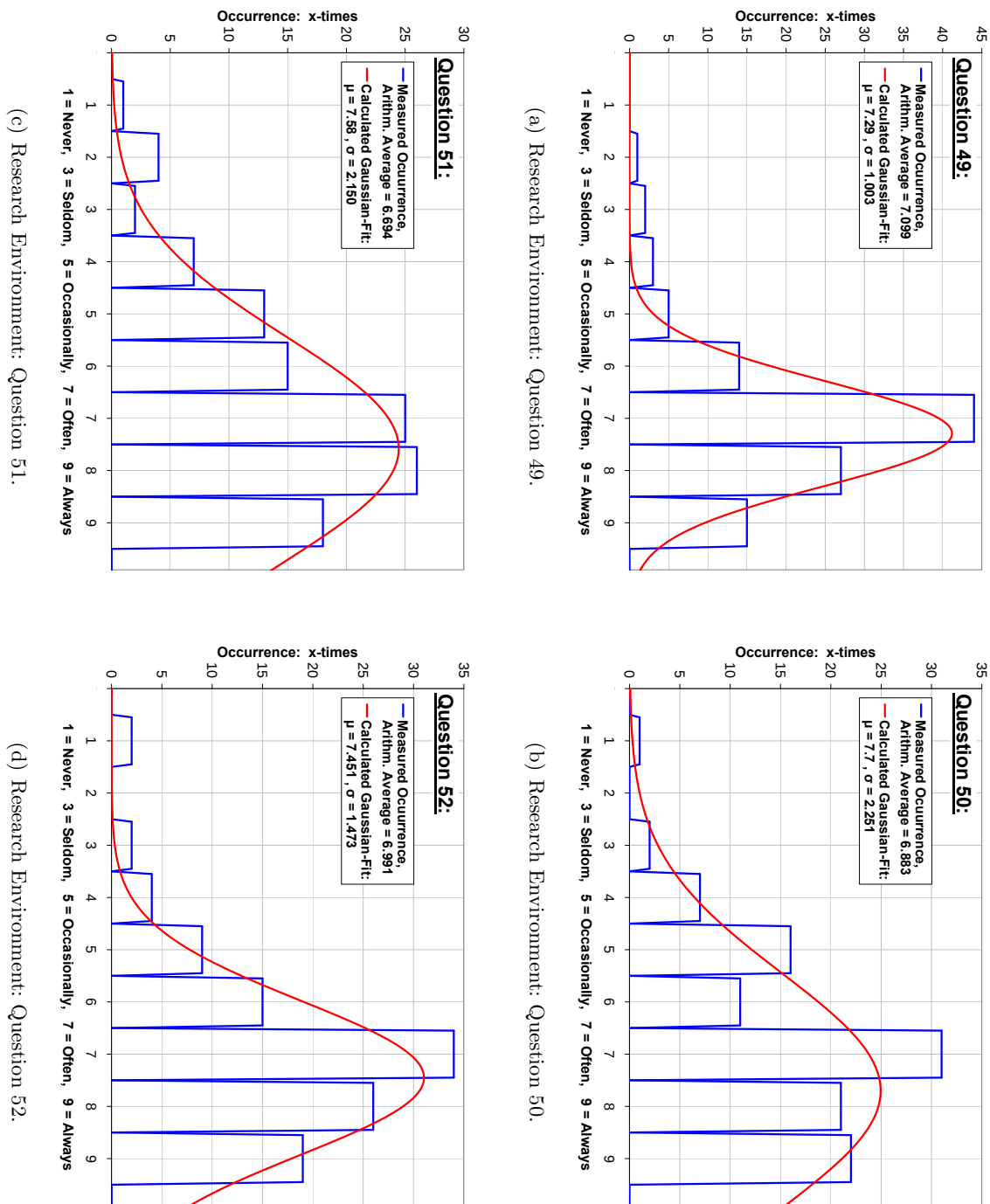


Figure C.13: Question 49: Recognizes the potential of her/his team members.

Question 50: Pays attention to team's performance. Supports and gives feedback.

Question 51: Likes to use her/his leadership power to help subordinates grow.

Question 52: Develops others by explaining or demonstrating relevant skills.

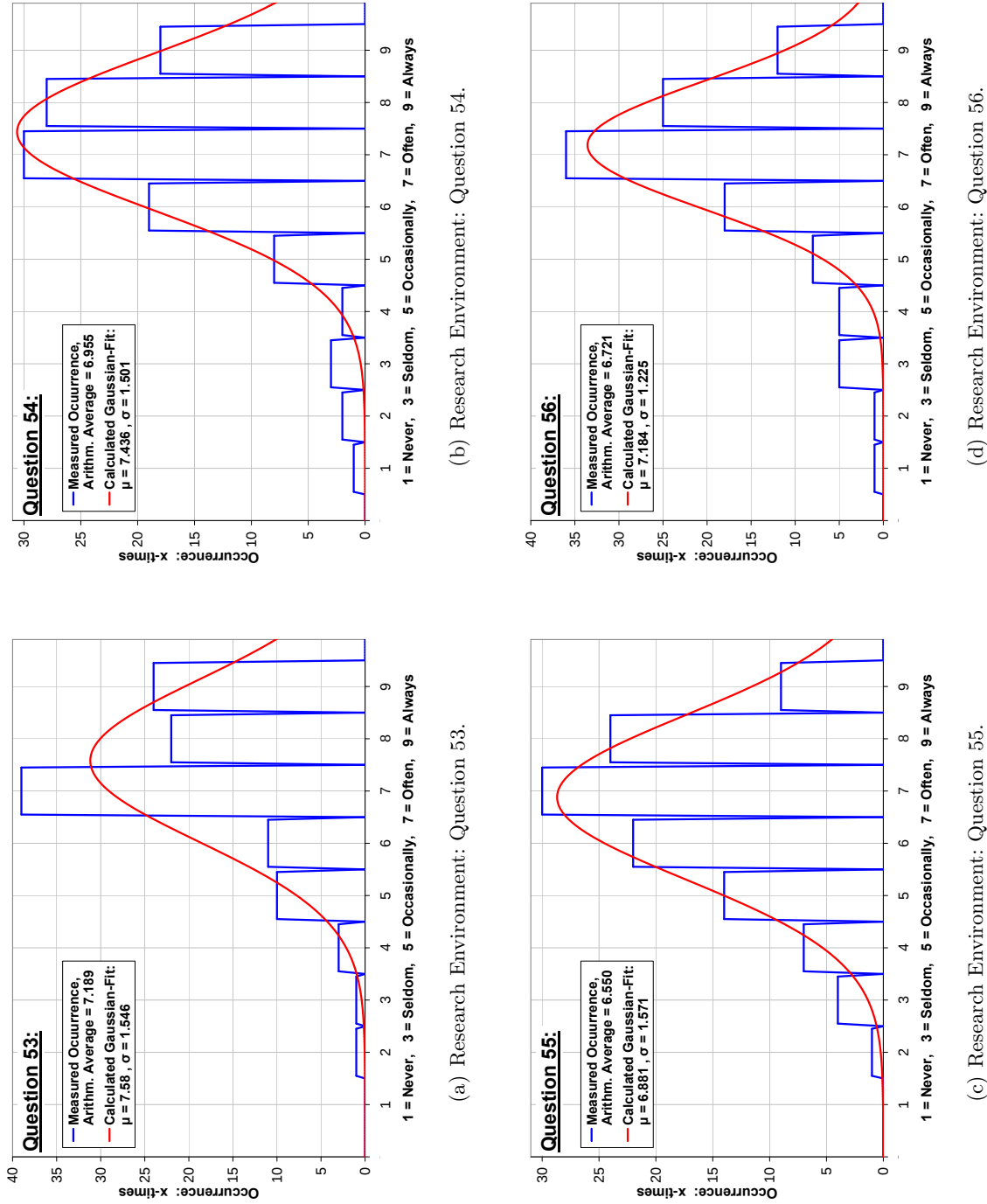


Figure C.14: *Question 53: Encourages team members to solve problems on their own.*

Question 54: Helps the team to focus on goals and objectives.

Question 55: Gets team members to look at problems from many different angles.

Question 56: Identifies causes of resistance and finds ways to overcome them.

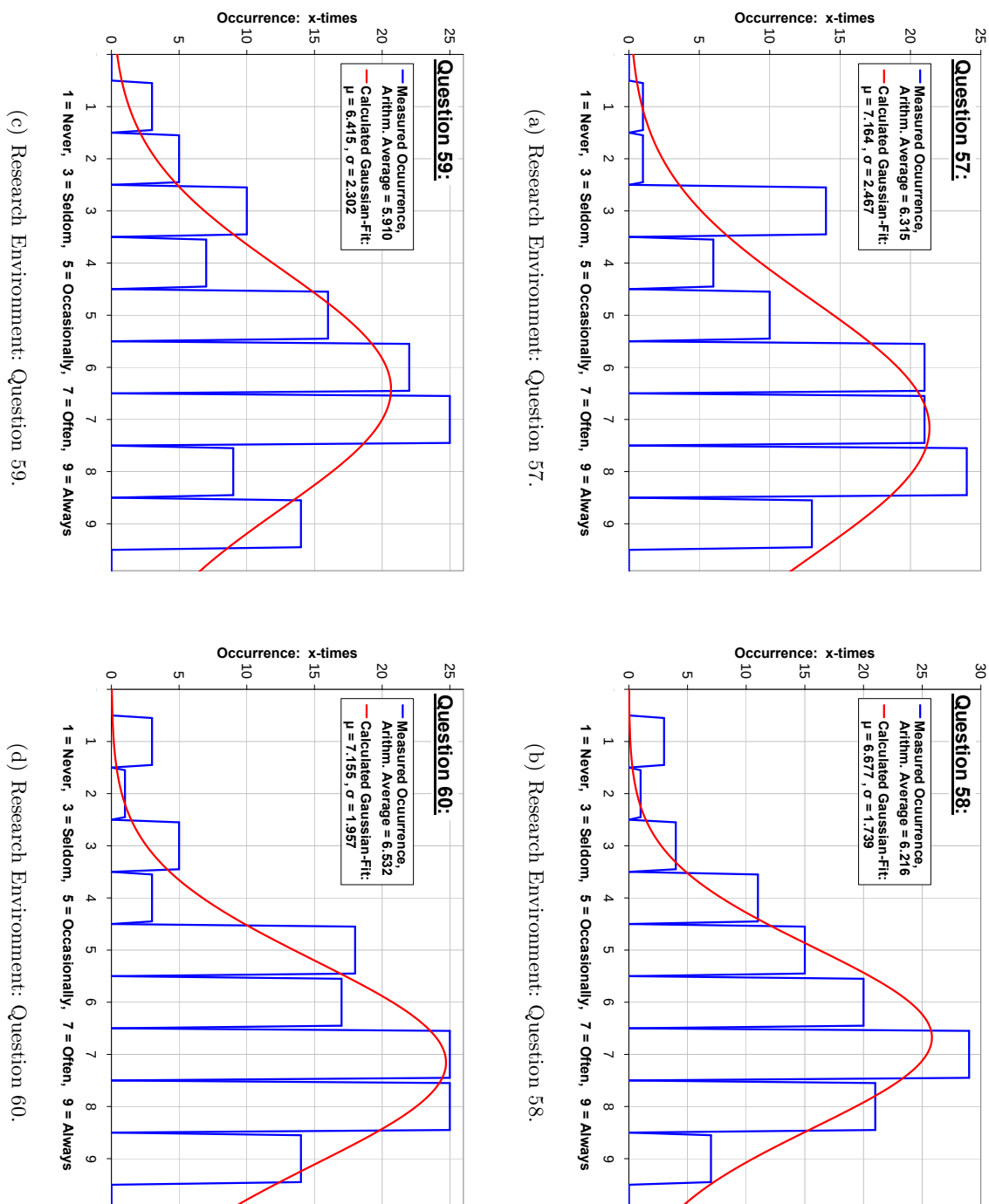


Figure C.15: Question 57: Spends time effectively teaching or mentoring team members.

Question 58: Explains how the team fits into the project or company objectives.

Question 59: Explains the purpose of the company's policies to the team.

Question 60: Explains rules and expectations.

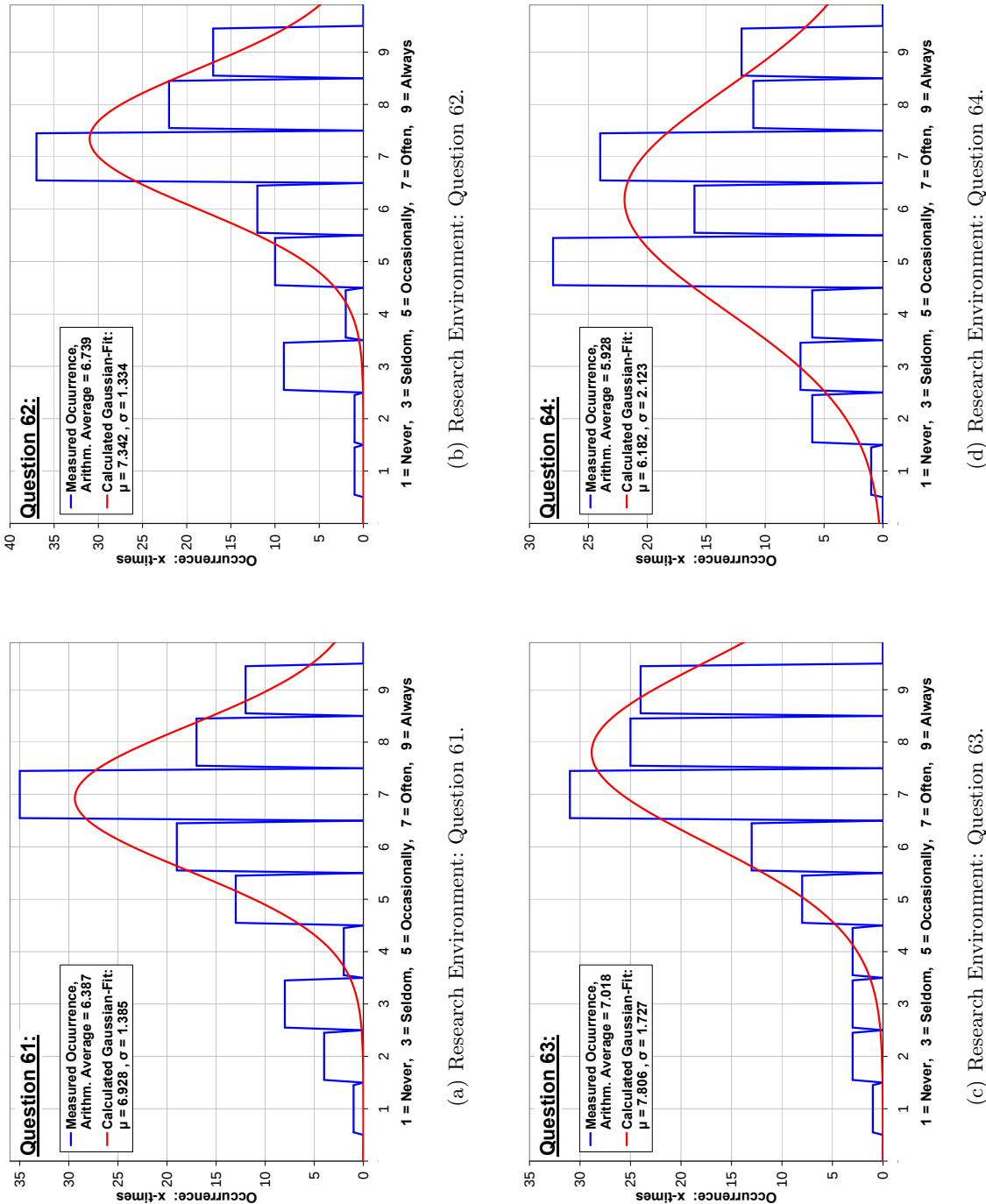
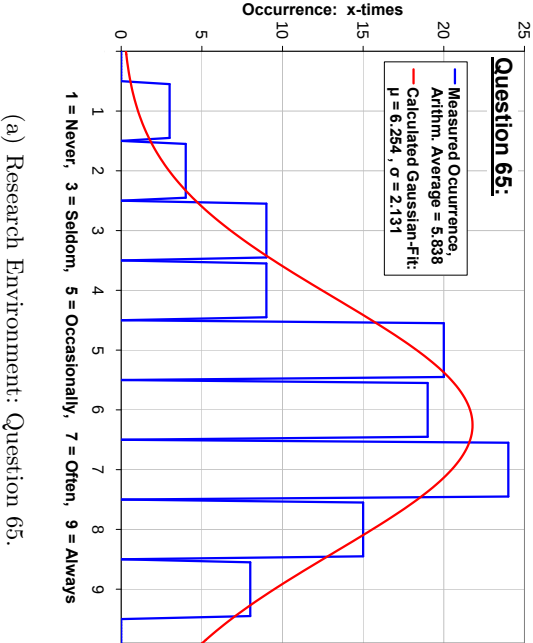


Figure C.16: *Question 61: Explains (personal and company) decisions, actions, and goals.*
Question 62: Openly shares information with others.
Question 63: Deals with issues in a straightforward manner.
Question 64: Able to calm others in stressful situations.

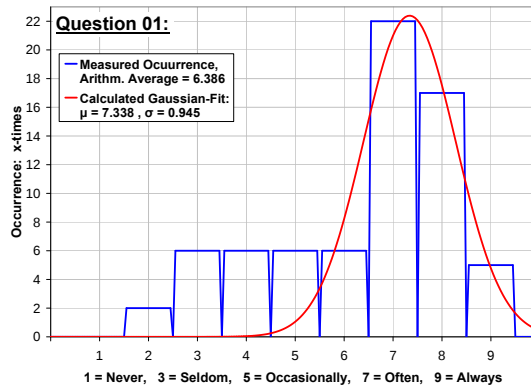


(a) Research Environment: Question 65.

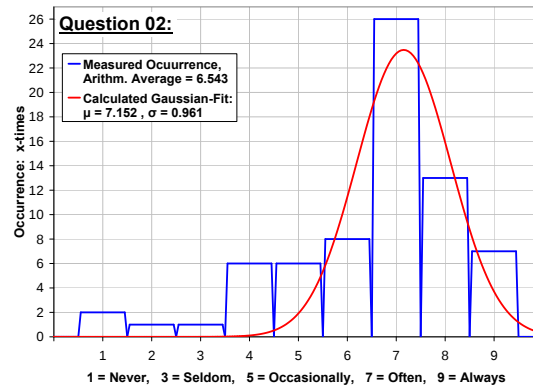
Figure C.17: Question 65: Handles difficult people and situations effectively.

C.2 Self-Appraisal & Supervisor

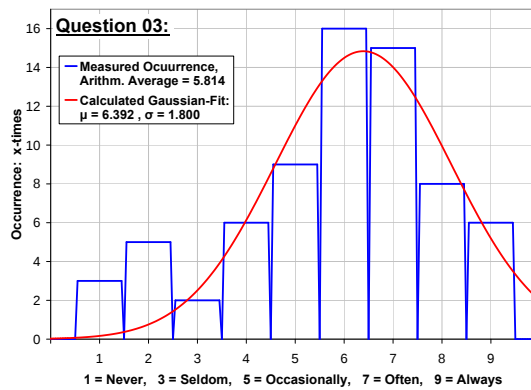
The Self-Appraisal & Supervisor group contains all data collected by the questionnaires, except for the Candidate category. The obtained occurrence values for the self-appraisal (“yourself”) and the supervisor (or team-leader) were summed up for each question and performance category and visually presented in the following graphs. The Candidate category focuses always on the same person and therefore might bias the global result. Therefore, the Candidate category was left out in this analysis and the Self-Appraisal and Supervisor categories alone were used to give a picture of the research laboratory environment.



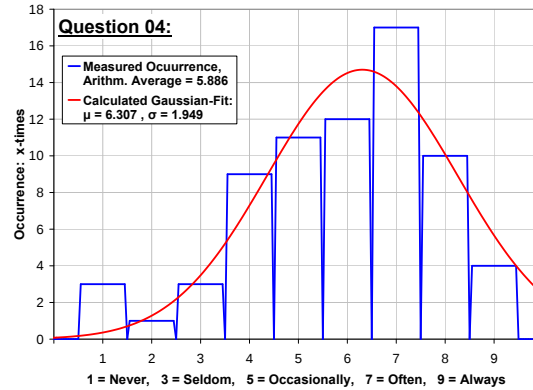
(a) Self-Appraisal & Supervisor: Question 01.



(b) Self-Appraisal & Supervisor: Question 02.



(c) Self-Appraisal & Supervisor: Question 03.



(d) Self-Appraisal & Supervisor: Question 04.

Figure C.18: Question 01: Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).

Question 02: Makes suggestions about how to solve problems and sets standards of performance for group members.

Question 03: Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.

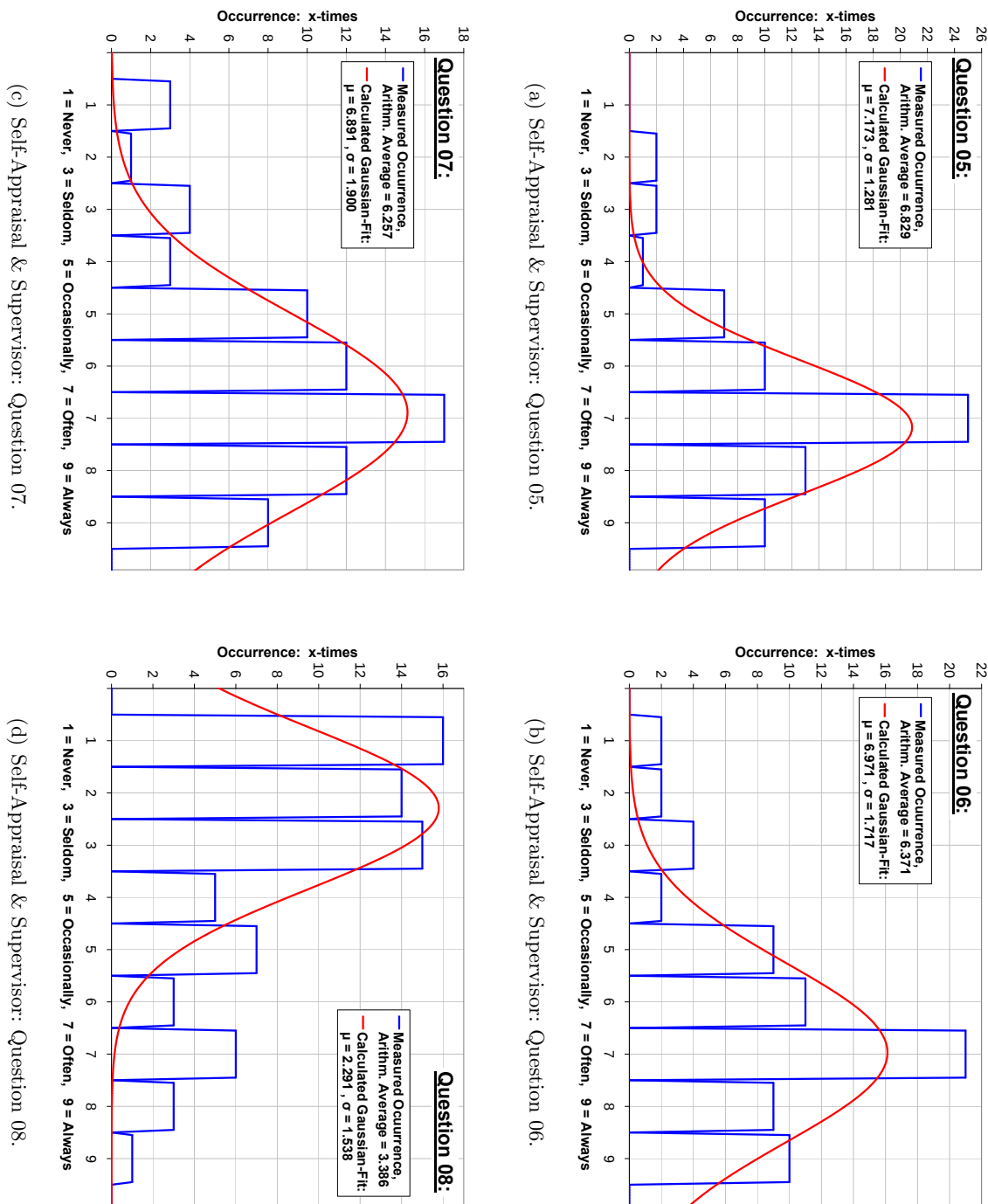
Question 04: Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.

Figure C.19: Question 05: Recognizes what needs to be done and takes the initiative to make it happen.

Question 06: Prioritizes key objectives and focuses the groups activity on them.

Question 07: Effectively allocates available resources, e.g., time, people, money.

Question 08: Gives vague or misleading explanations to team members.



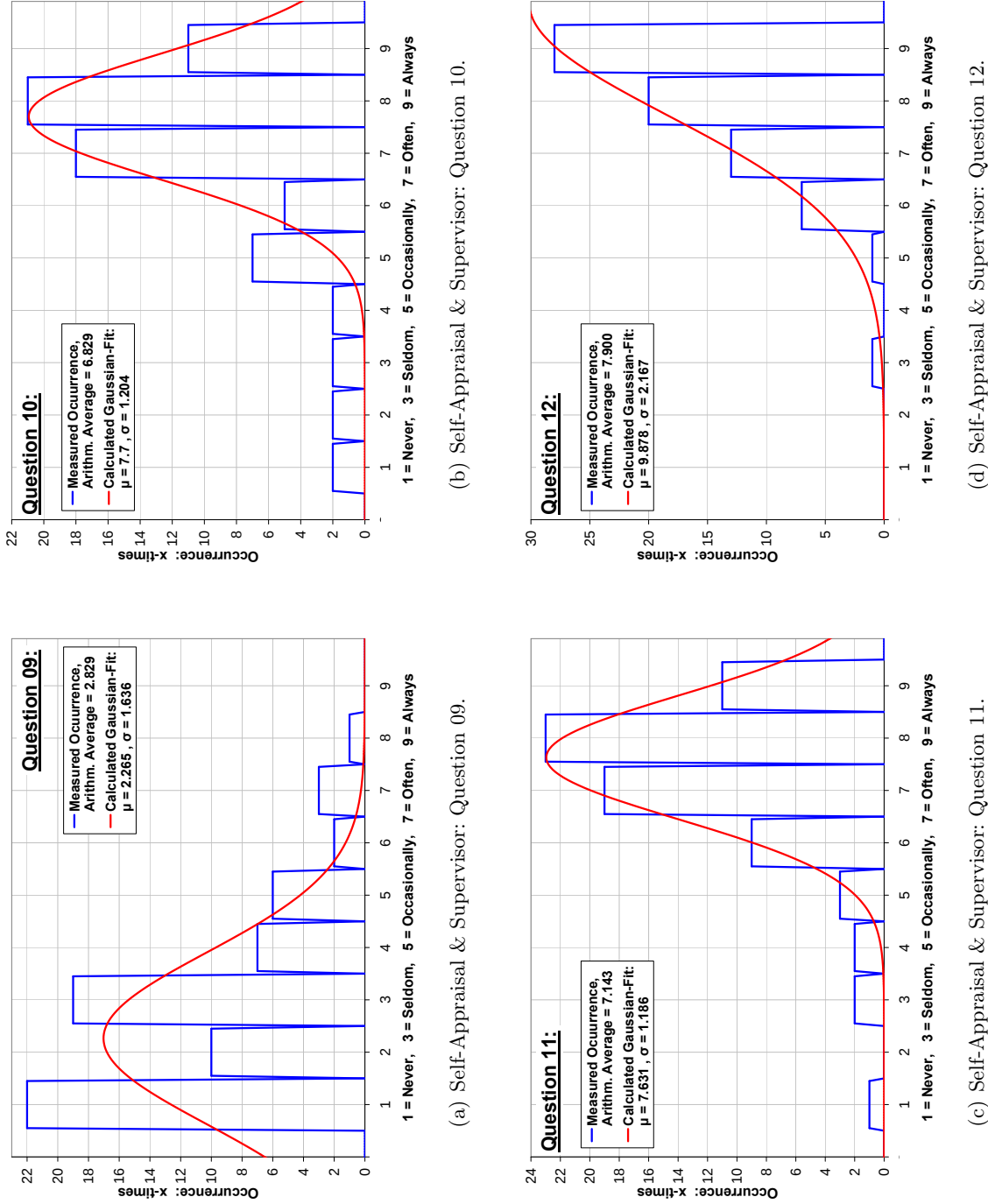


Figure C.20: Question 09: Makes NO suggestions (because she/he has no clue at all).

Question 10: Enjoys getting into the details of how things work.

Question 11: Is good at making things work and completing the assigned tasks.

Question 12: Knows and understands how to do basic things.

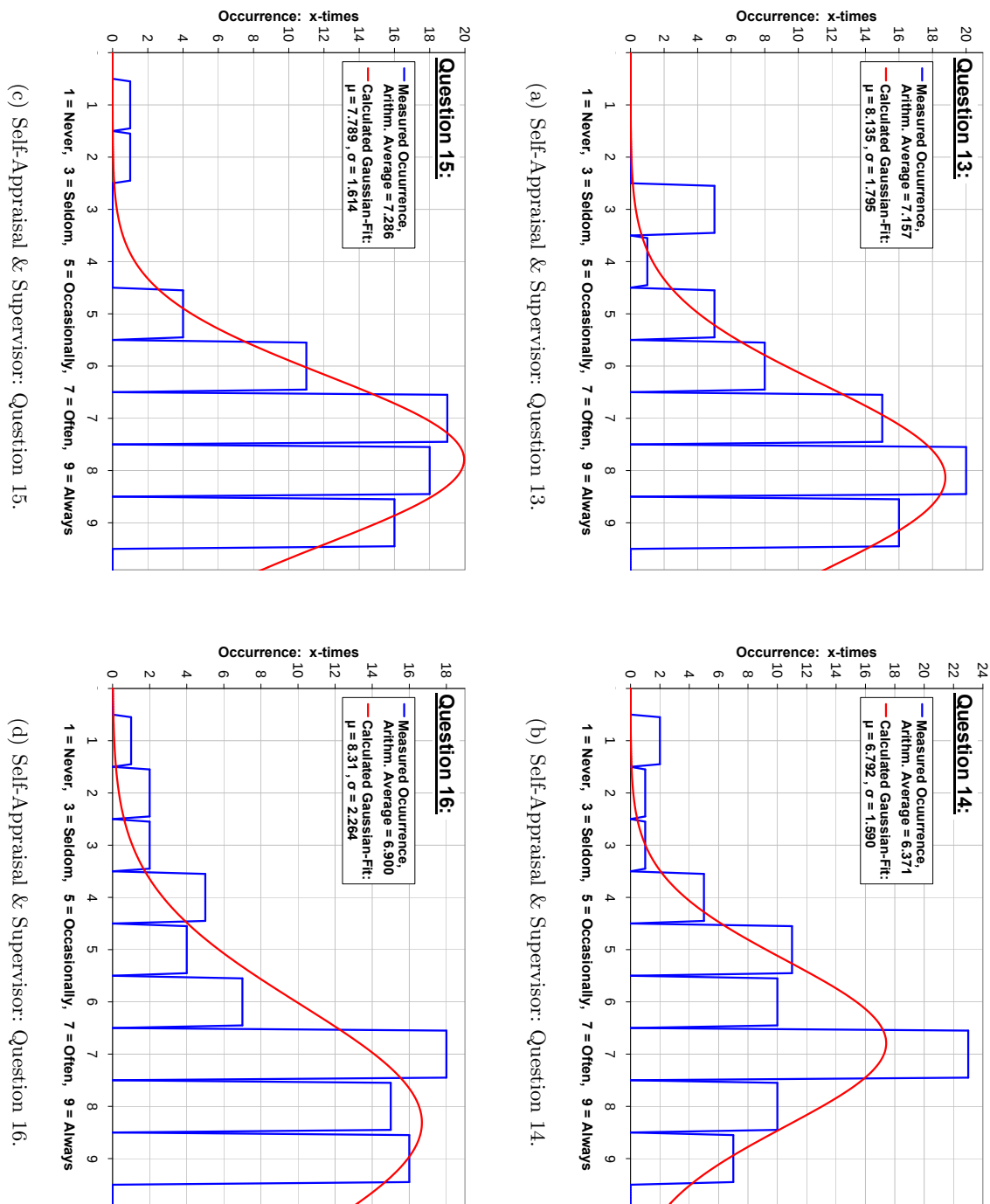


Figure C.21: Question 13: Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.

Question 14: Knows (exactly and in detail) what work is being done in the team.

Question 15: Treats people as equals, fairly and consistently (behaves predictably).

Question 16: Communicates actively (i.e., starts conversations) with team members.

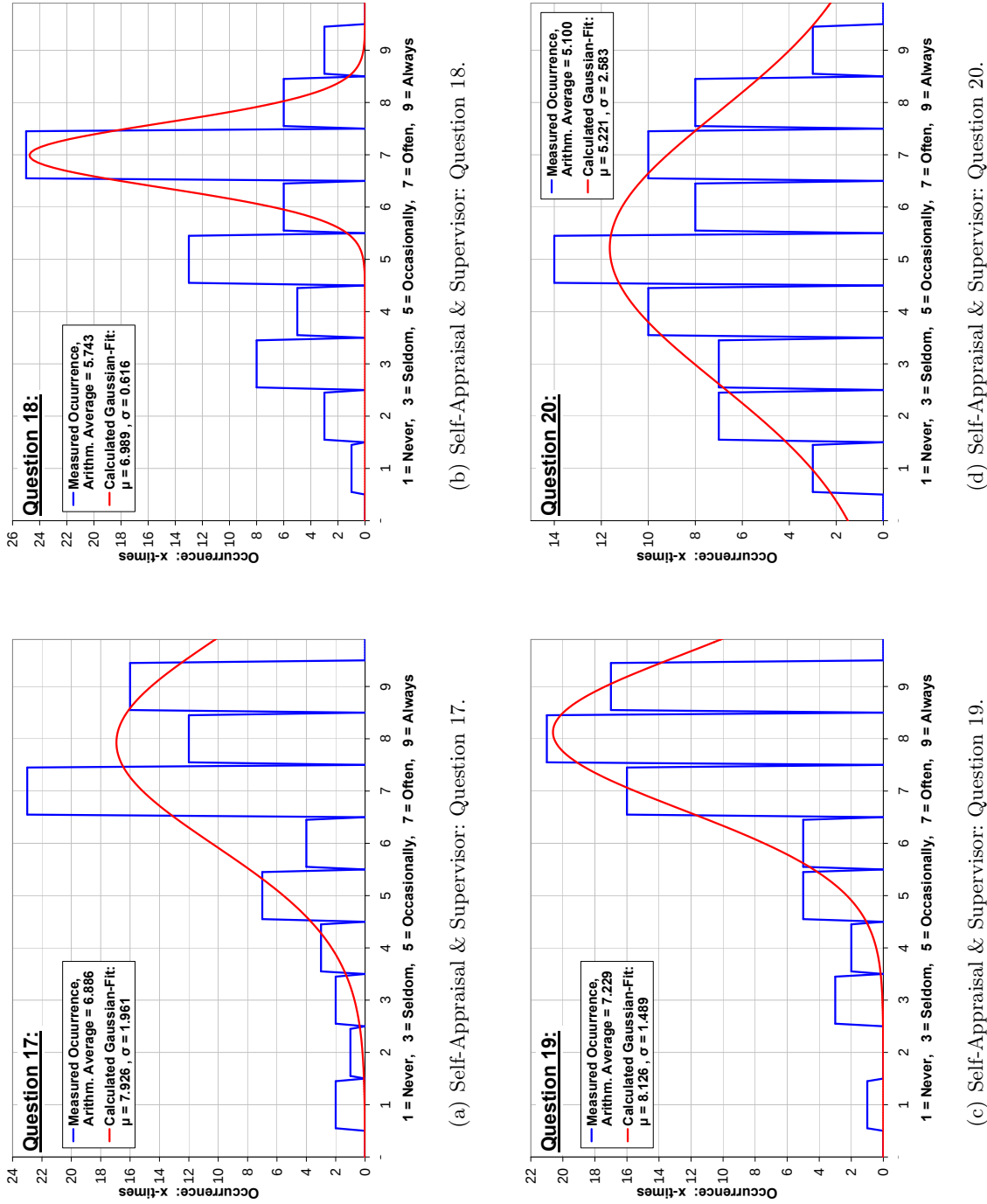


Figure C.22: Question 17: Acknowledges her/his own mistakes and takes corrective action.

Question 18: Discloses thoughts and feelings to group members.

Question 19: Gives team members honest and fair answers.

Question 20: Does not worry about jeopardizing relationships when correcting mistakes.

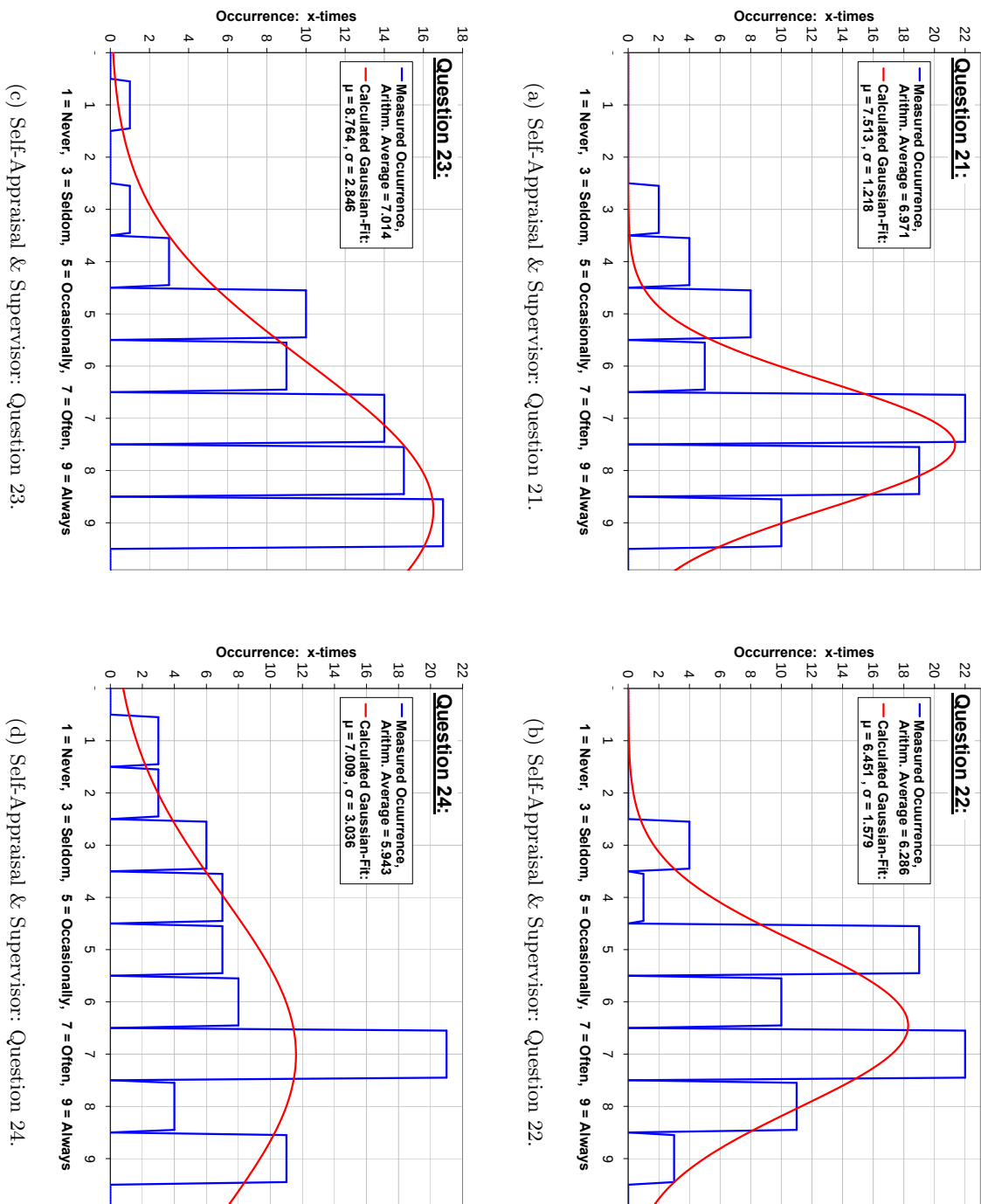


Figure C.23: Question 21: Honors other people's (personal) boundaries.

Question 22: Regularly achieves "win-win" outcomes.

Question 23: Identifies and promotes opportunities for collaboration.

Question 24: Is concerned with how her/his decisions affect the lives of others.

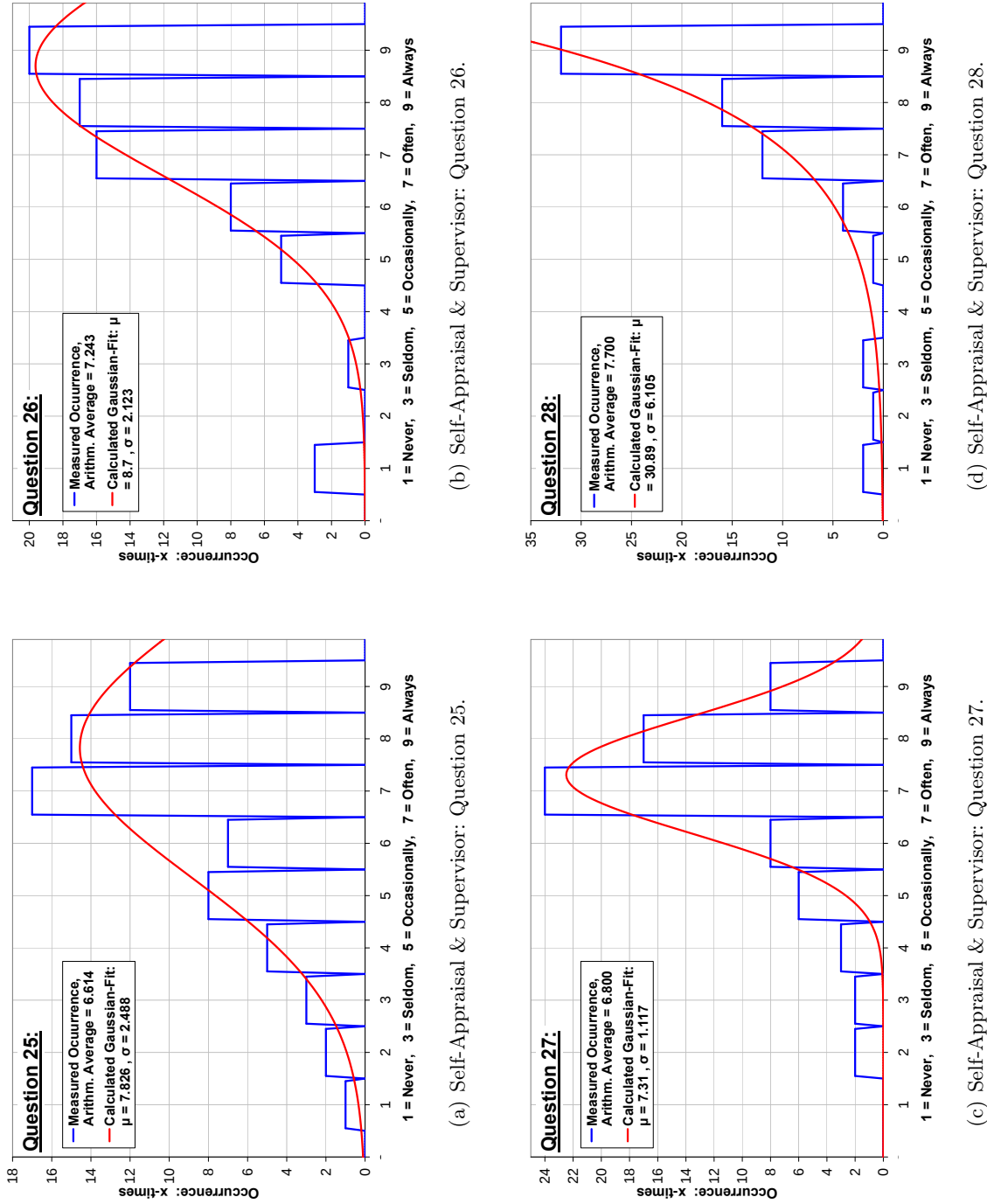


Figure C.24: *Question 25: Sets high and clear standards for others by her/his own behavior.*
Question 26: Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.
Question 27: Models positive team attributes such as mutual respect, open communication, and full participation.
Question 28: Has high moral standards. Can be trusted with confidential information.

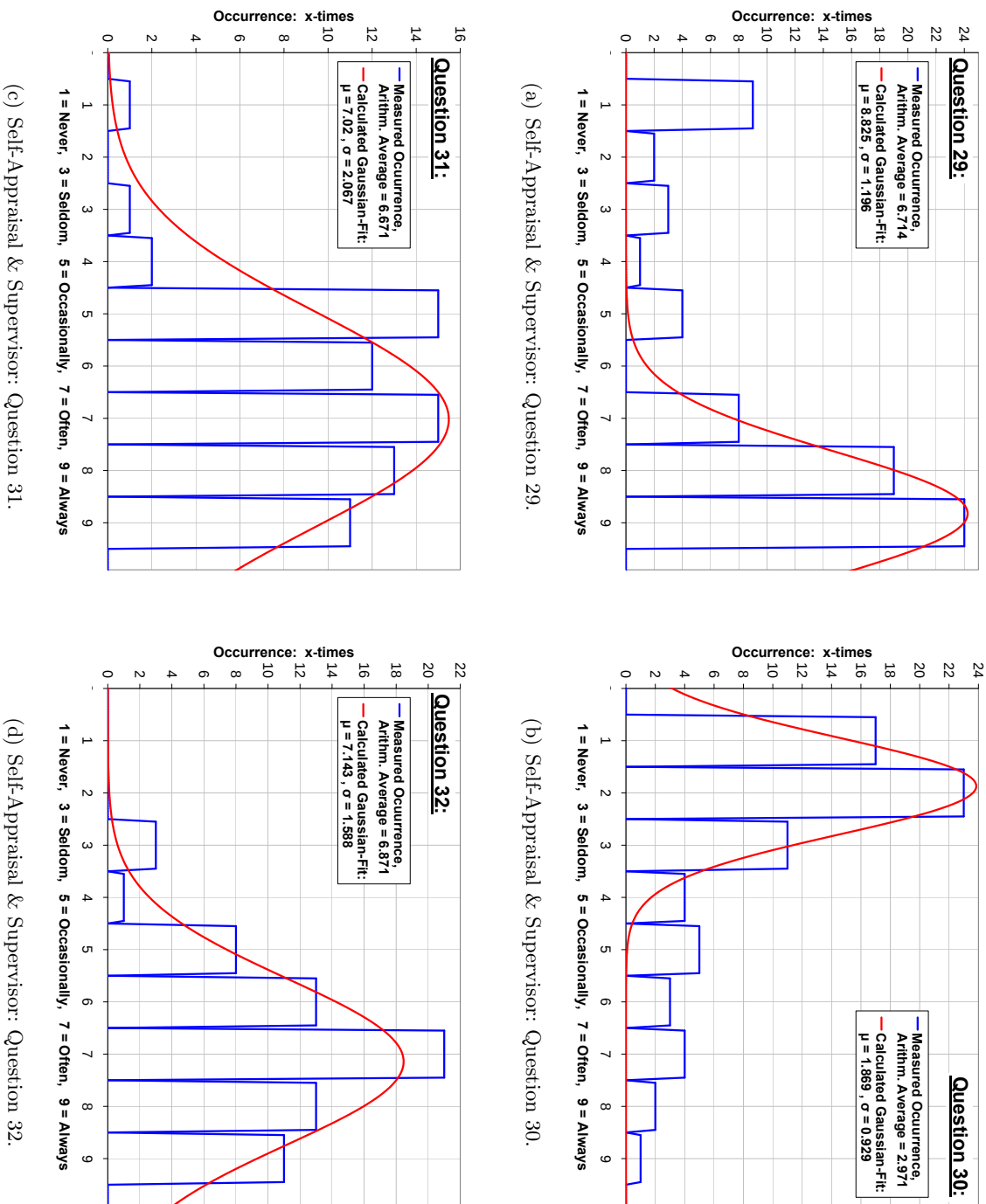
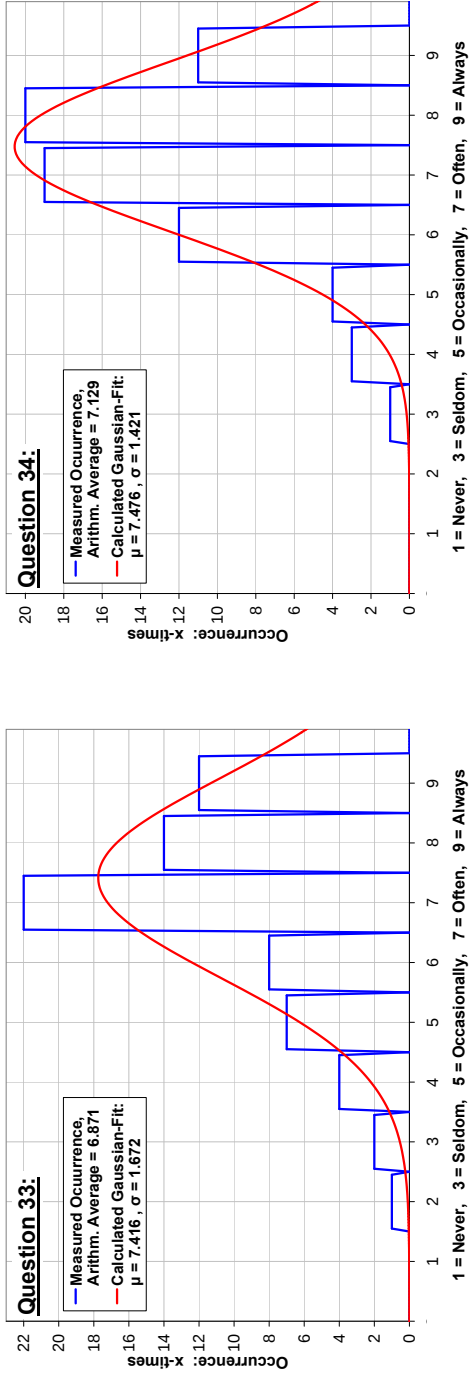


Figure C.25: Question 29: Would never try to take credit for other people's ideas.

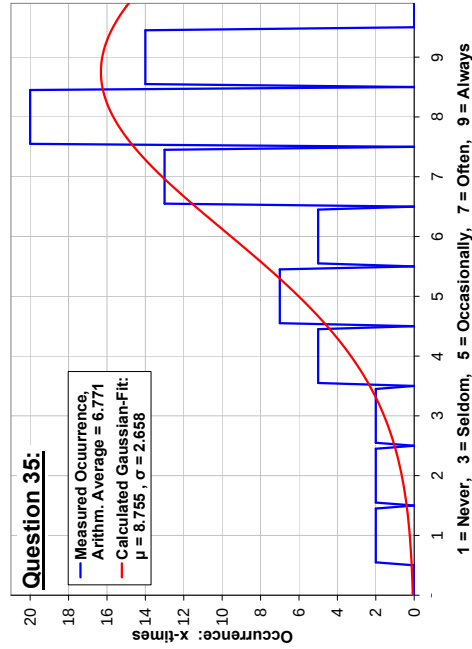
Question 30: Shows favoritism (in an unfair amount) towards some people.

Question 31: Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.

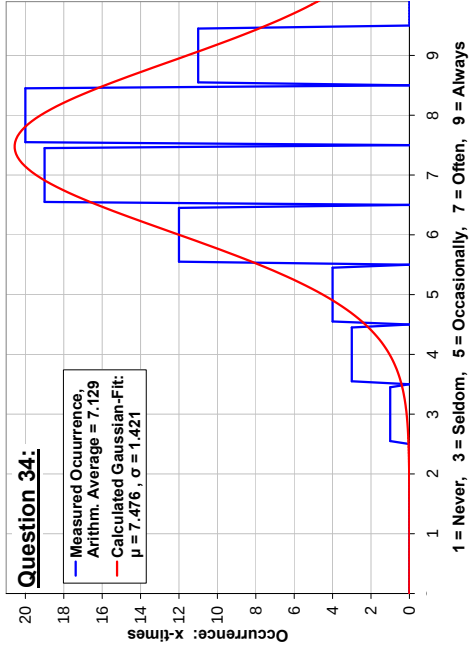
Question 32: Possesses awareness of her/his own strengths and weaknesses.



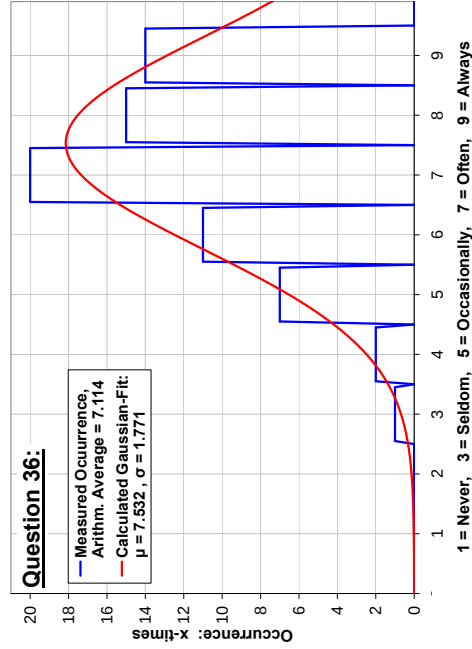
(a) Self-Appraisal & Supervisor: Question 33.



(c) Self-Appraisal & Supervisor: Question 35.

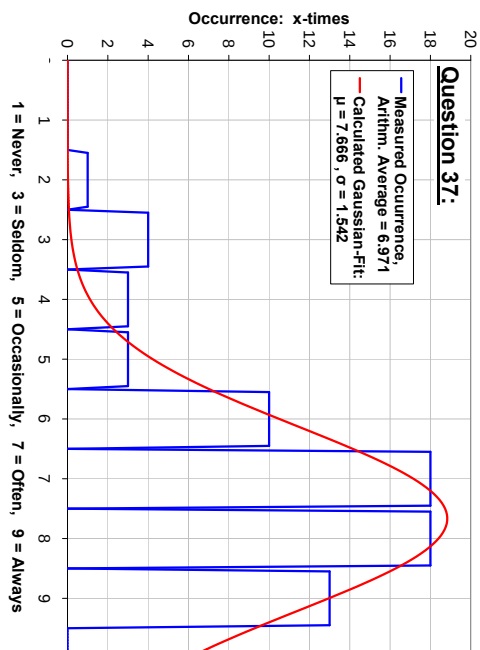


(b) Self-Appraisal & Supervisor: Question 34.

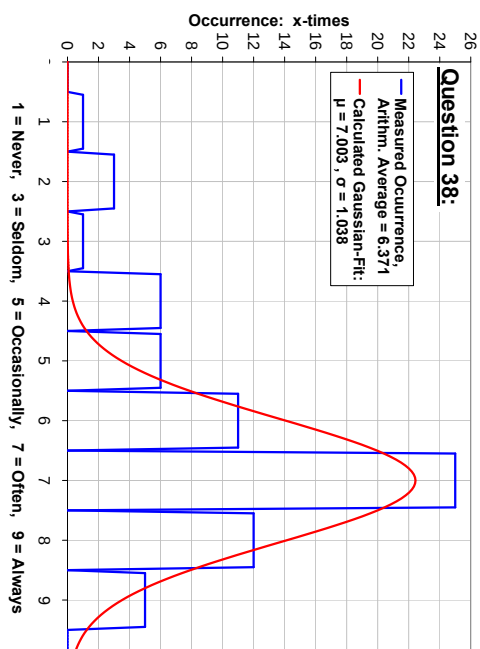


(d) Self-Appraisal & Supervisor: Question 36.

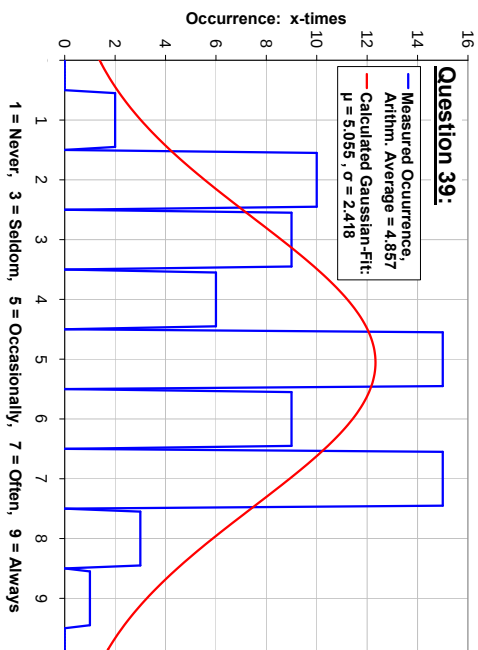
Figure C.26: Question 33: Is open to feedback from others. Encourages others to give feedback.*Question 34: Learns from own experiences and also those of others. Seeks opportunities for self-development.**Question 35: Speaks up even when her/his opinion is in the minority.**Question 36: Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.*



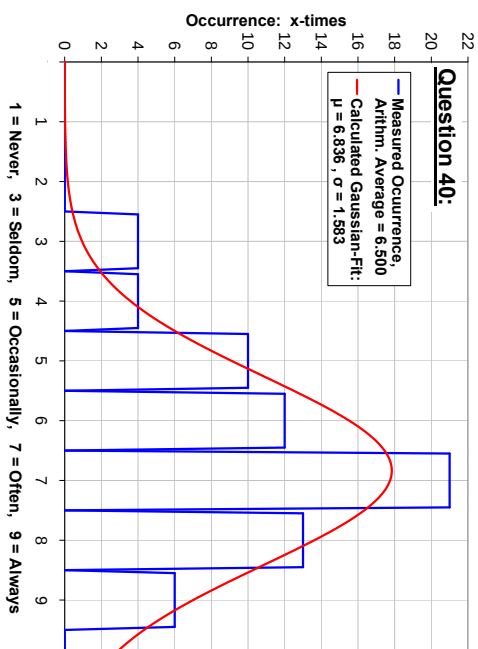
(a) Self-Appraisal & Supervisor: Question 37.



(b) Self-Appraisal & Supervisor: Question 38.



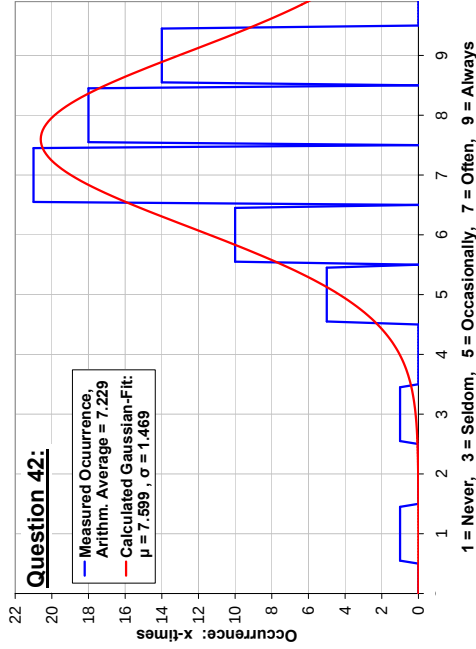
(c) Self-Appraisal & Supervisor: Question 39.



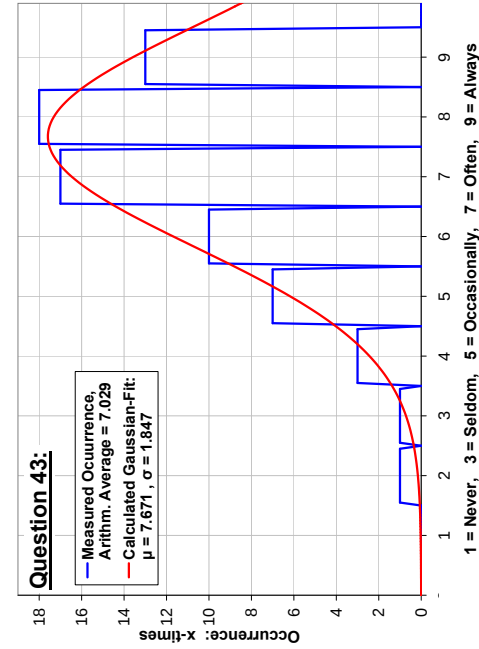
(d) Self-Appraisal & Supervisor: Question 40.

Figure C.27: *Question 37: Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.*
Question 38: Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.

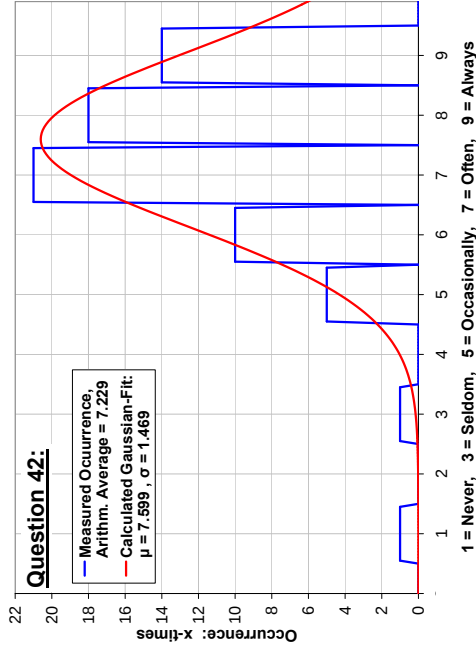
Question 39: Makes decisions that are based only on his/her own ideas.
Question 40: Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.



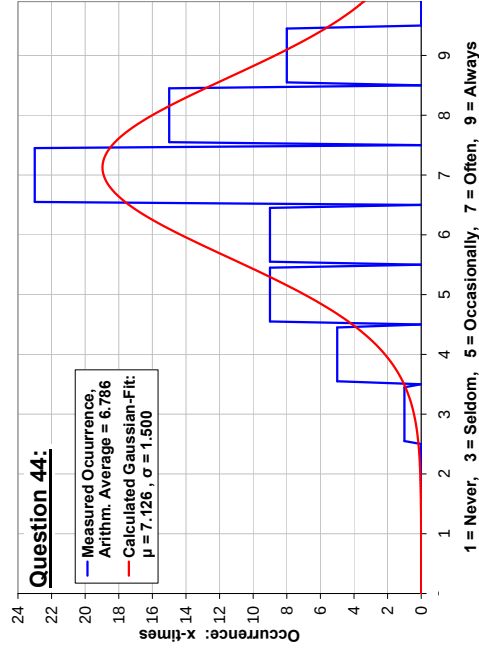
(a) Self-Appraisal & Supervisor: Question 41.



(c) Self-Appraisal & Supervisor: Question 43.



(b) Self-Appraisal & Supervisor: Question 42.



(d) Self-Appraisal & Supervisor: Question 44.

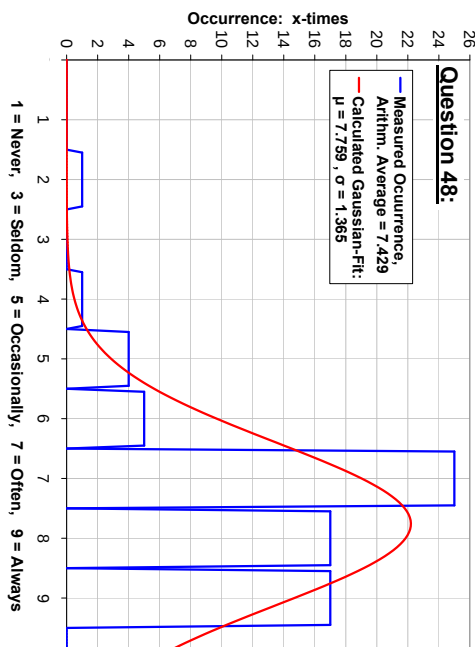
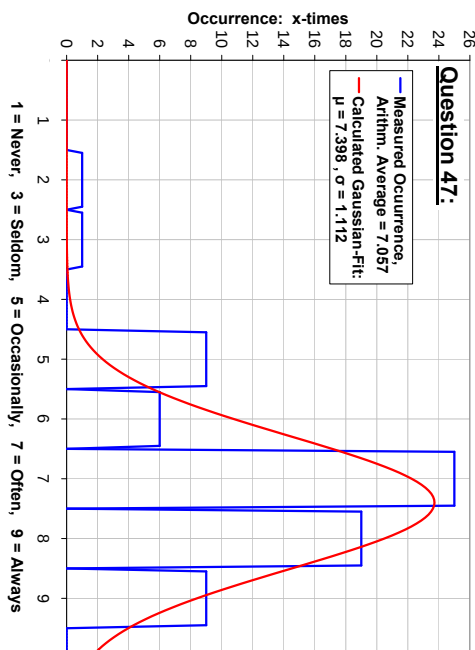
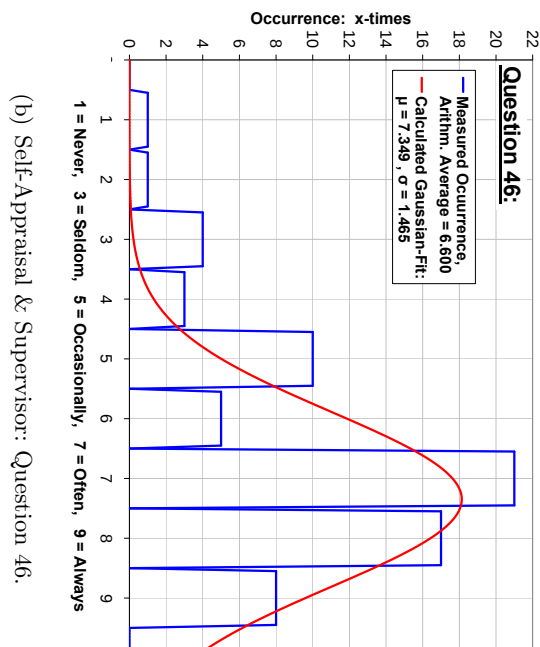
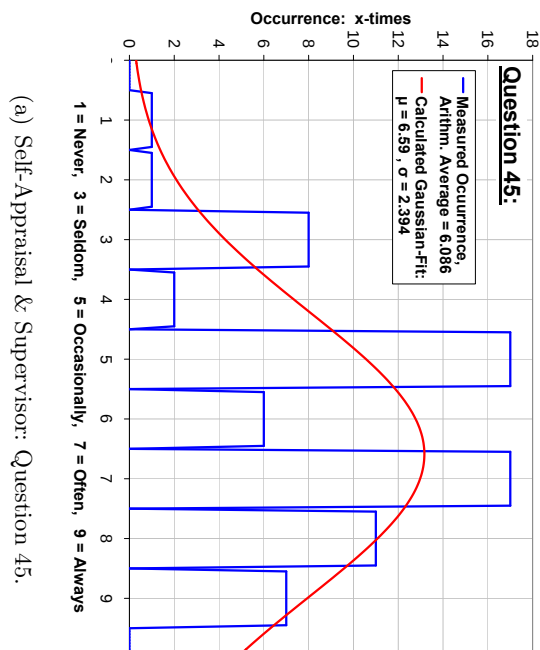
Figure C.28: *Question 41: When things go wrong, the main concern is to fix it, not to lay blame.**Question 42: Is capable of juggling multiple demands.**Question 43: Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.**Question 44: Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).*

Figure C.29: *Question 45: Likes to share her/his leadership power with subordinates.*

Question 46: There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.

Question 47: The team members feel a real responsibility to make things work.

Question 48: Acknowledges others for their contributions and celebrates in their successes.



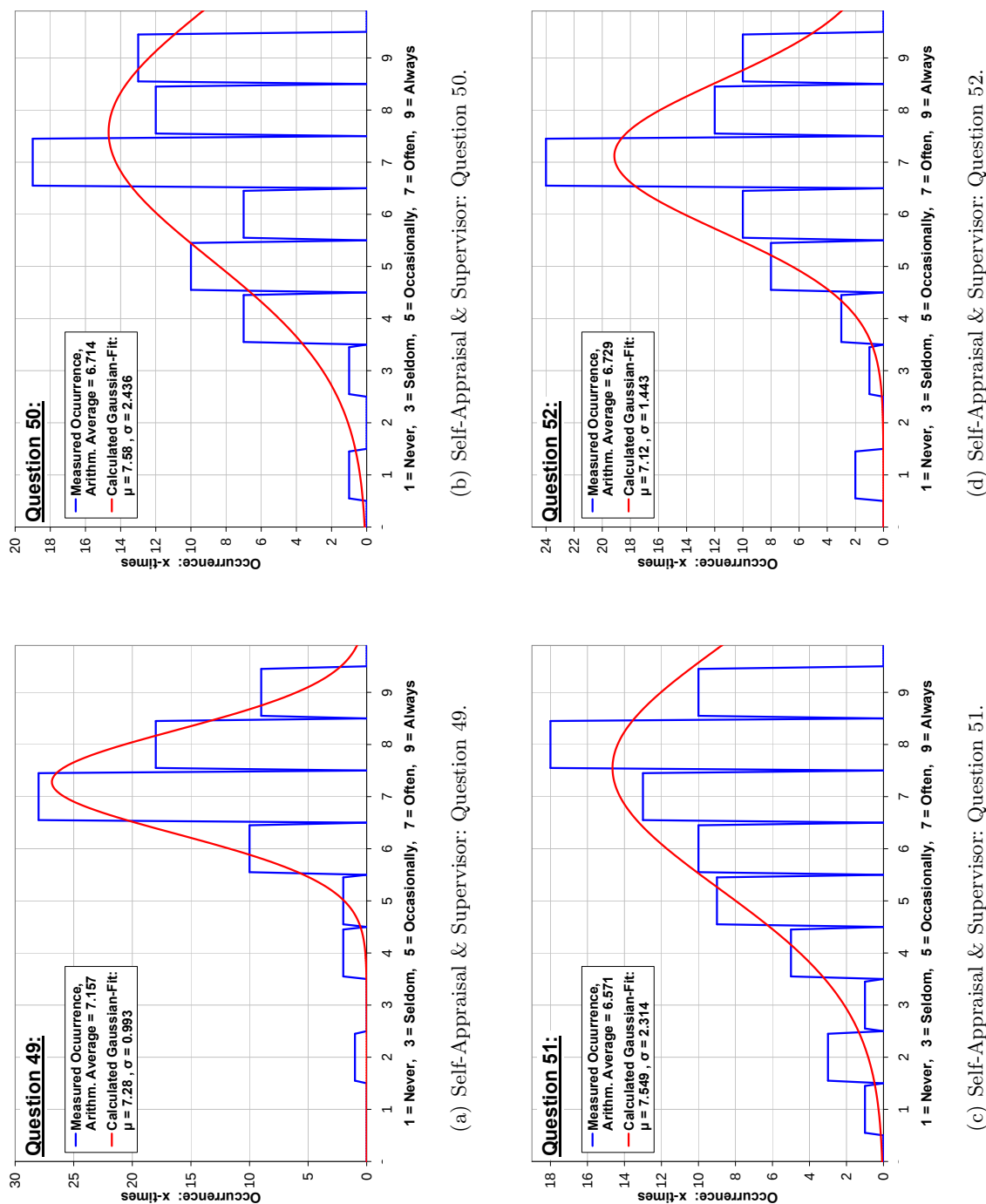


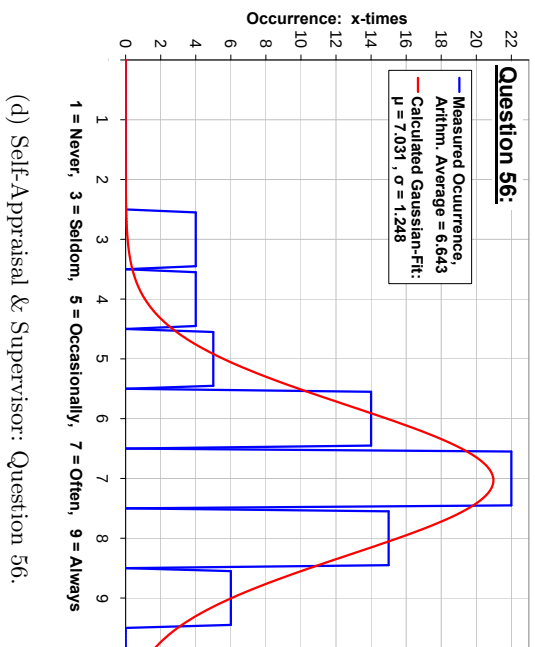
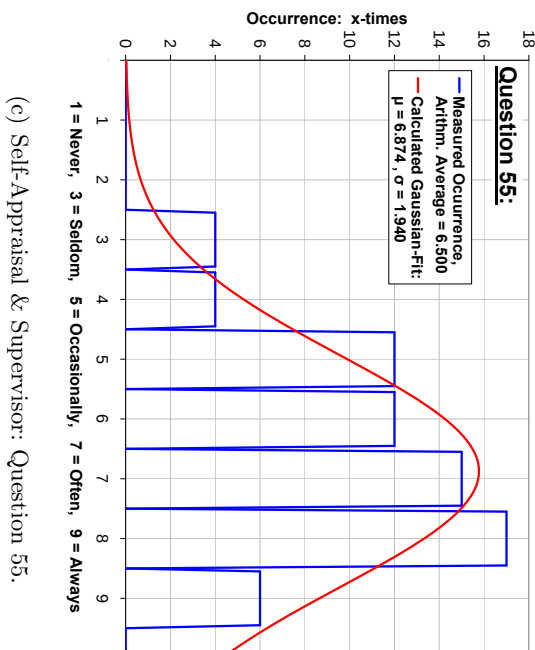
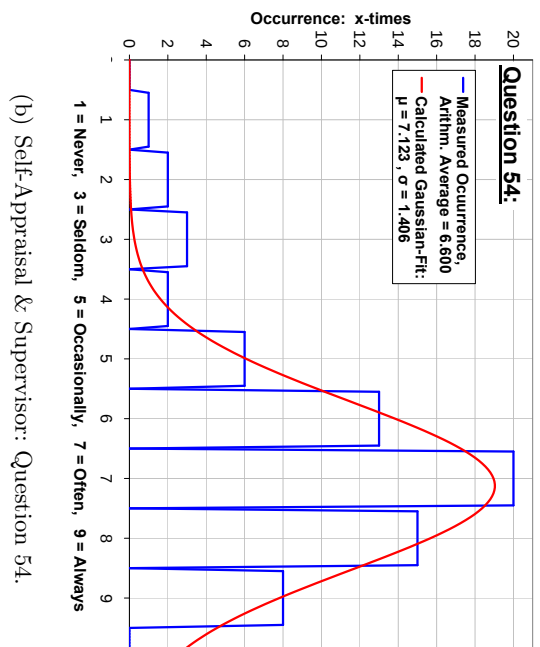
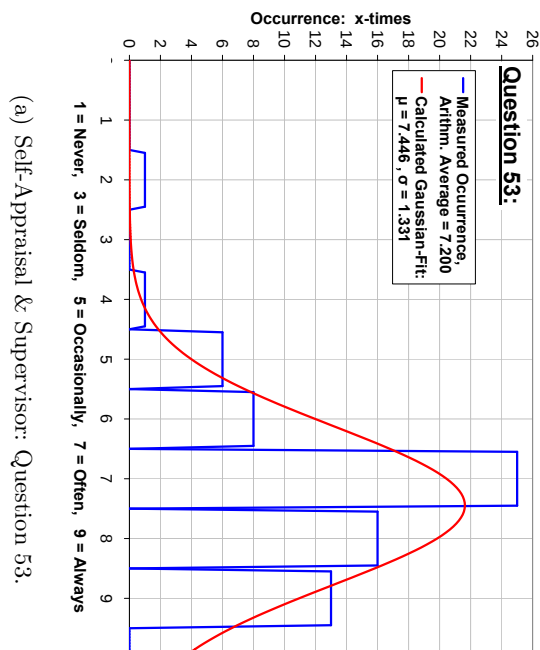
Figure C.30: *Question 49: Recognizes the potential of her/his team members.
Question 50: Pays attention to team's performance. Supports and gives feedback.
Question 51: Likes to use her/his leadership power to help subordinates grow.
Question 52: Develops others by explaining or demonstrating relevant skills.*

Figure C.31: Question 53: Encourages team members to solve problems on their own.

Question 54: Helps the team to focus on goals and objectives.

Question 55: Gets team members to look at problems from many different angles.

Question 56: Identifies causes of resistance and finds ways to overcome them.



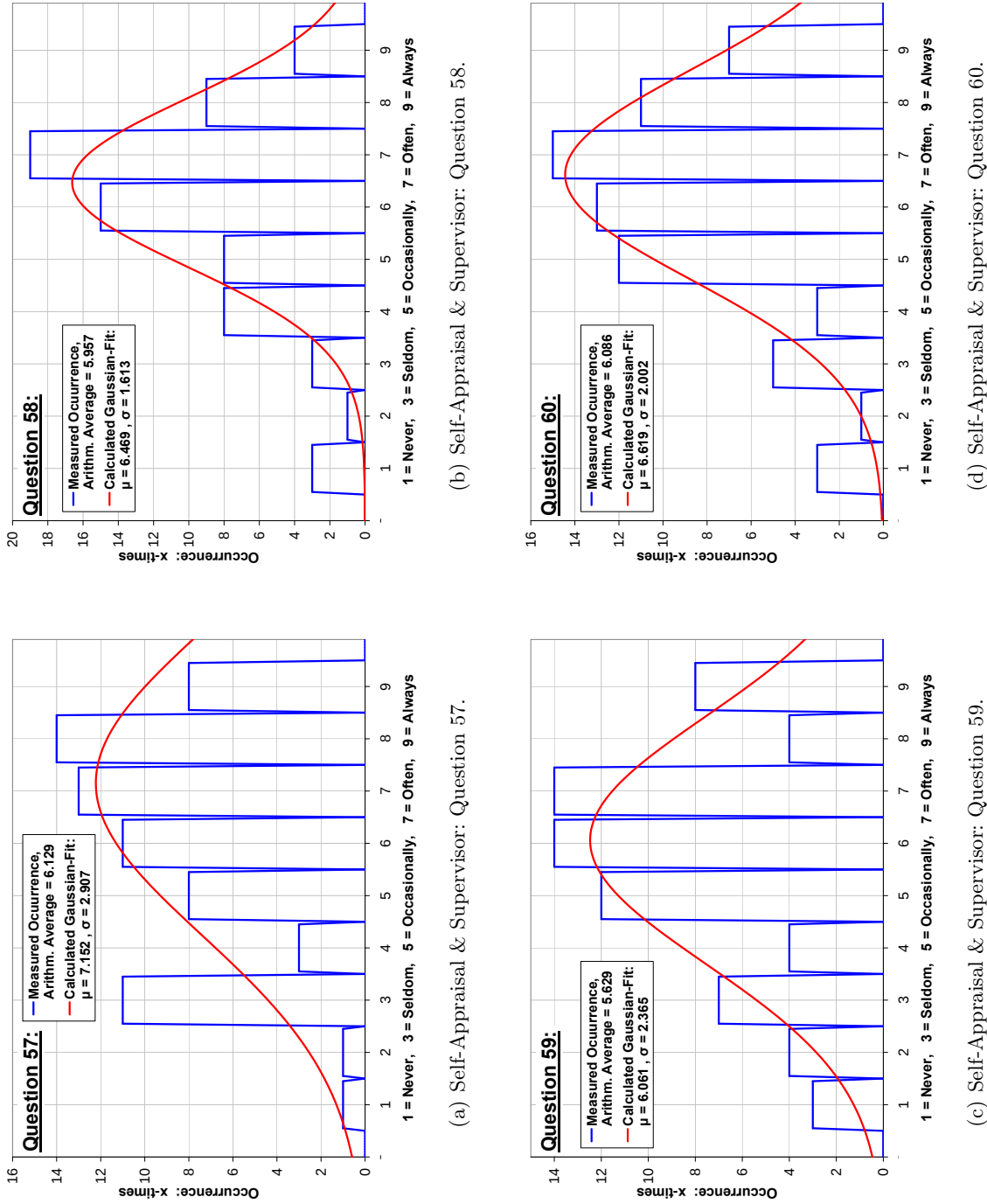


Figure C.32: *Question 57: Spends time effectively teaching or mentoring team members.*
Question 58: Explains how the team fits into the project or company objectives.
Question 59: Explains the purpose of the company's policies to the team.
Question 60: Explains rules and expectations.

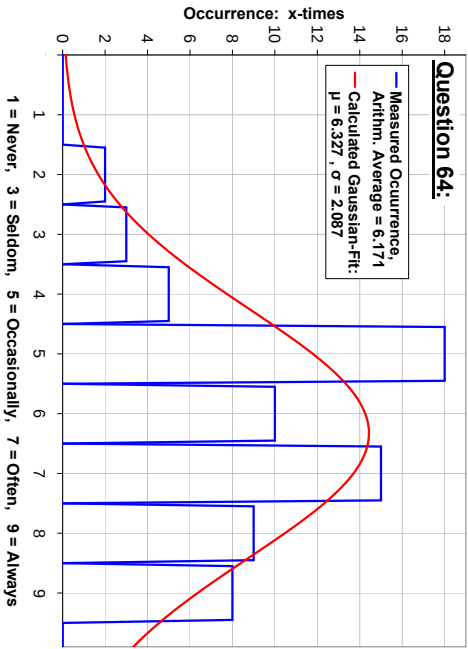
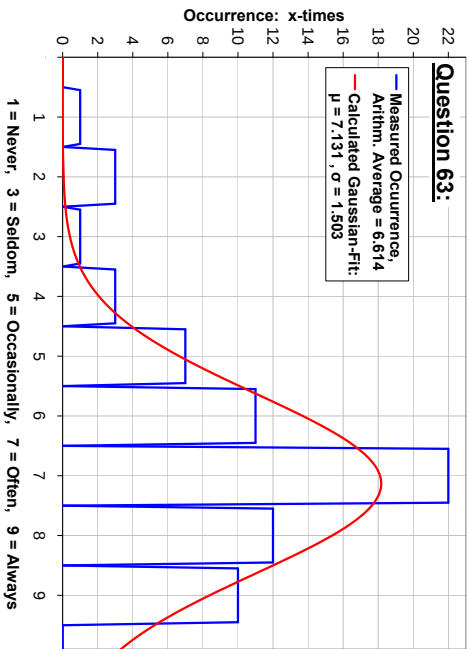
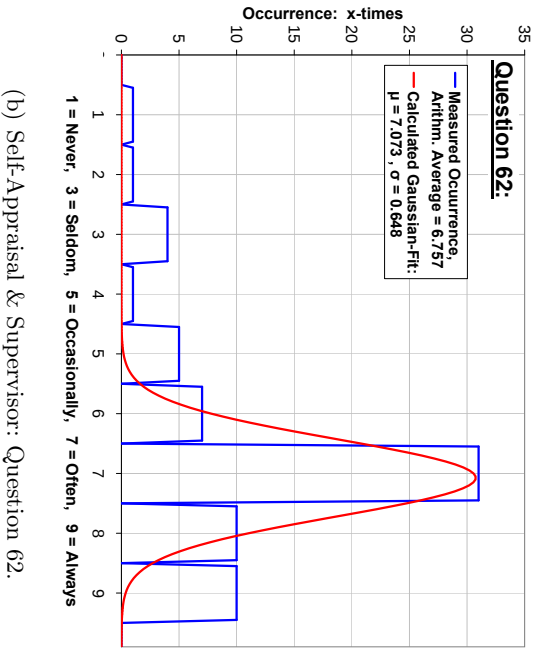
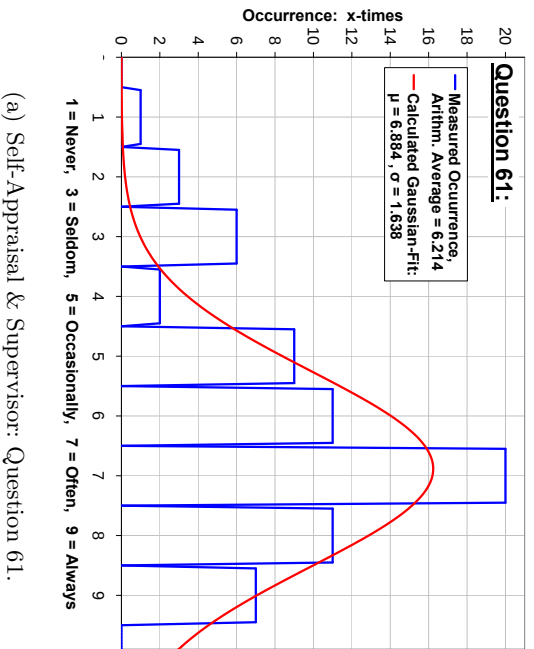
Figure C.33:

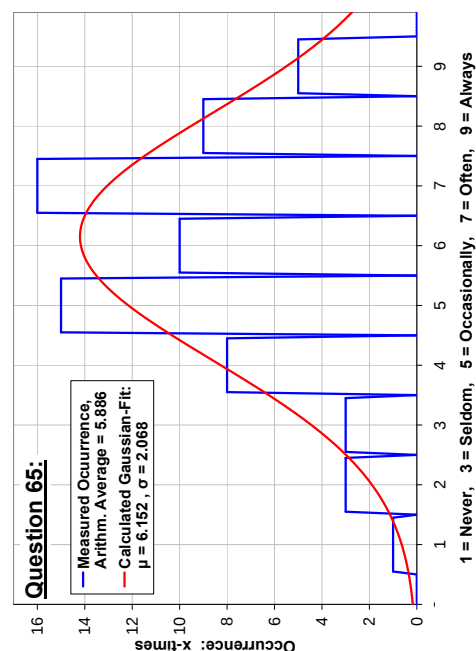
Question 61: Explains (personal and company) decisions, actions, and goals.

Question 62: Openly shares information with others.

Question 63: Deals with issues in a straightforward manner.

Question 64: Able to calm others in stressful situations.



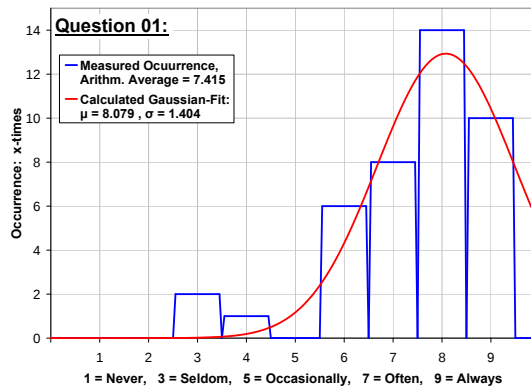


(a) Self-Appraisal & Supervisor: Question 65.

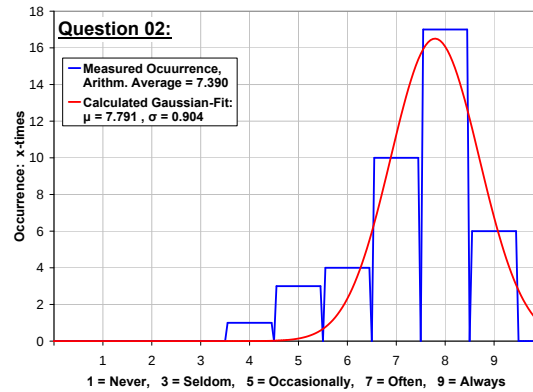
Figure C.34: *Question 65: Handles difficult people and situations effectively.*

C.3 Candidate

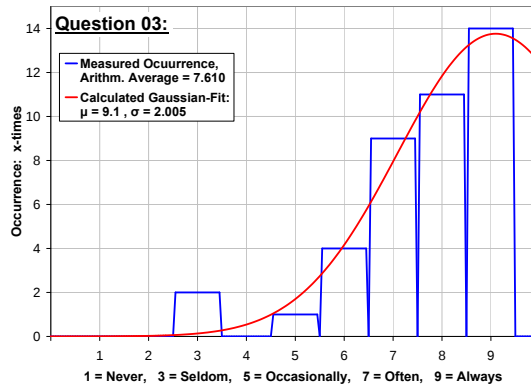
The Candidate group contains the data for one specific candidate who was the same person for all participants. The obtained occurrence values collected by the questionnaires were summed up for each question and performance category and visually presented in the following graphs. The Candidate category tests the functionality of the questionnaire in terms of leadership and management issues for one specific individual.



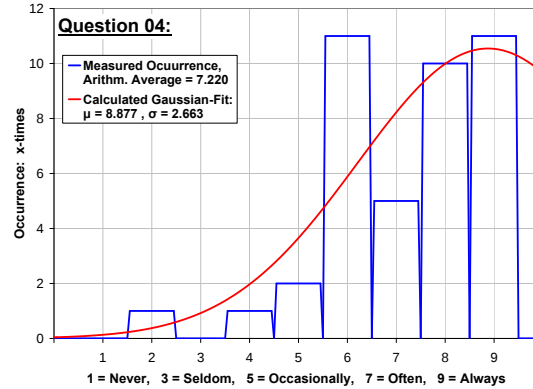
(a) Candidate: Question 01.



(b) Candidate: Question 02.



(c) Candidate: Question 03.



(d) Candidate: Question 04.

Figure C.35: Question 01: Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).

Question 02: Makes suggestions about how to solve problems and sets standards of performance for group members.

Question 03: Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.

Question 04: Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.

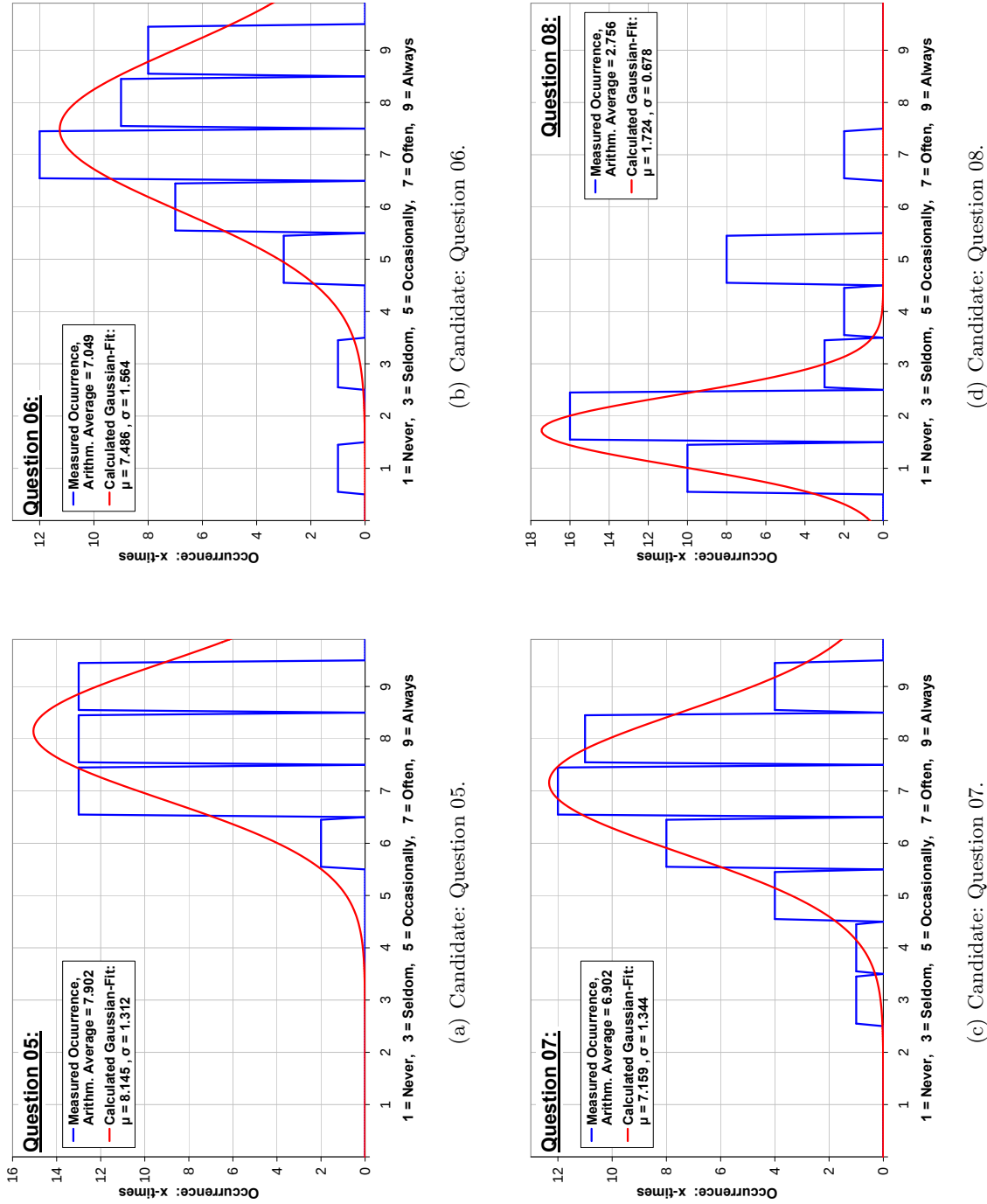
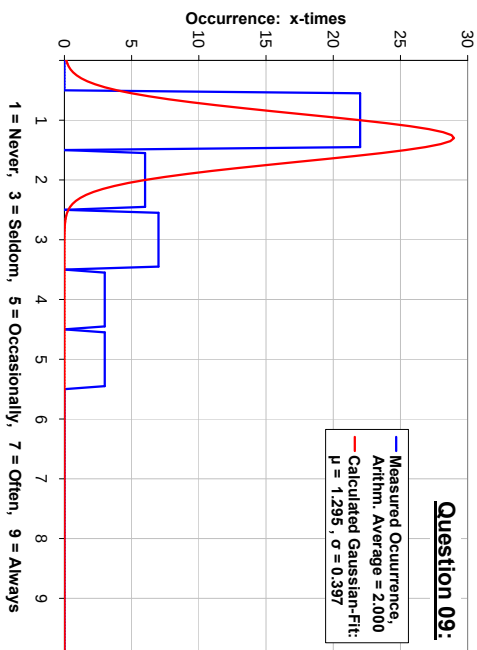


Figure C.36: Question 05: Recognizes what needs to be done and takes the initiative to make it happen.

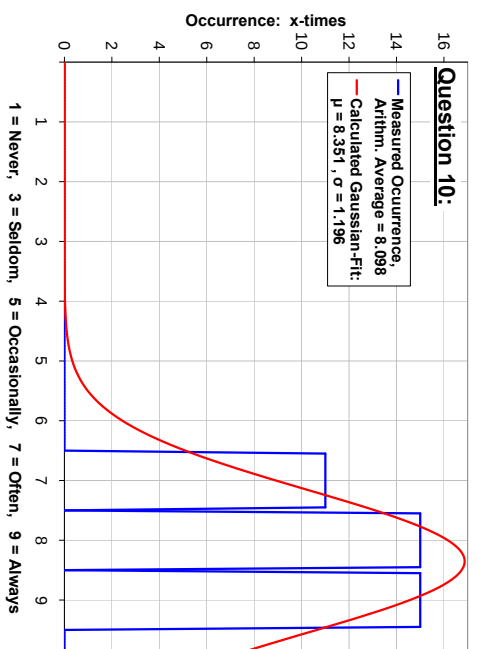
Question 06: Prioritizes key objectives and focuses the groups activity on them.

Question 07: Effectively allocates available resources, e.g., time, people, money.

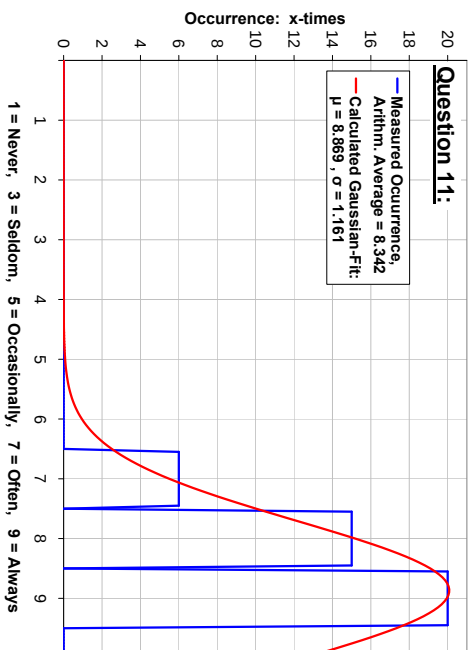
Question 08: Gives vague or misleading explanations to team members.



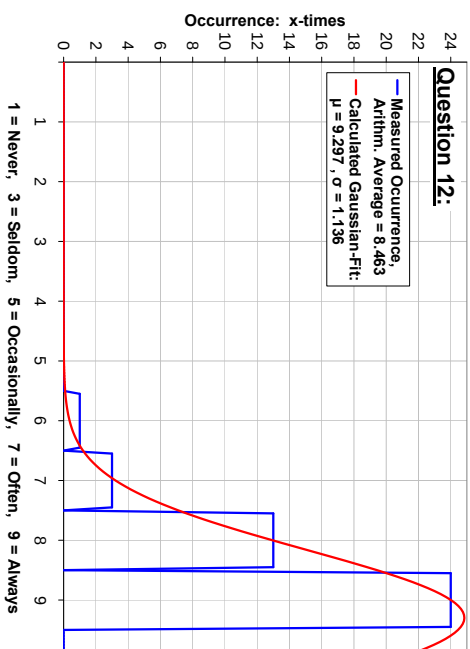
(a) Candidate: Question 09.



(b) Candidate: Question 10.



(c) Candidate: Question 11.



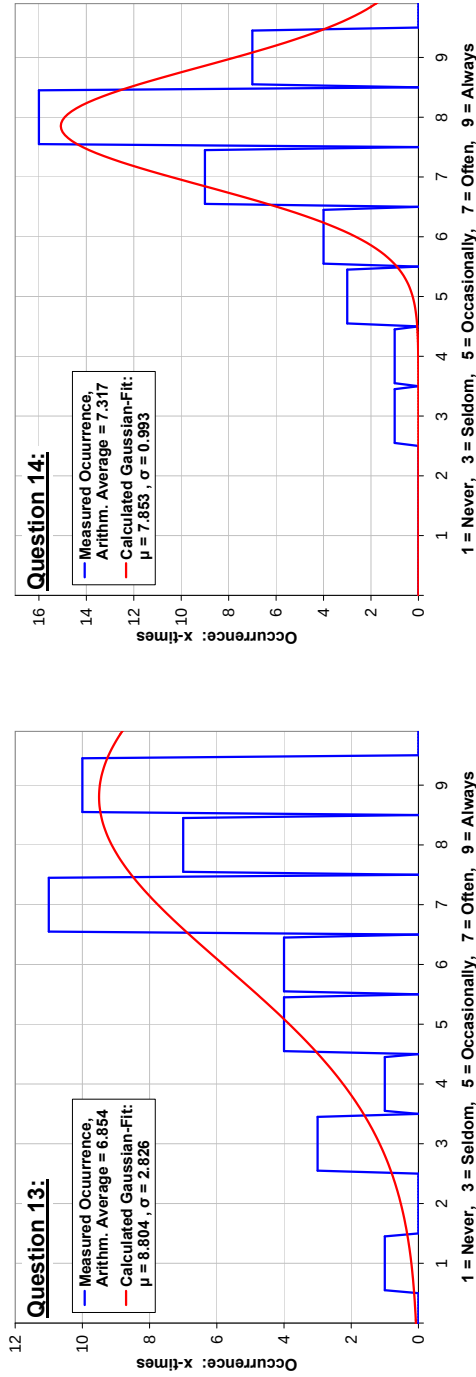
(d) Candidate: Question 12.

Figure C.37: Question 09: Makes NO suggestions (because she/he has no clue at all).

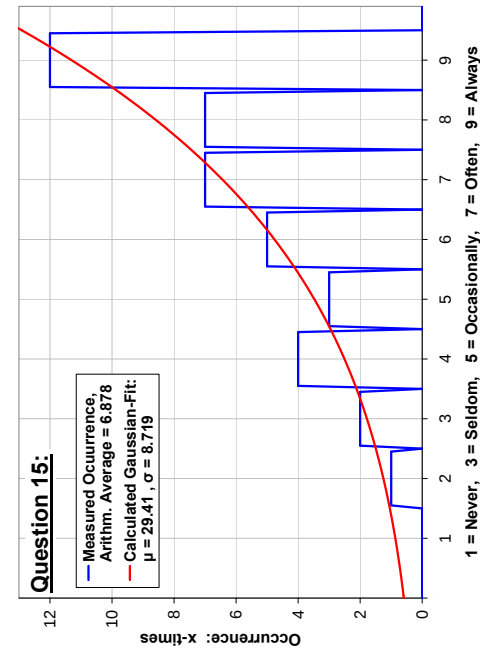
Question 10: Enjoys getting into the details of how things work.

Question 11: Is good at making things work and completing the assigned tasks.

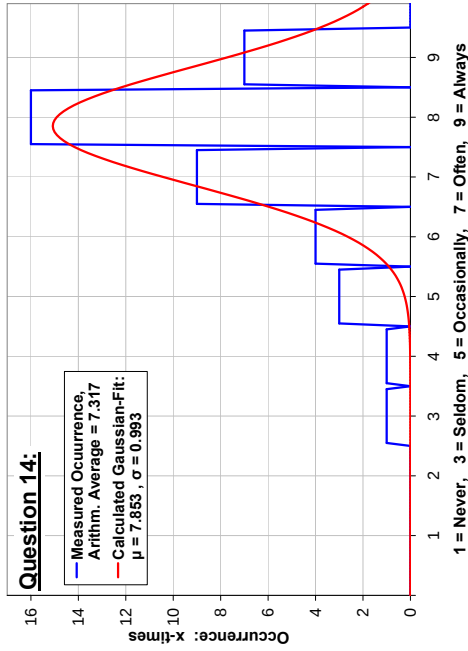
Question 12: Knows and understands how to do basic things.



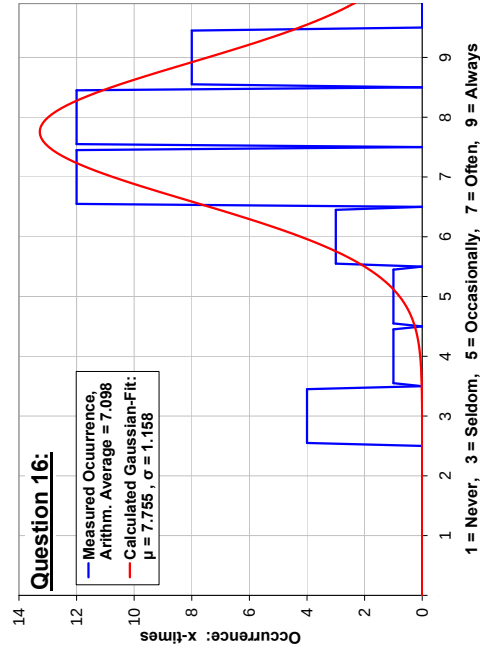
(a) Candidate: Question 13.



(c) Candidate: Question 15.



(b) Candidate: Question 14.



(d) Candidate: Question 16.

Figure C.38: *Question 13: Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.*

Question 14: *Knows (exactly and in detail) what work is being done in the team.*

Question 15: *Treats people as equals, fairly and consistently (behaves predictably).*

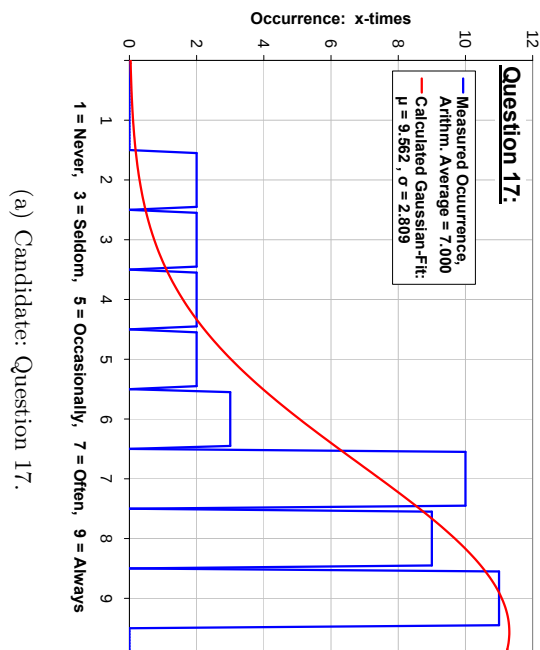
Question 16: *Communicates actively (i.e., starts conversations) with team members.*

Figure C.39: Question 17: Acknowledges her/his own mistakes and takes corrective action.

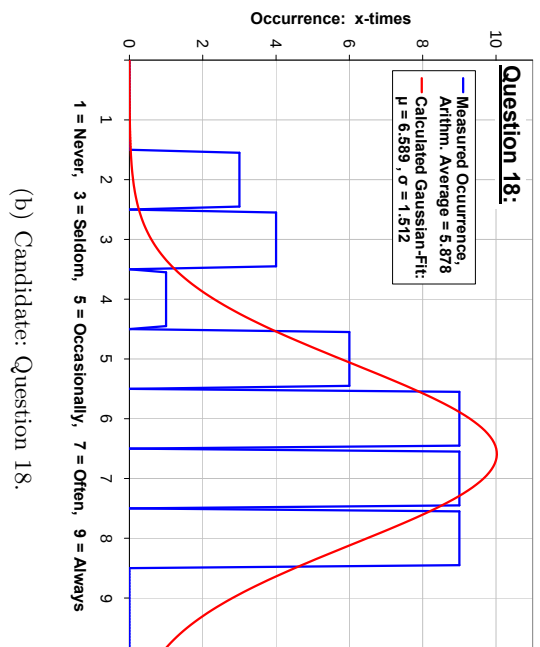
Question 18: Discloses thoughts and feelings to group members.

Question 19: Gives team members honest and fair answers.

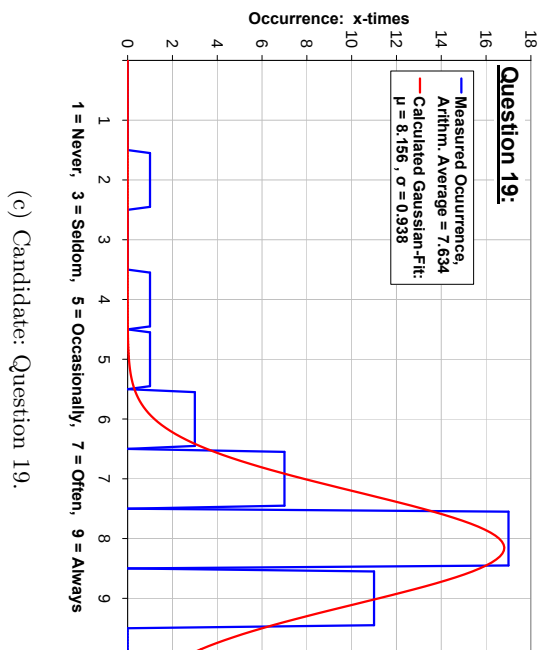
Question 20: Does not worry about jeopardizing relationships when correcting mistakes.



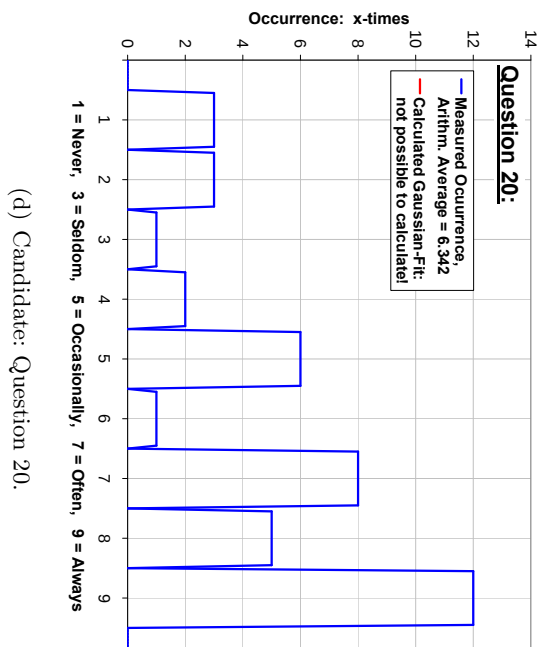
(a) Candidate: Question 17.



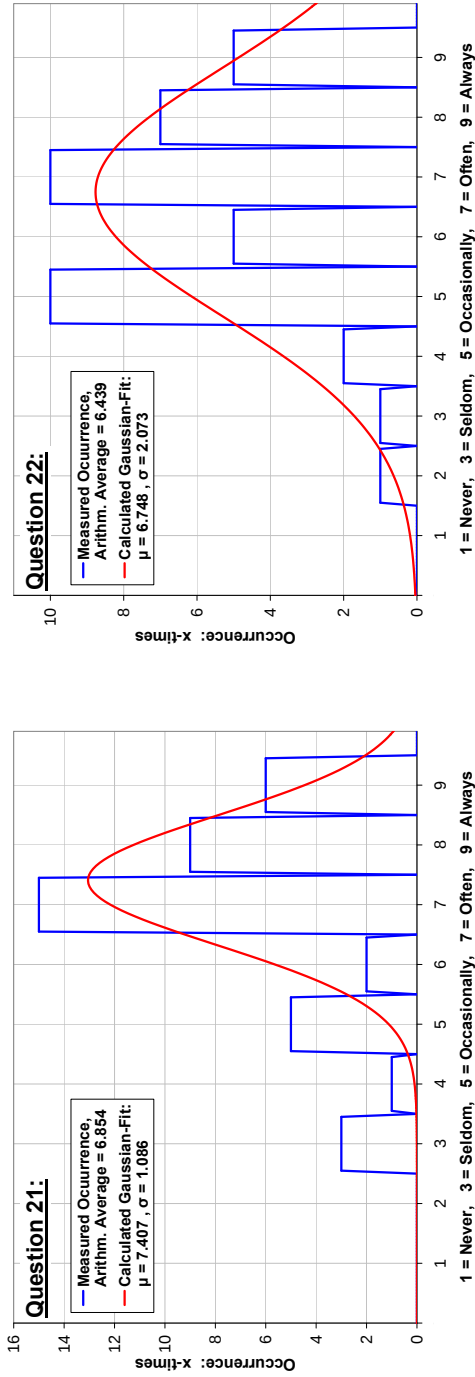
(b) Candidate: Question 18.



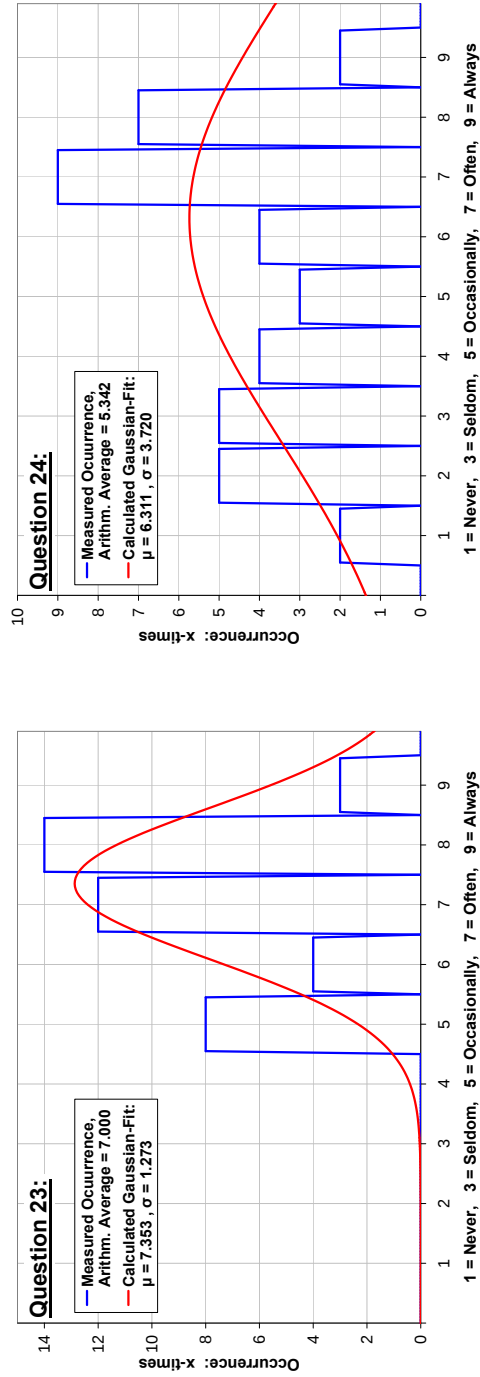
(c) Candidate: Question 19.



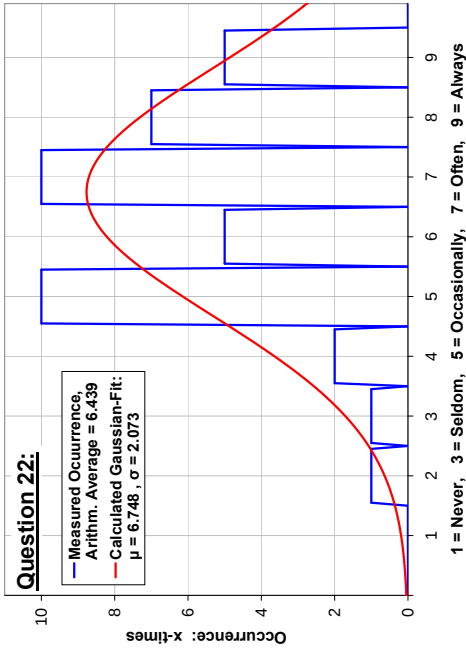
(d) Candidate: Question 20.



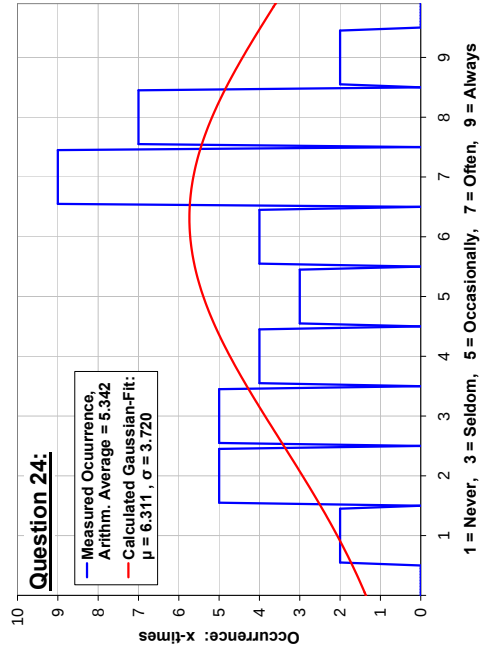
(a) Candidate: Question 21.



(c) Candidate: Question 23.



(b) Candidate: Question 22.



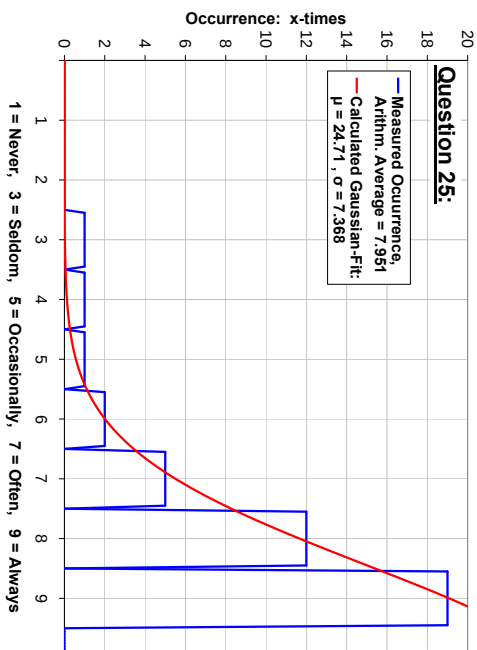
(d) Candidate: Question 24.

Figure C.40: Question 21: Honors other people's (personal) boundaries.

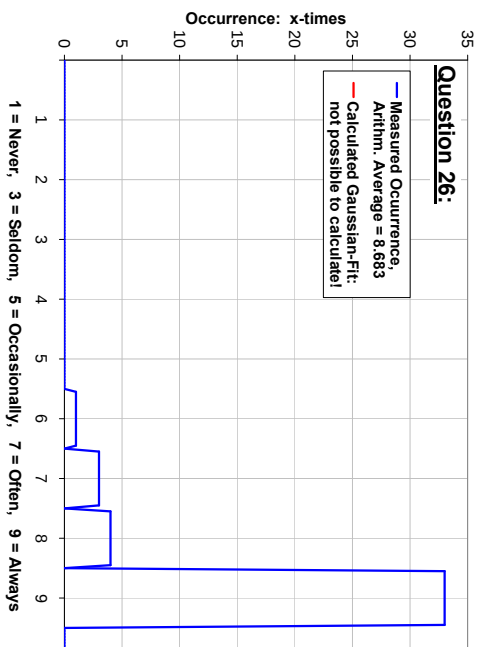
Question 22: Regularly achieves "win-win" outcomes.

Question 23: Identifies and promotes opportunities for collaboration.

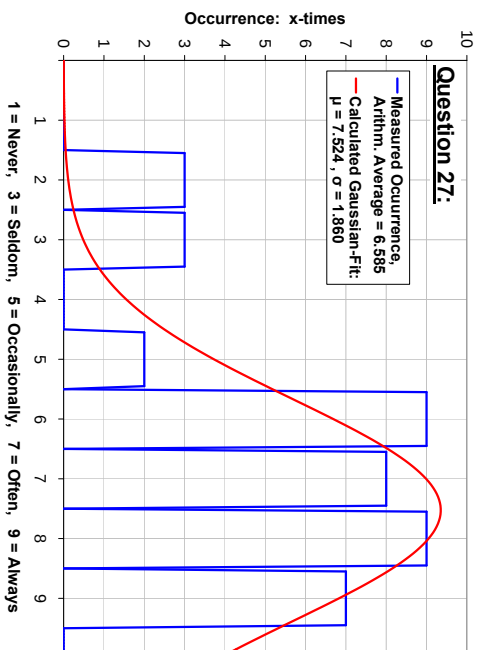
Question 24: Is concerned with how her/his decisions affect the lives of others.



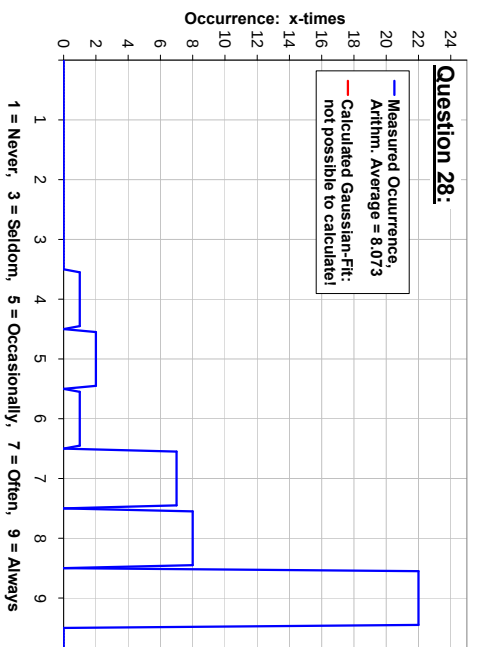
(a) Candidate: Question 25.



(b) Candidate: Question 26.



(c) Candidate: Question 27.



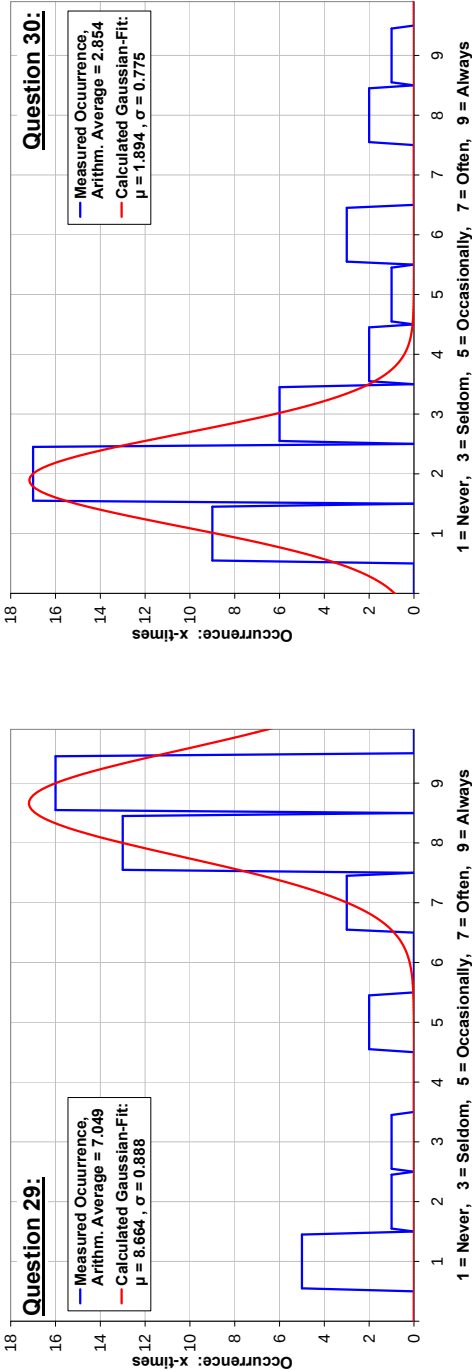
(d) Candidate: Question 28.

Figure C.41: Question 25: Sets high and clear standards for others by her/his own behavior.

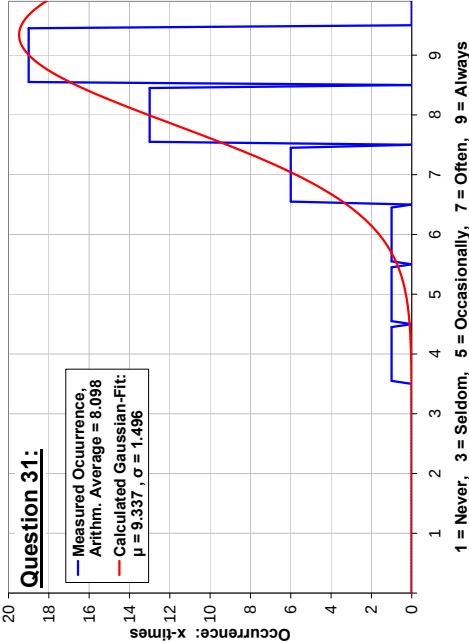
Question 26: Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.

Question 27: Models positive team attributes such as mutual respect, open communication, and full participation.

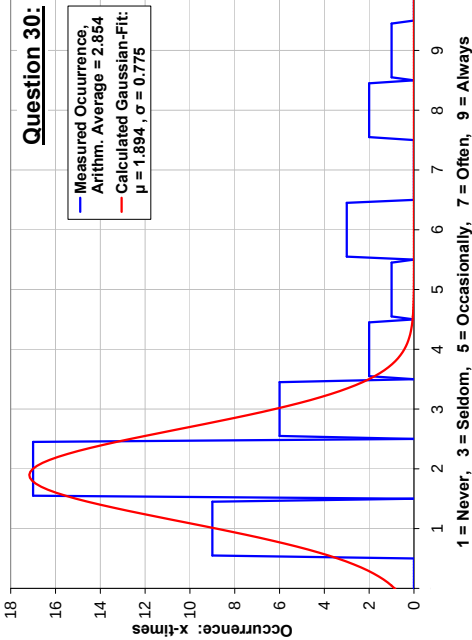
Question 28: Has high moral standards. Can be trusted with confidential information.



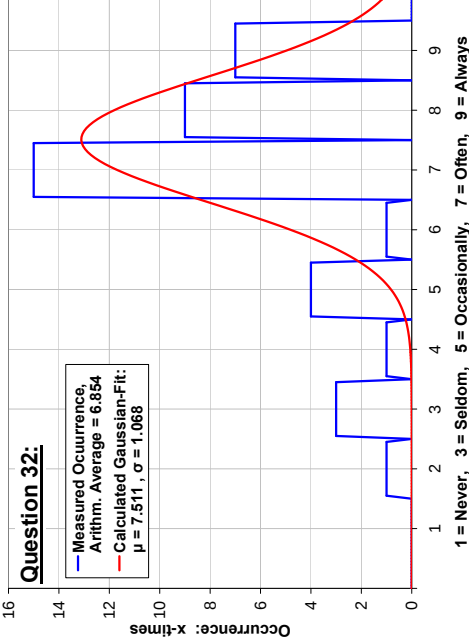
(a) Candidate: Question 29.



(c) Candidate: Question 31.

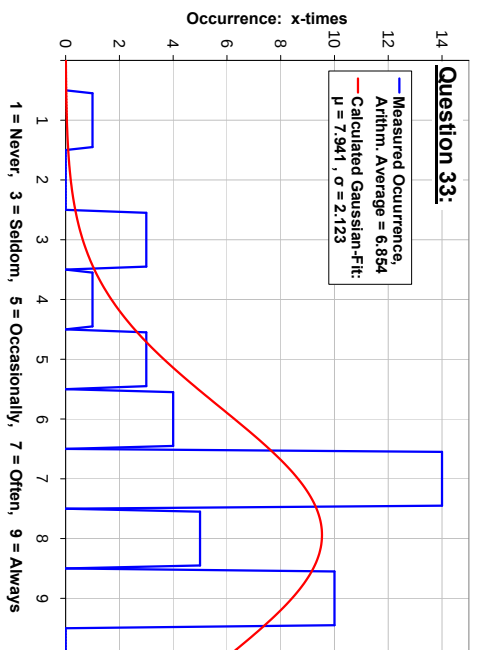


(b) Candidate: Question 30.

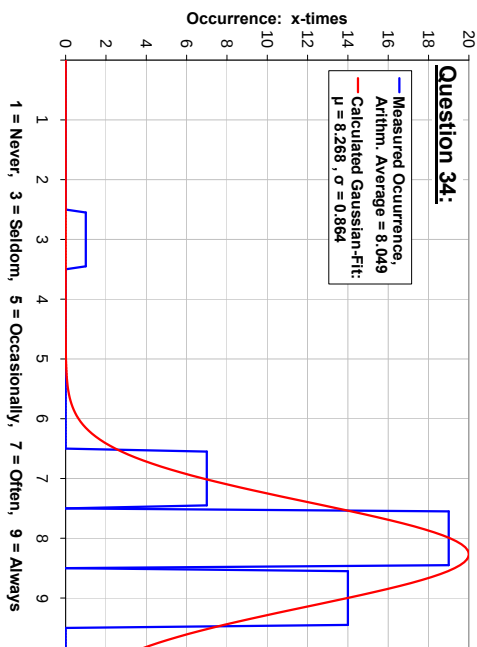


(d) Candidate: Question 32.

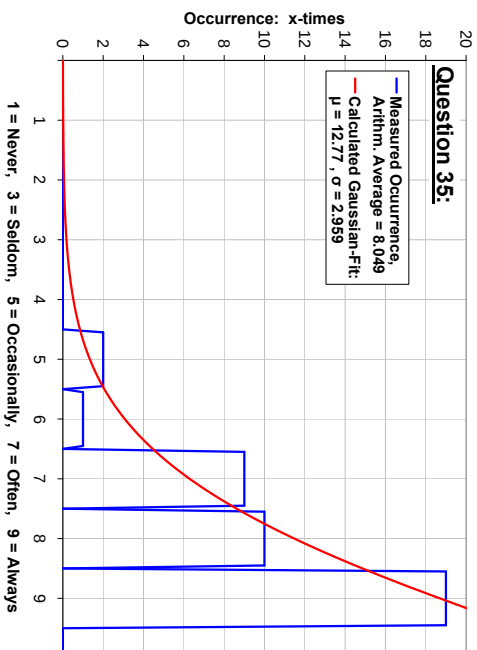
Figure C.42: *Question 29: Would never try to take credit for other people's ideas.*
Question 30: Shows favoritism (in an unfair amount) towards some people.
Question 31: Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.
Question 32: Possesses awareness of her/his own strengths and weaknesses.



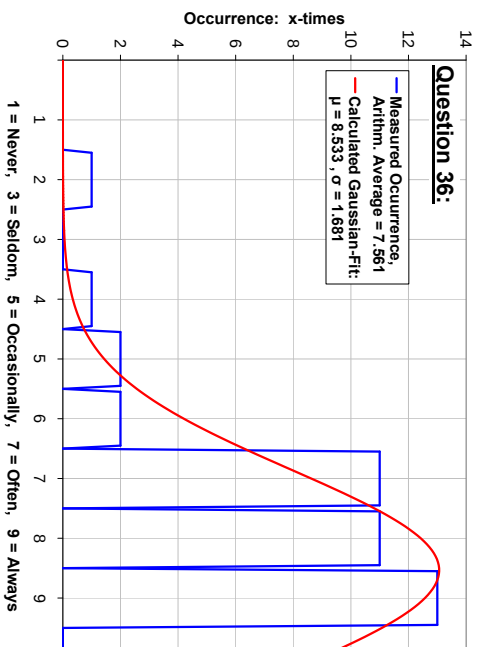
(a) Candidate: Question 33.



(b) Candidate: Question 34.



(c) Candidate: Question 35.



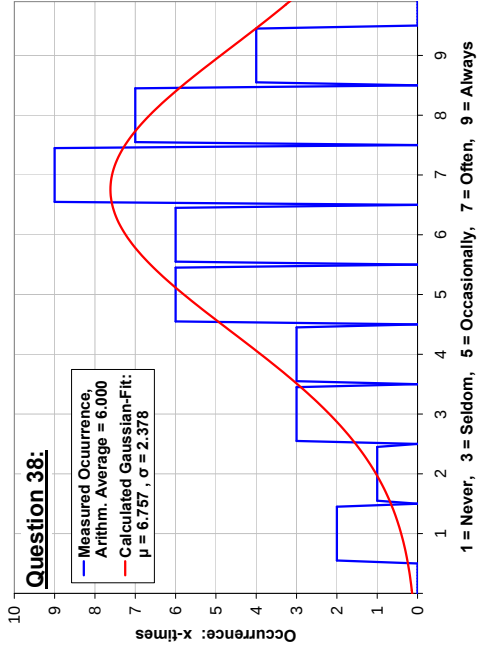
(d) Candidate: Question 36.

Figure C.43: Question 33: Is open to feedback from others. Encourages others to give feedback.

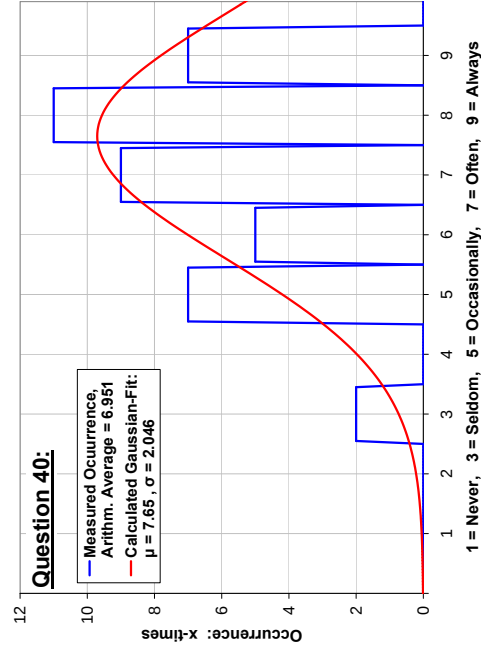
Question 34: Learns from own experiences and also those of others. Seeks opportunities for self-development.

Question 35: Speaks up even when her/his opinion is in the minority.

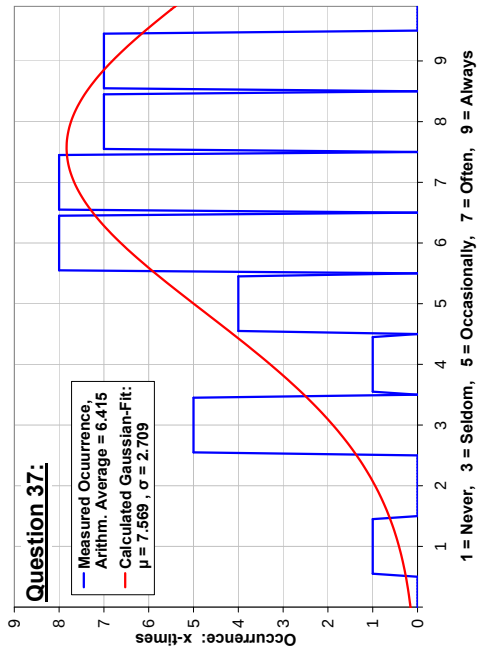
Question 36: Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.



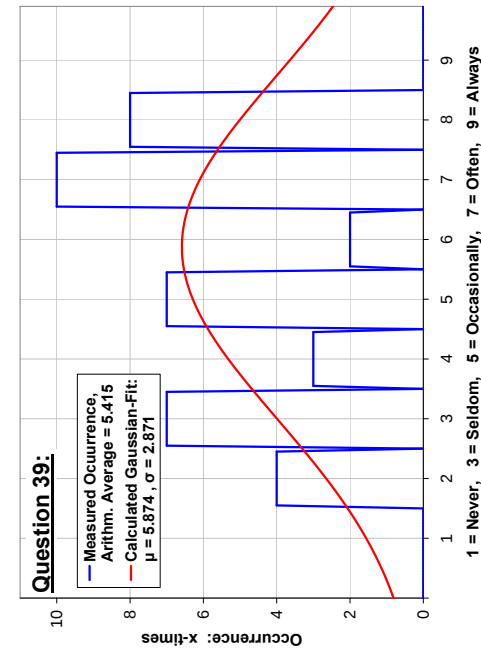
(b) Candidate: Question 38.



(d) Candidate: Question 40.



(a) Candidate: Question 37.



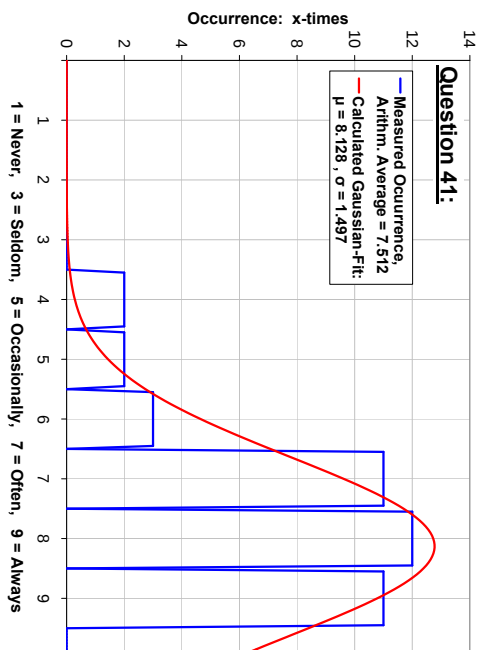
(c) Candidate: Question 39.

Figure C.44: Question 37: Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.

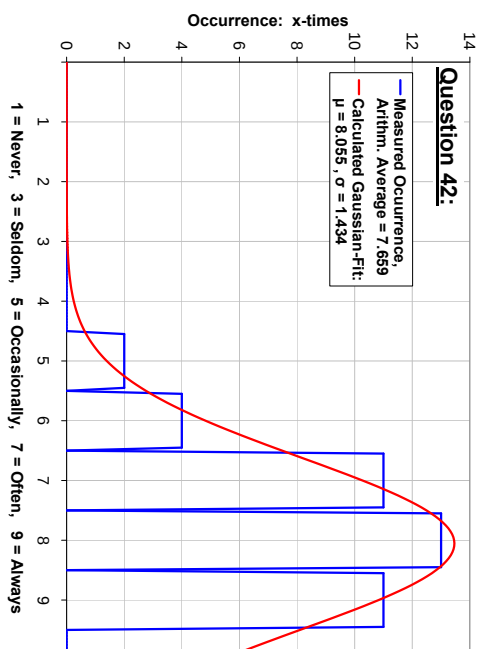
Question 38: Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.

Question 39: Makes decisions that are based only on his/her own ideas.

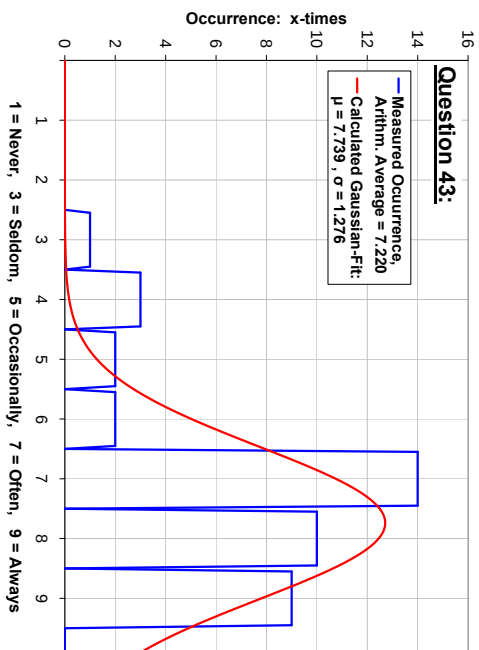
Question 40: Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.



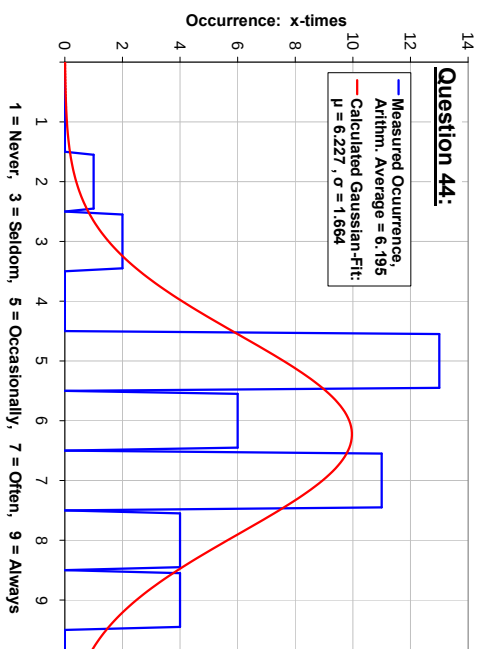
(a) Candidate: Question 41.



(b) Candidate: Question 42.



(c) Candidate: Question 43.



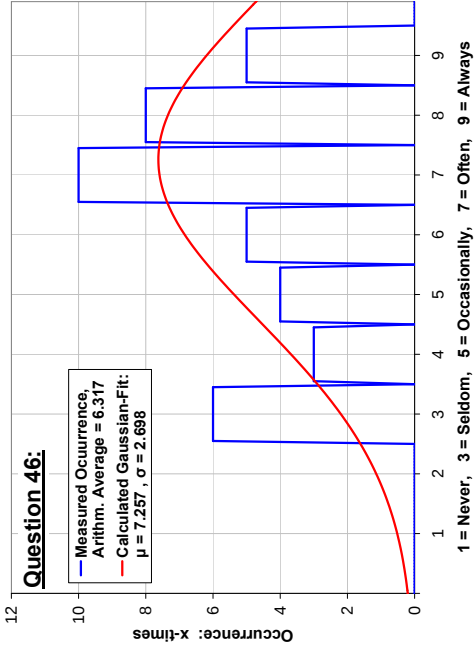
(d) Candidate: Question 44.

Figure C.45: Question 41: When things go wrong, the main concern is to fix it, not to lay blame.

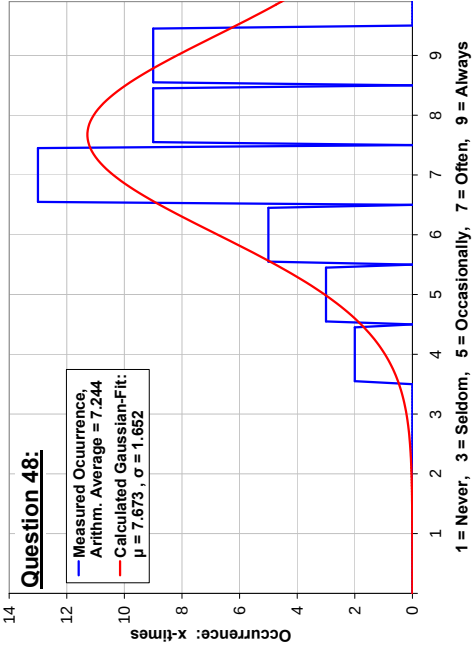
Question 42: Is capable of juggling multiple demands.

Question 43: Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.

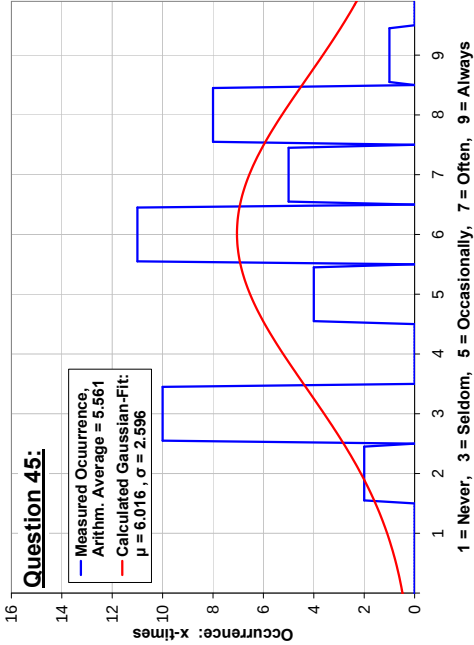
Question 44: Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).



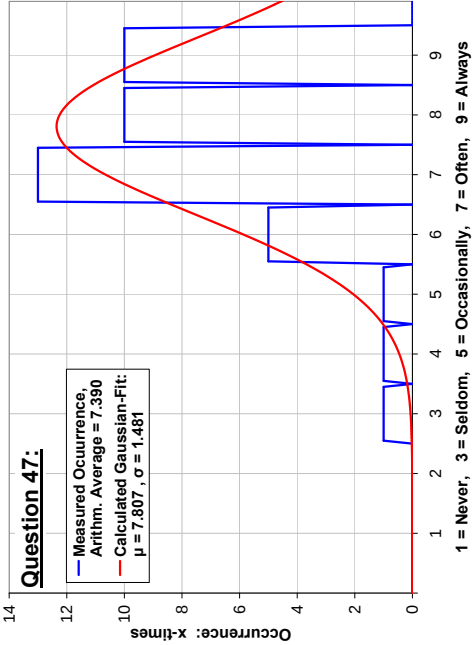
(b) Candidate: Question 46.



(d) Candidate: Question 48.



(a) Candidate: Question 45.



(c) Candidate: Question 47.

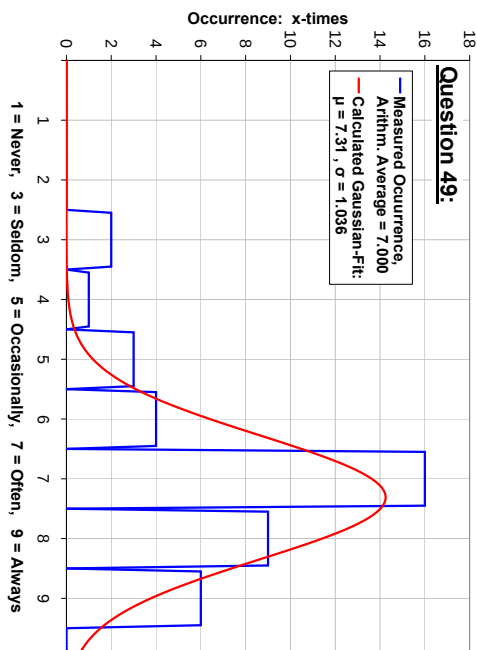
Figure C.46: Question 45: Likes to share her/his leadership power with subordinates.
Question 46: There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.
Question 47: The team members feel a real responsibility to make things work.
Question 48: Acknowledges others for their contributions and celebrates in their successes.

Figure C.47: Question 49: Recognizes the potential of her/his team members.

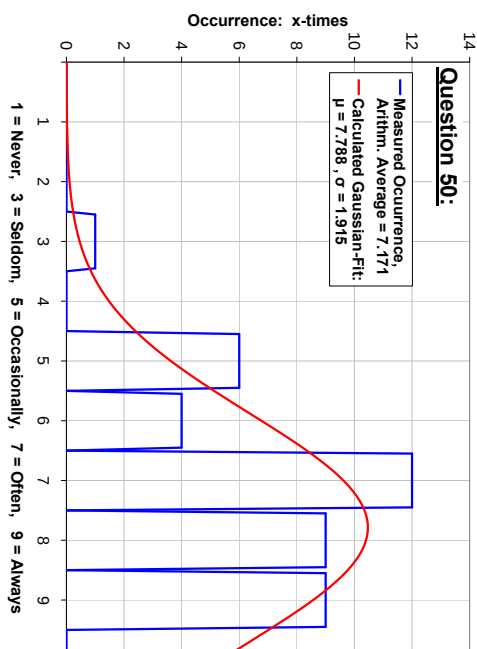
Question 50: Pays attention to team's performance. Supports and gives feedback.

Question 51: Likes to use her/his leadership power to help subordinates grow.

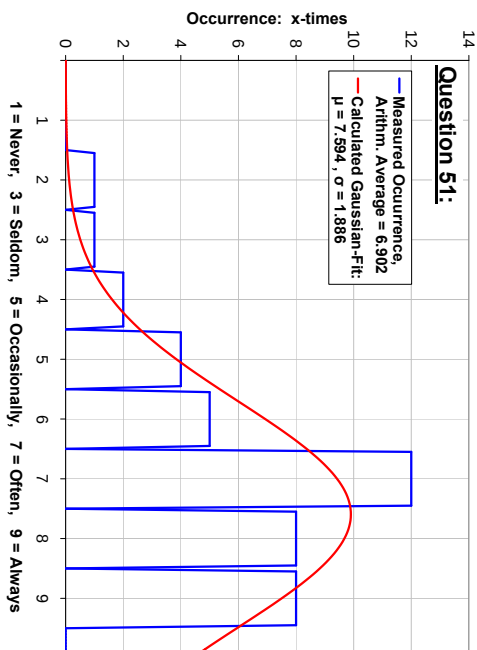
Question 52: Develops others by explaining or demonstrating relevant skills.



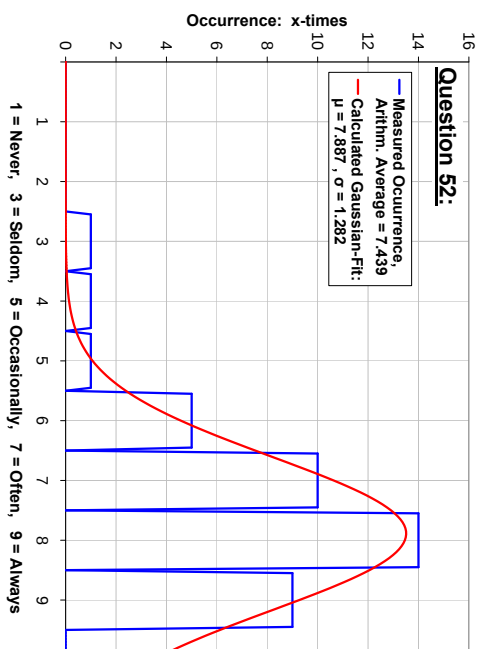
(a) Candidate: Question 49.



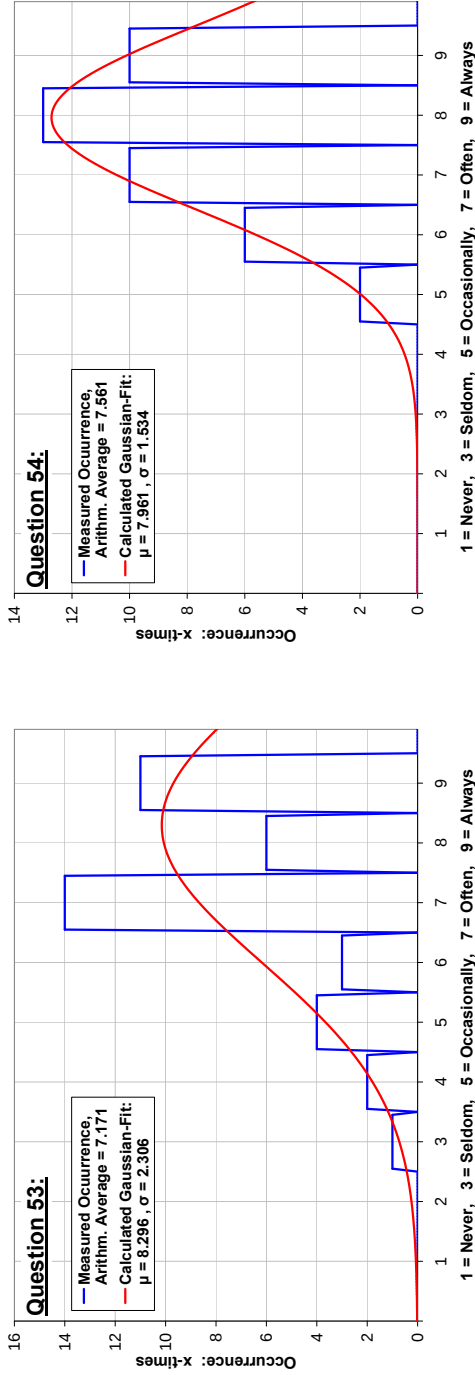
(b) Candidate: Question 50.



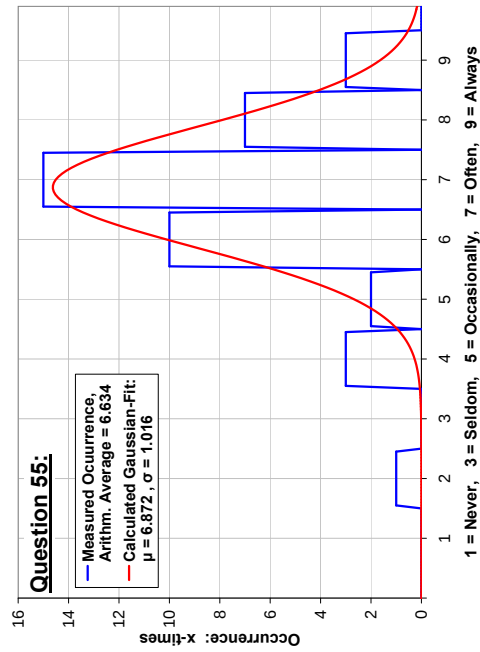
(c) Candidate: Question 51.



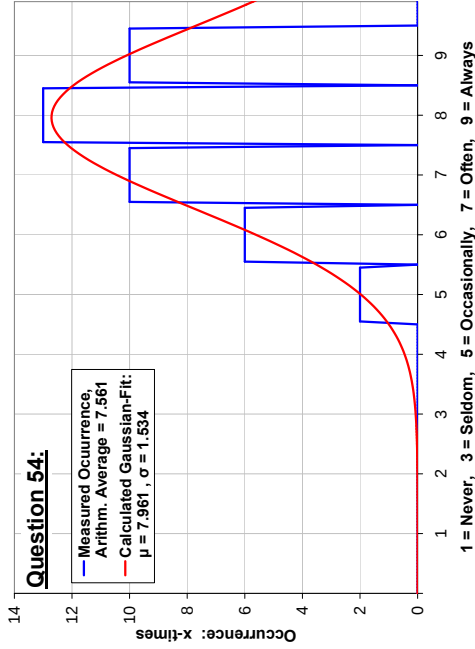
(d) Candidate: Question 52.



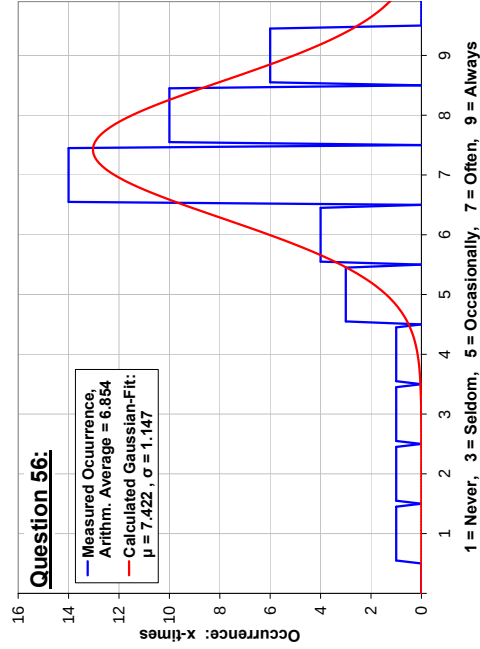
(a) Candidate: Question 53.



(c) Candidate: Question 55.



(b) Candidate: Question 54.



(d) Candidate: Question 56.

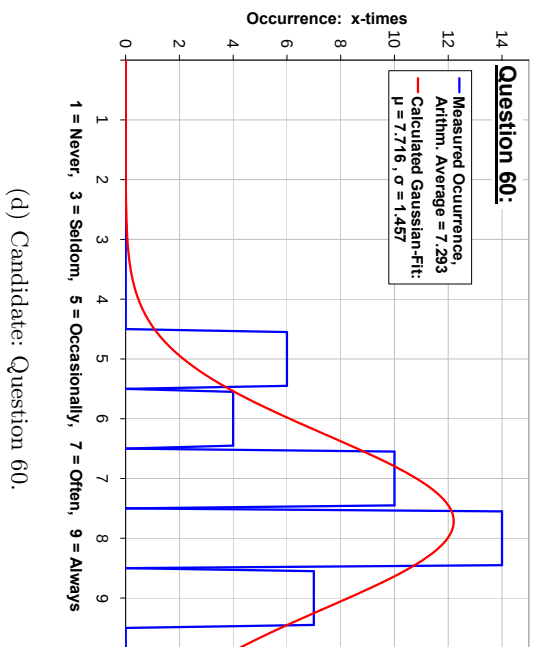
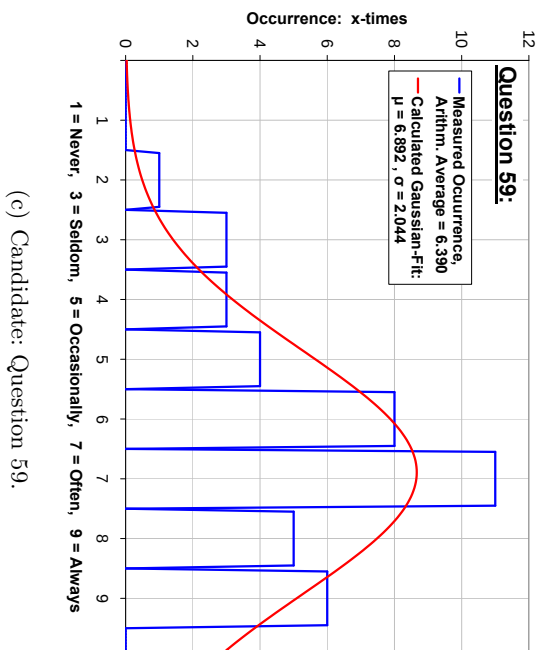
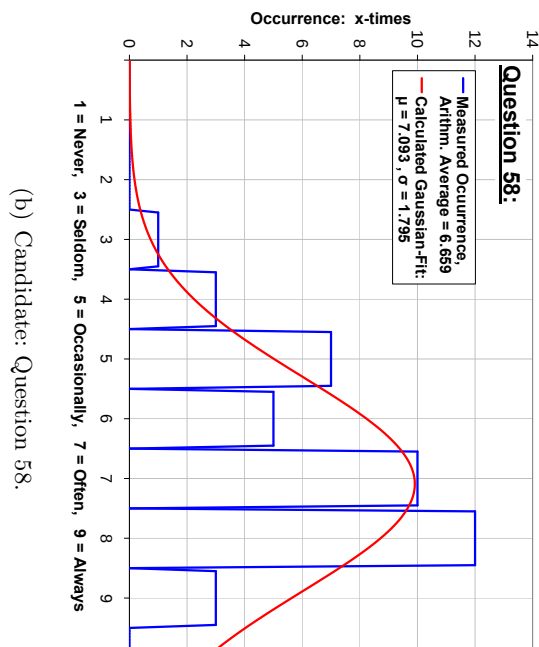
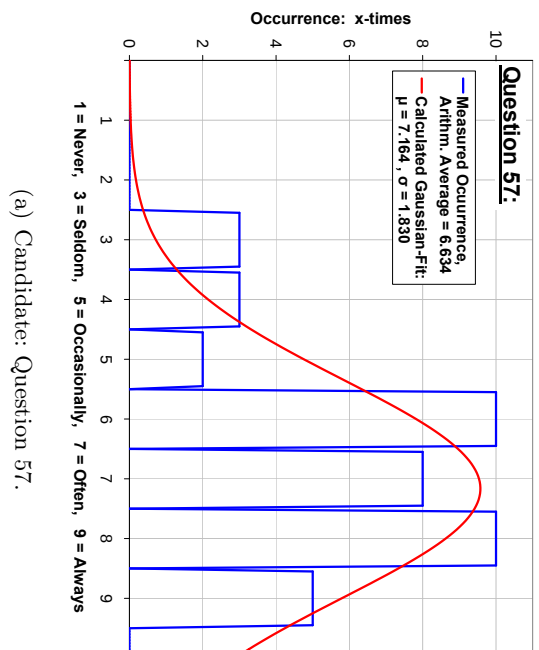
Figure C.48: Question 53: Encourages team members to solve problems on their own.*Question 54: Helps the team to focus on goals and objectives.**Question 55: Gets team members to look at problems from many different angles.**Question 56: Identifies causes of resistance and finds ways to overcome them.*

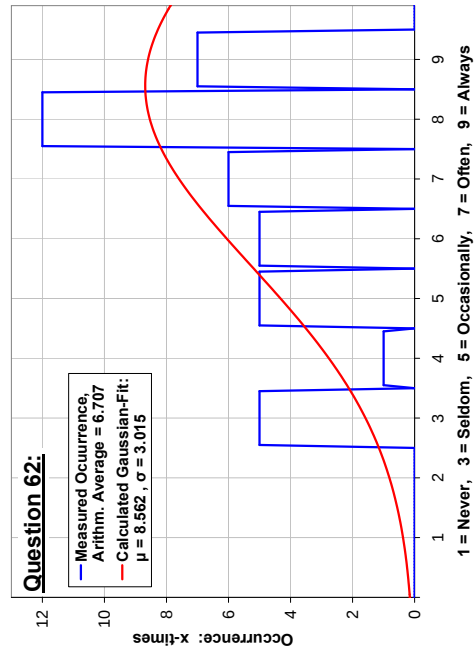
Figure C.49: Question 57: Spends time effectively teaching or mentoring team members.

Question 58: Explains how the team fits into the project or company objectives.

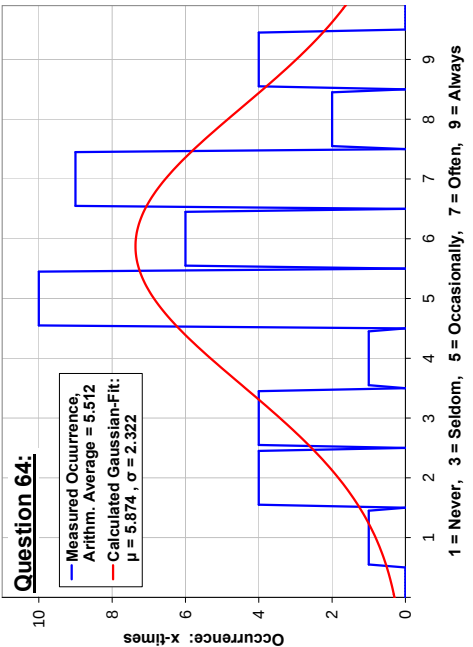
Question 59: Explains the purpose of the company's policies to the team.

Question 60: Explains rules and expectations.

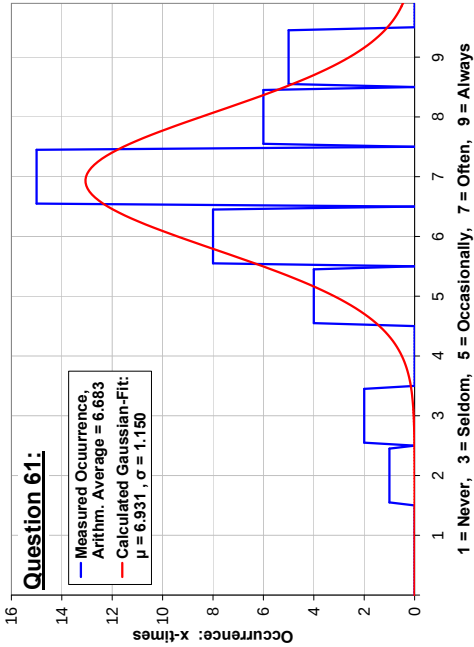




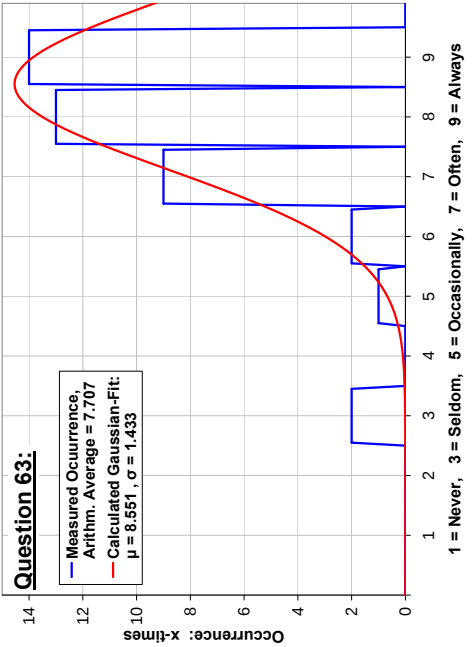
(b) Candidate: Question 62.



(d) Candidate: Question 64.



(a) Candidate: Question 61.



(c) Candidate: Question 63.

Figure C.50: *Question 61: Explains (personal and company) decisions, actions, and goals.*
Question 62: Openly shares information with others.
Question 63: Deals with issues in a straightforward manner.
Question 64: Able to calm others in stressful situations.

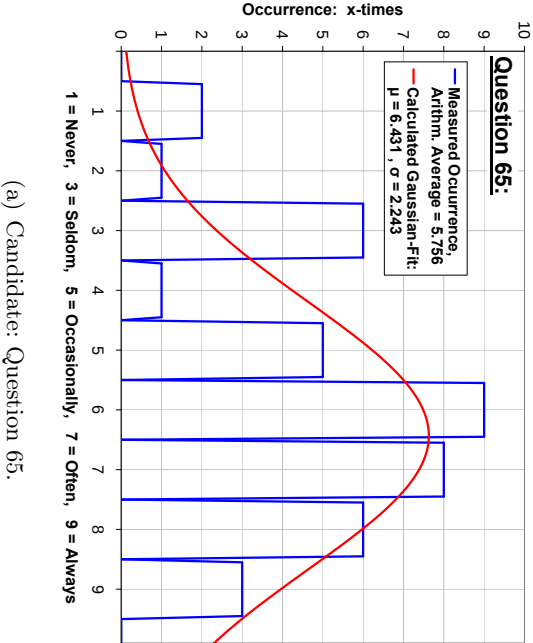
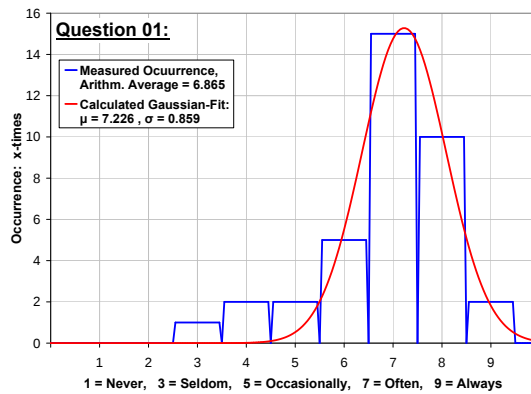


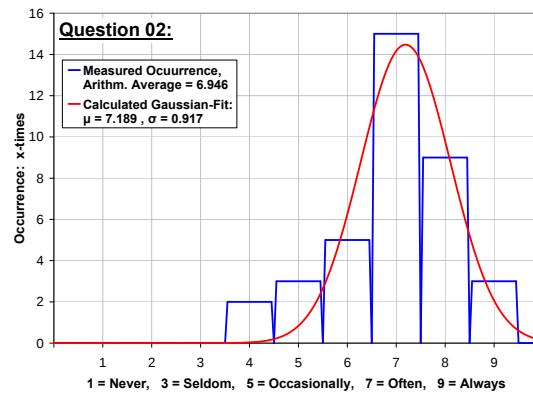
Figure C.51: Question 65: Handles difficult people and situations effectively.

C.4 Self-Appraisal

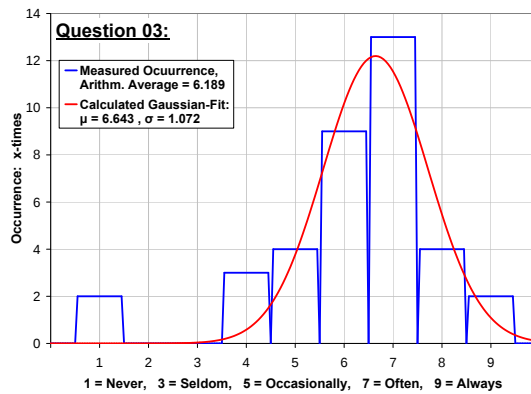
The Self-Appraisal group contains the data for all the different questionnaire participants. The obtained occurrence values collected by the questionnaires were summed up for each question and performance category and visually presented in the following graphs. The Self-Appraisal category tests the functionality of the questionnaire in terms of leadership and management self-appraisal issues.



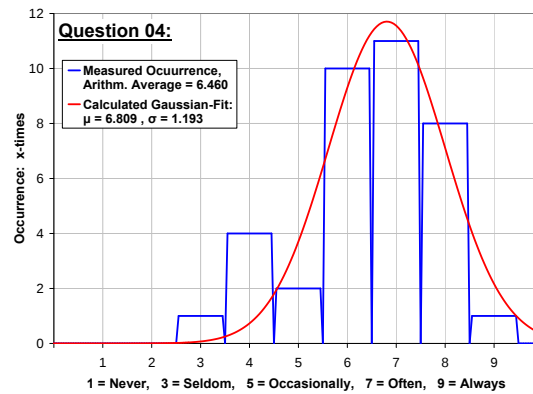
(a) Self-Appraisal: Question 01.



(b) Self-Appraisal: Question 02.



(c) Self-Appraisal: Question 03.



(d) Self-Appraisal: Question 04.

Figure C.52: Question 01: Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).

Question 02: Makes suggestions about how to solve problems and sets standards of performance for group members.

Question 03: Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.

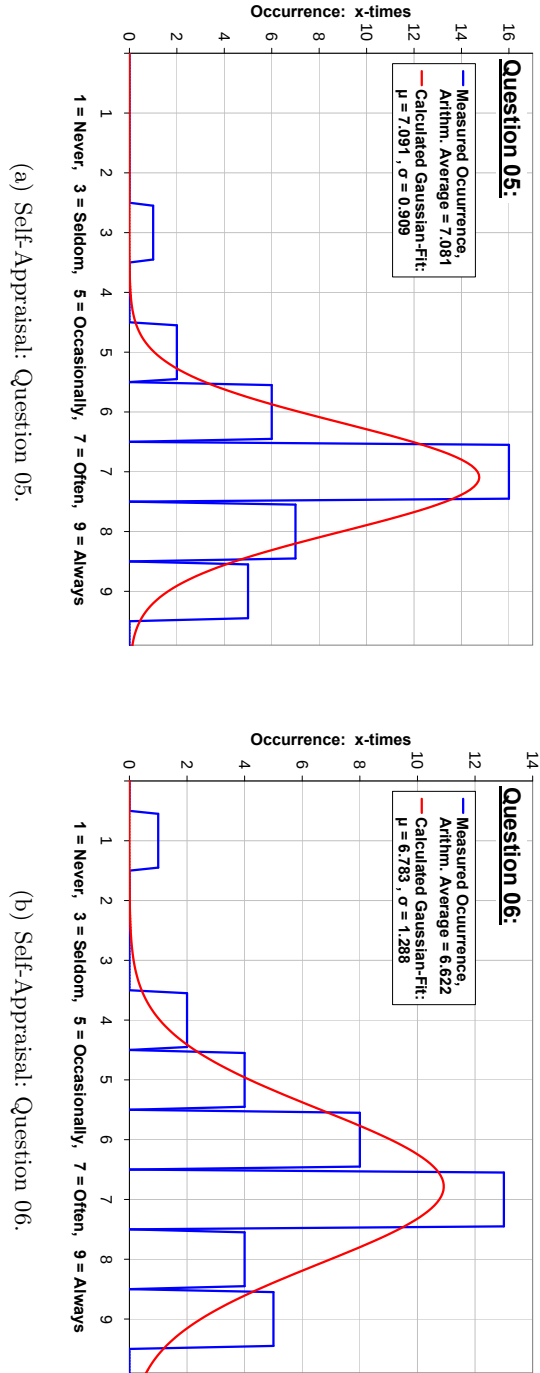
Question 04: Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.

Figure C.53: Question 05: Recognizes what needs to be done and takes the initiative to make it happen.

Question 06: Prioritizes key objectives and focuses the groups activity on them.

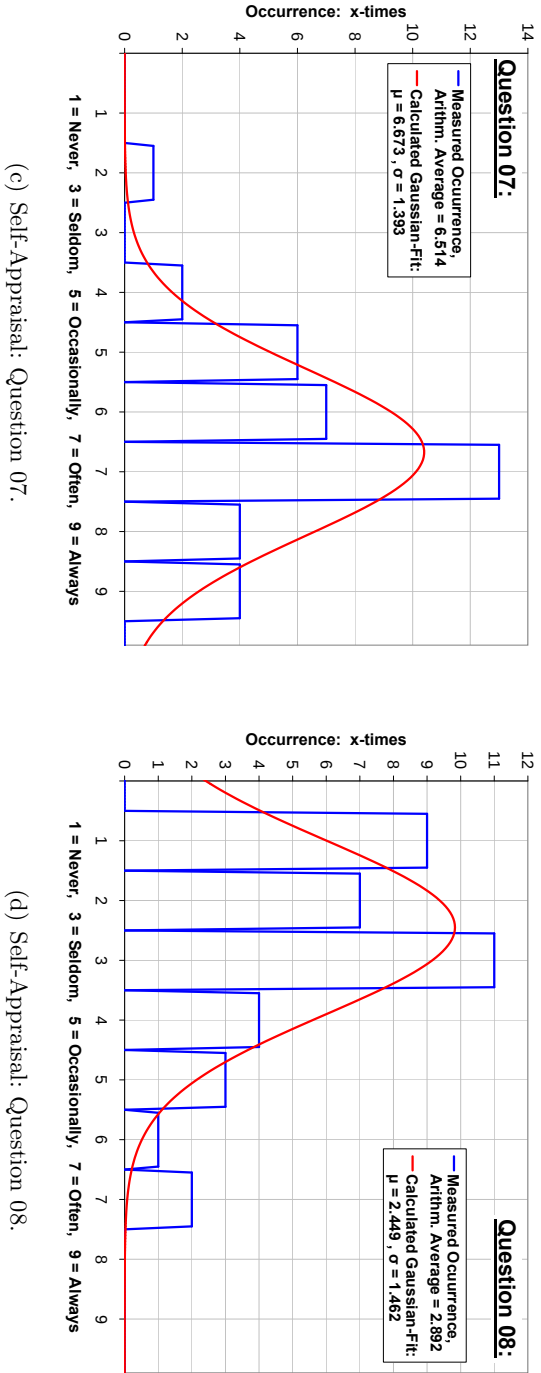
Question 07: Effectively allocates available resources, e.g., time, people, money.

Question 08: Gives vague or misleading explanations to team members.



(a) Self-Appraisal: Question 05.

(b) Self-Appraisal: Question 06.



(c) Self-Appraisal: Question 07.

(d) Self-Appraisal: Question 08.

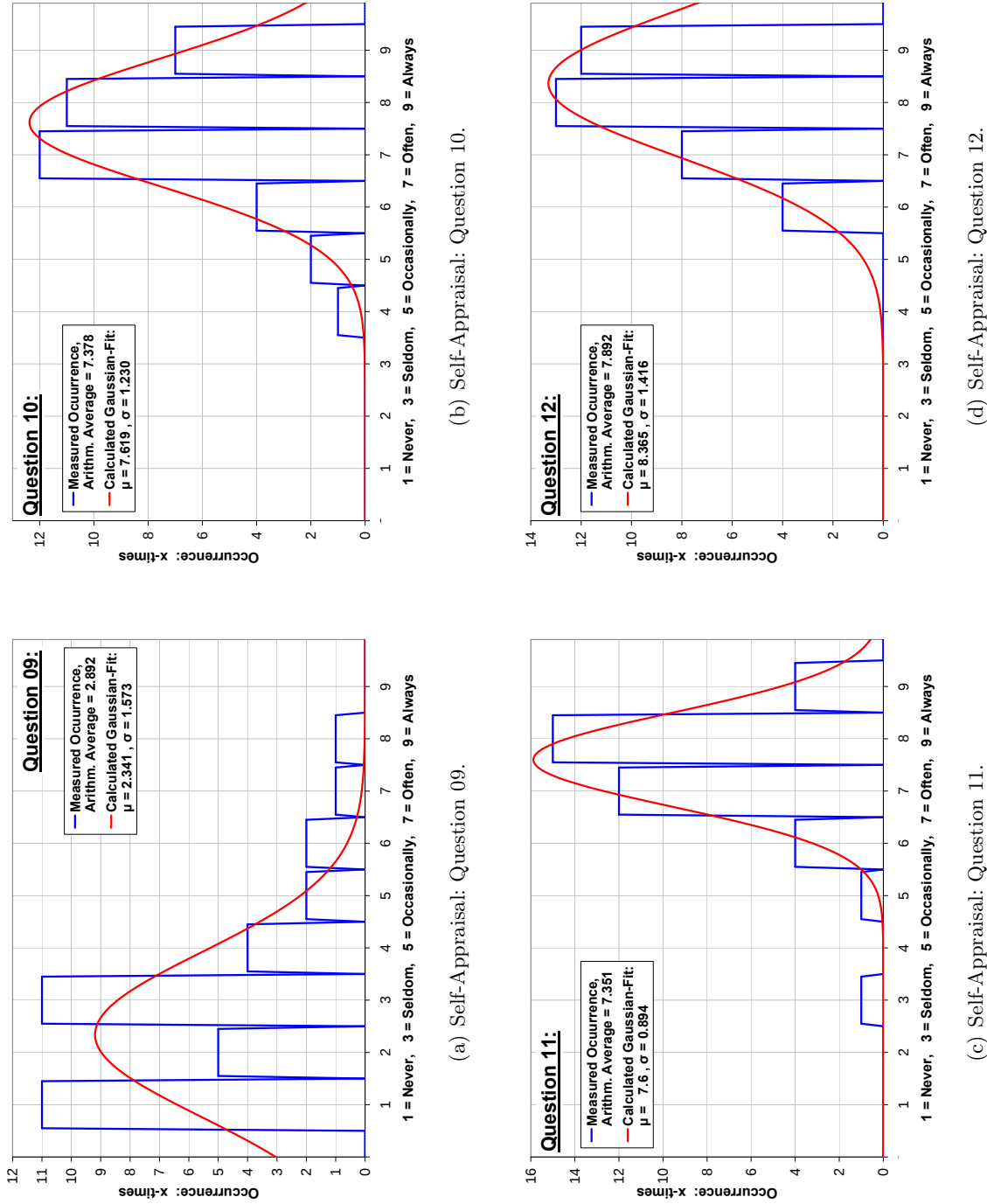
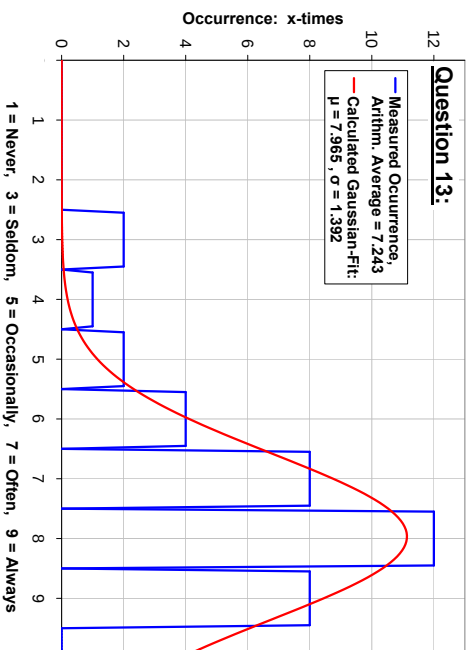


Figure C.54: Question 09: Makes NO suggestions (because she/he has no clue at all).

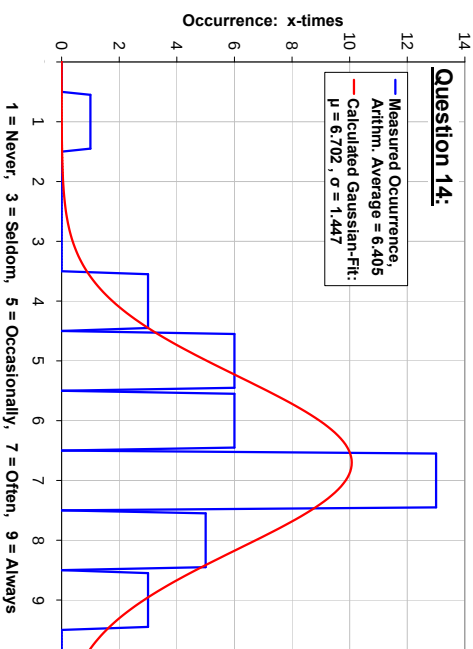
Question 10: Enjoys getting into the details of how things work.

Question 11: Is good at making things work and completing the assigned tasks.

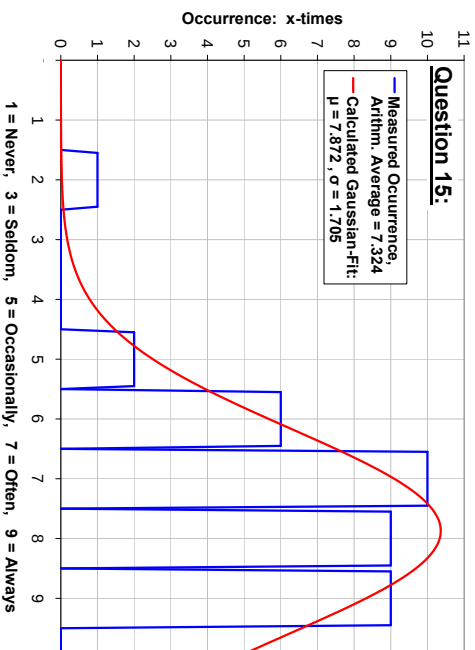
Question 12: Knows and understands how to do basic things.



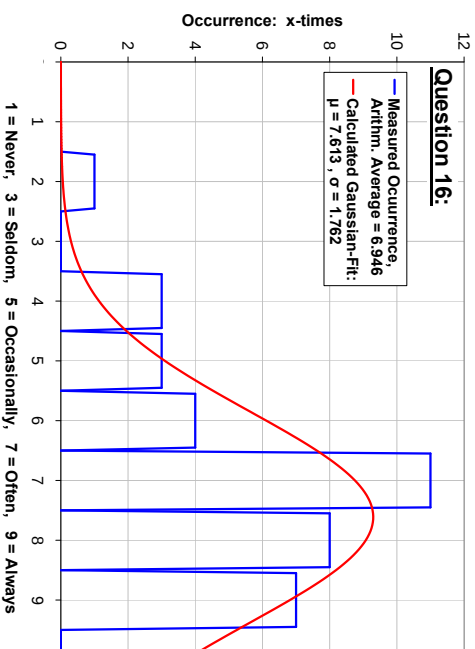
(a) Self-Appraisal: Question 13.



(b) Self-Appraisal: Question 14.



(c) Self-Appraisal: Question 15.



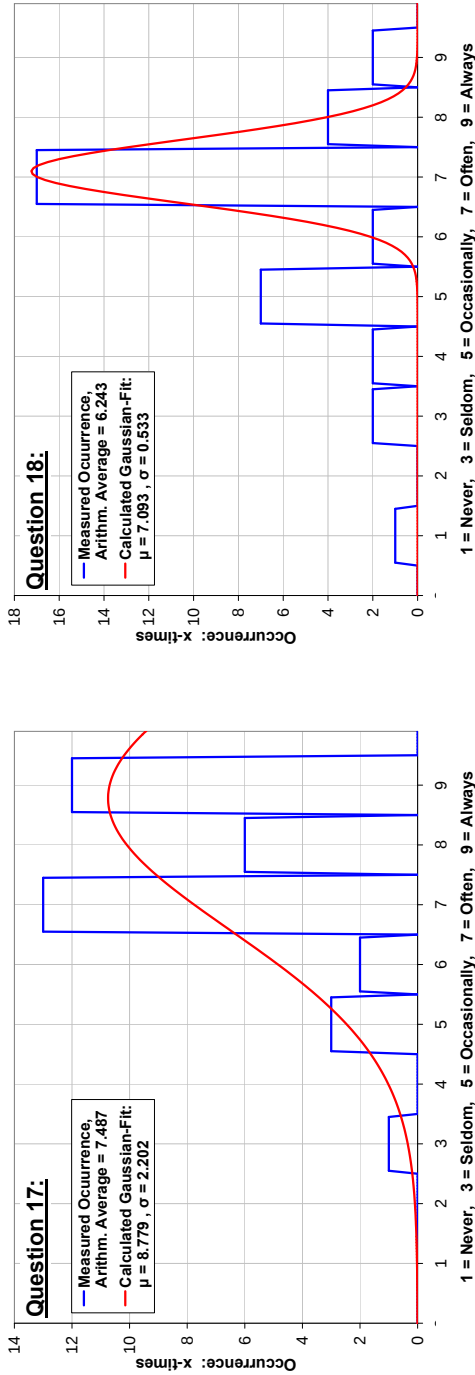
(d) Self-Appraisal: Question 16.

Figure C.55: Question 13: Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.

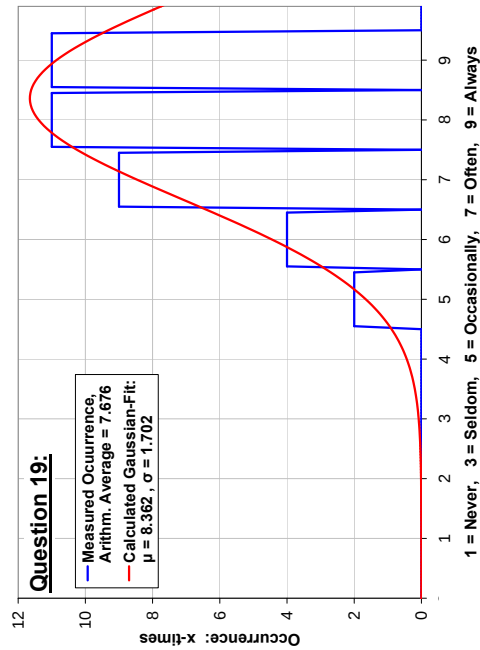
Question 14: Knows (exactly and in detail) what work is being done in the team.

Question 15: Treats people as equals, fairly and consistently (behaves predictably).

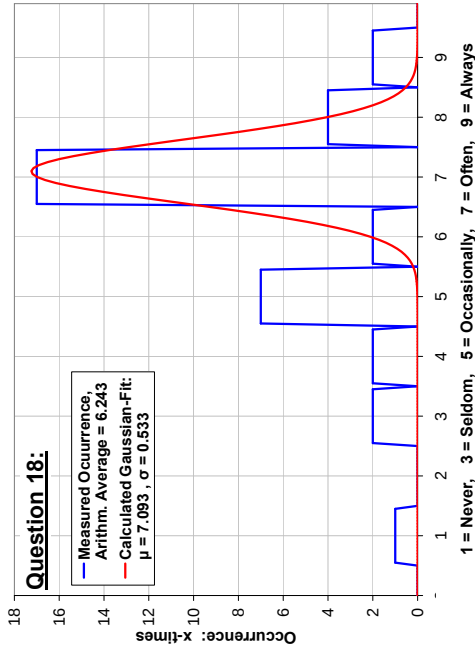
Question 16: Communicates actively (i.e., starts conversations) with team members.



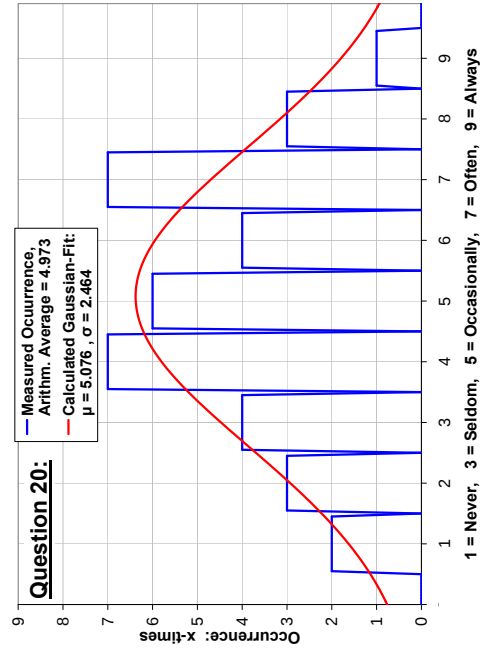
(a) Self-Appraisal: Question 17.



(c) Self-Appraisal: Question 19.



(b) Self-Appraisal: Question 18.



(d) Self-Appraisal: Question 20.

Figure C.56: Question 17: Acknowledges her/his own mistakes and takes corrective action.

Question 18: Discloses thoughts and feelings to group members.

Question 19: Gives team members honest and fair answers.

Question 20: Does not worry about jeopardizing relationships when correcting mistakes.

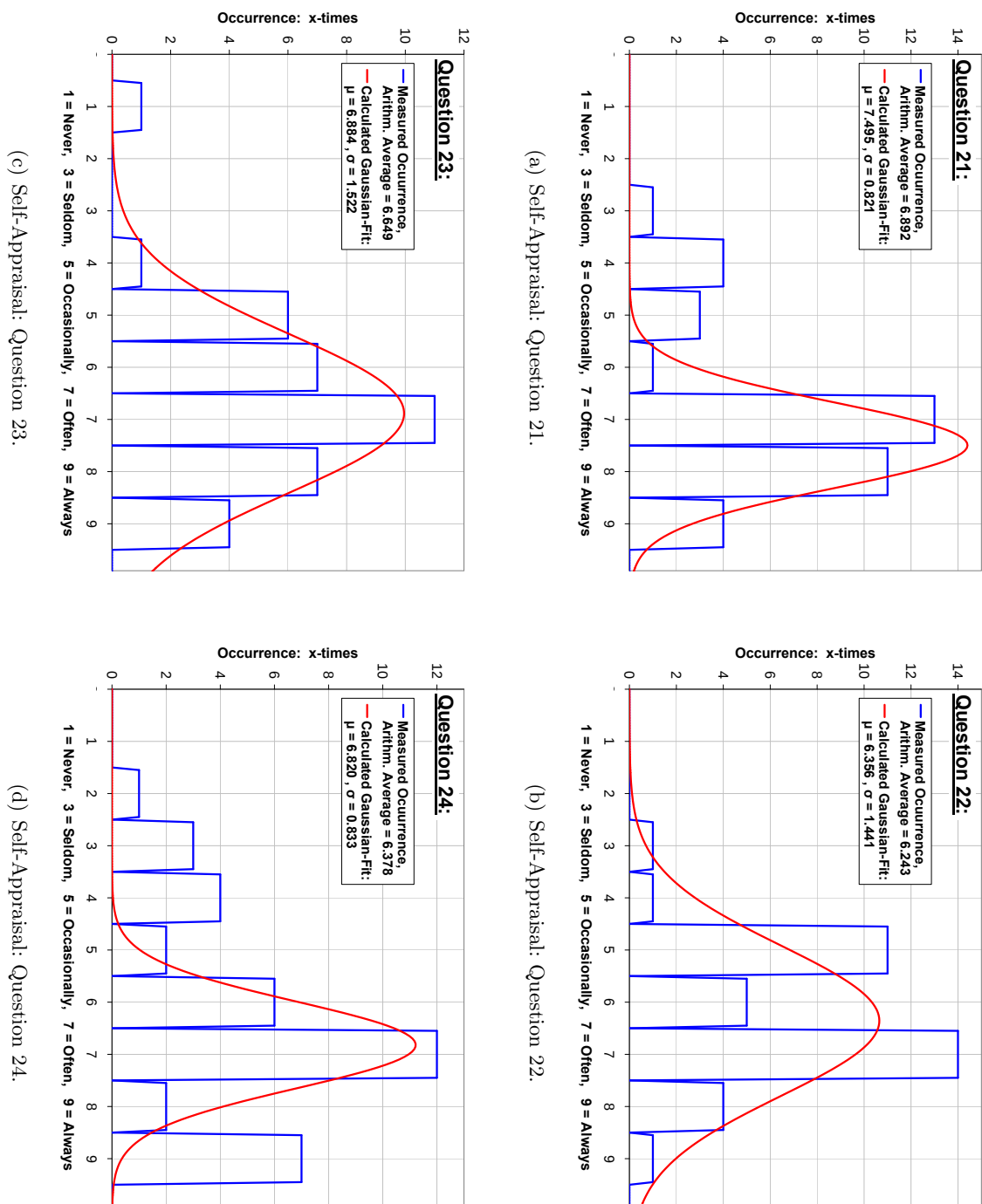


Figure C.57: Question 21: Honors other people's (personal) boundaries.

Question 22: Regularly achieves "win-win" outcomes.

Question 23: Identifies and promotes opportunities for collaboration.

Question 24: Is concerned with how her/his decisions affect the lives of others.

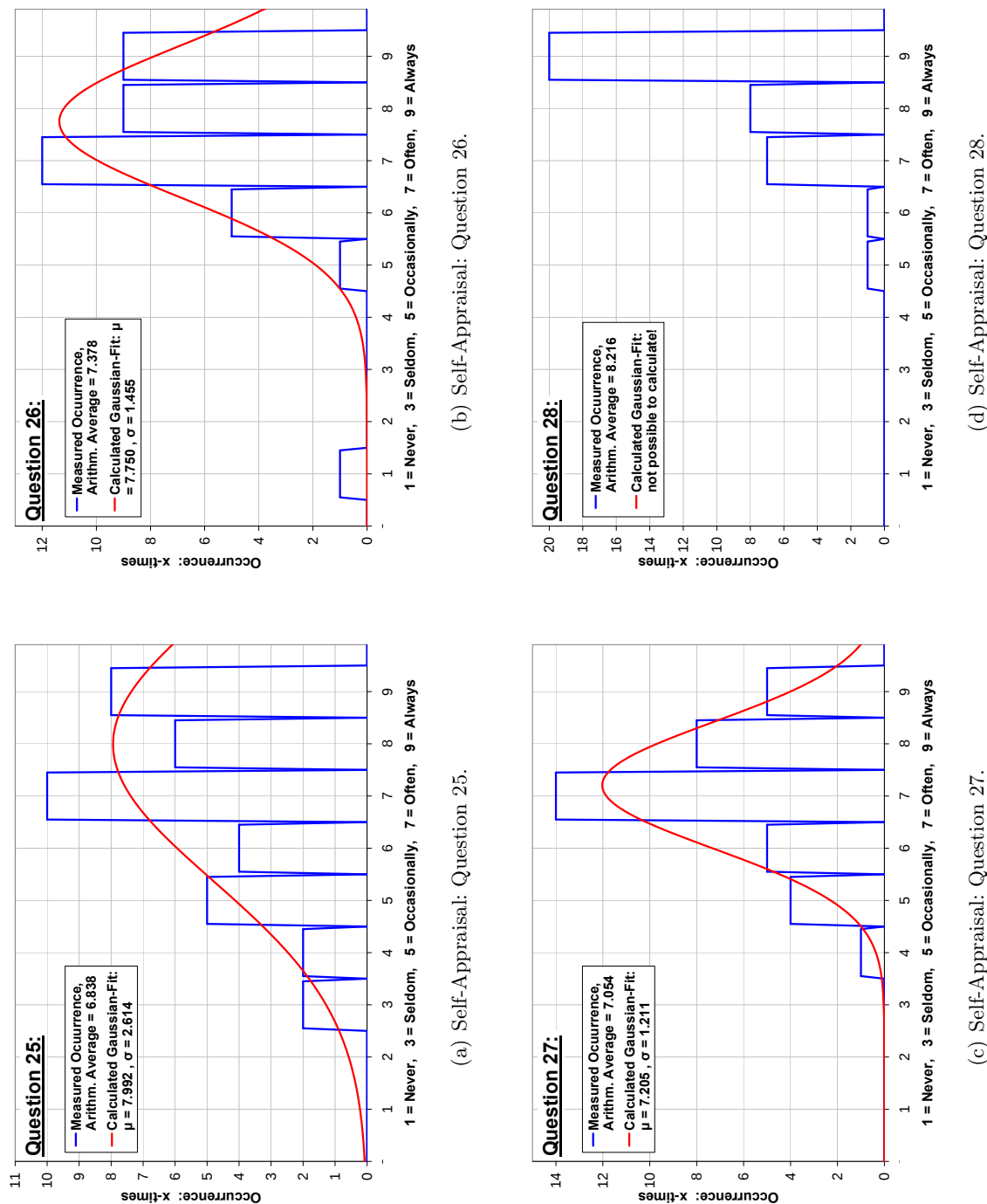


Figure C.58: Question 25: Sets high and clear standards for others by her/his own behavior.
Question 26: Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.
Question 27: Models positive team attributes such as mutual respect, open communication, and full participation.
Question 28: Has high moral standards. Can be trusted with confidential information.

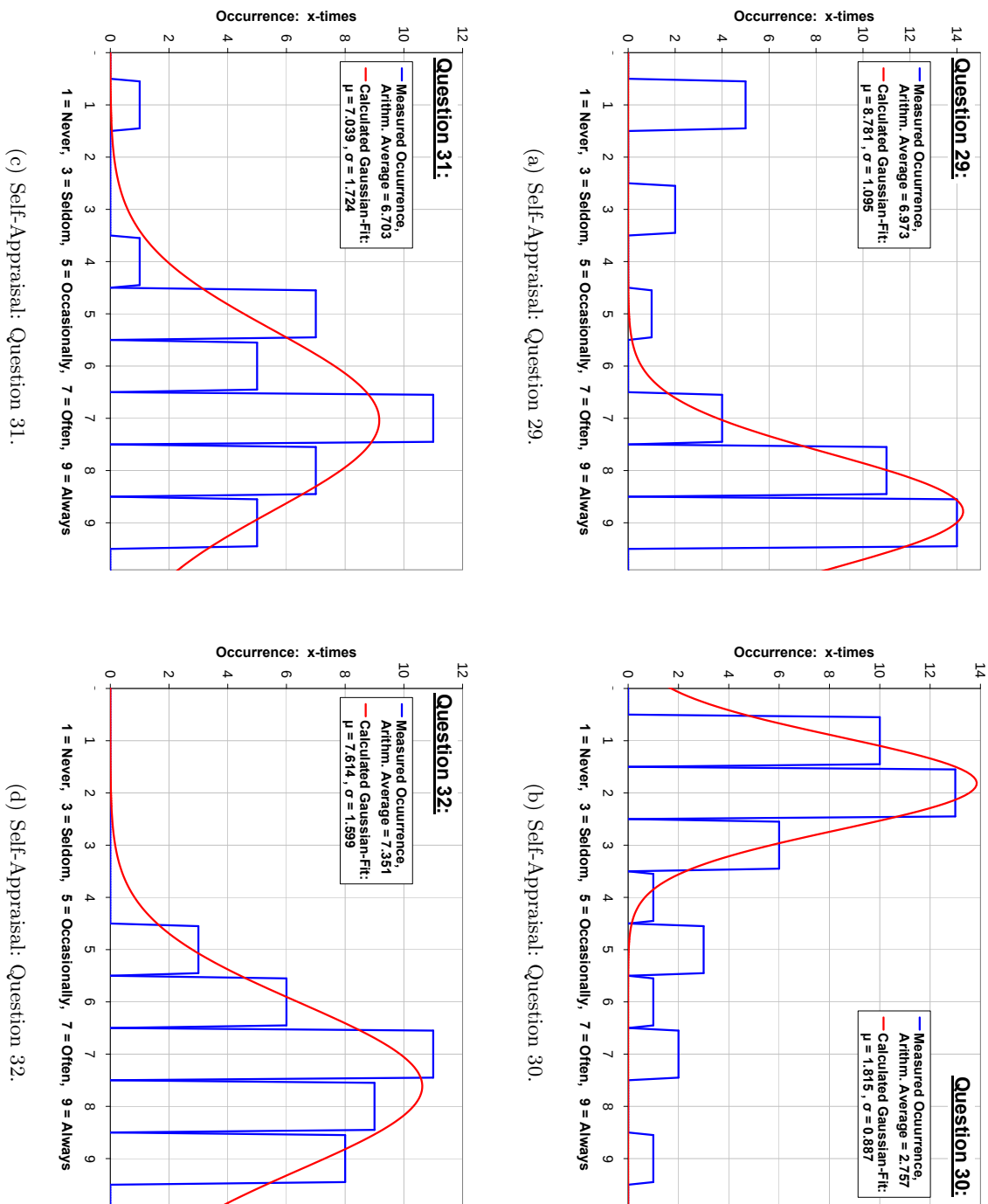
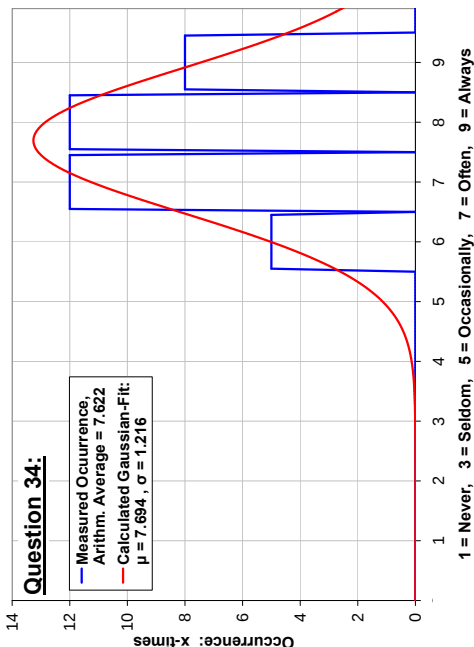


Figure C.59: Question 29: Would never try to take credit for other people's ideas.

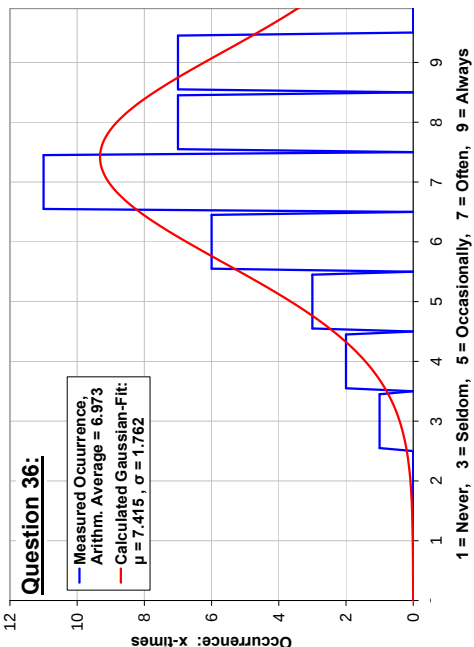
Question 30: Shows favoritism (in an unfair amount) towards some people.

Question 31: Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.

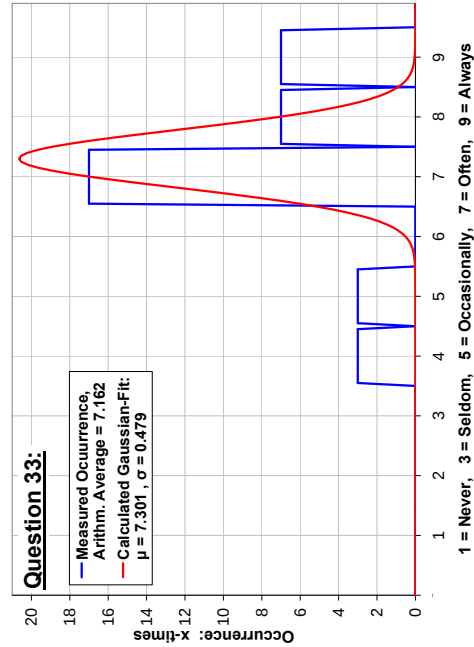
Question 32: Possesses awareness of her/his own strengths and weaknesses.



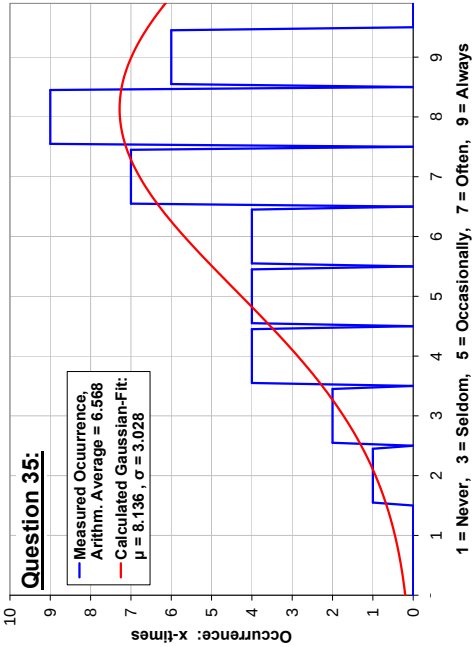
(a) Self-Appraisal: Question 33.



(b) Self-Appraisal: Question 34.

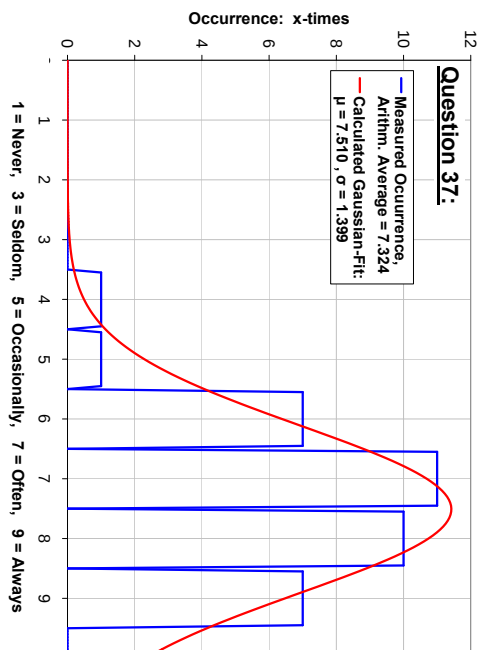


(c) Self-Appraisal: Question 35.

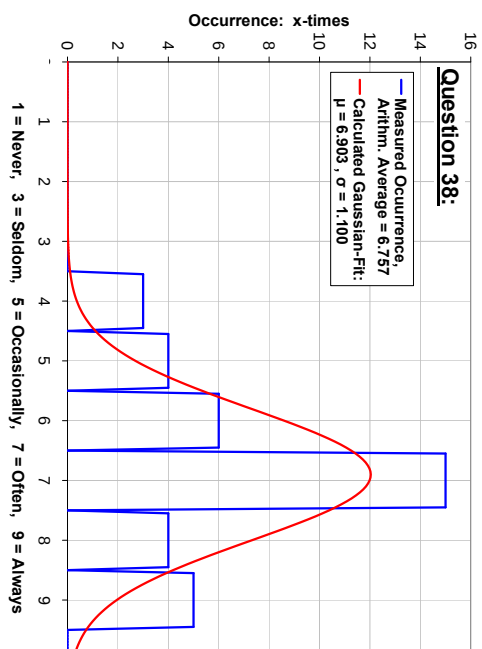


(d) Self-Appraisal: Question 36.

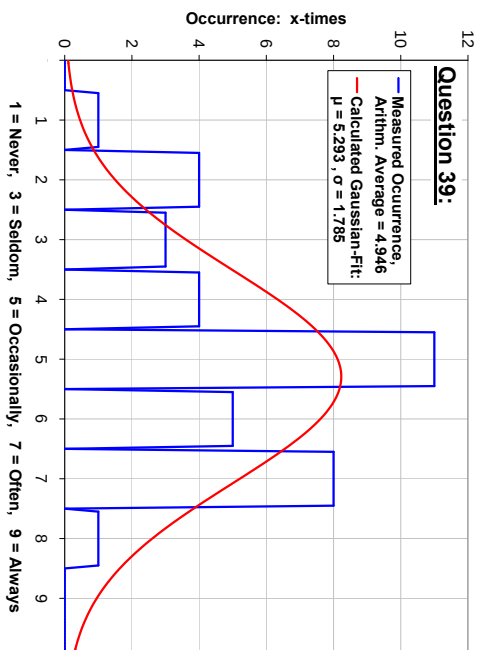
Figure C.60: *Question 33: Is open to feedback from others. Encourages others to give feedback.*
Question 34: Learns from own experiences and also those of others. Seeks opportunities for self-development.
Question 35: Speaks up even when her/his opinion is in the minority.
Question 36: Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.



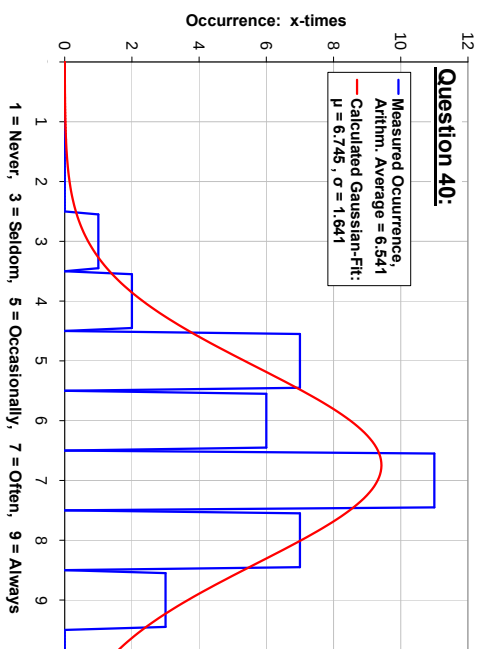
(a) Self-Appraisal: Question 37.



(b) Self-Appraisal: Question 38.



(c) Self-Appraisal: Question 39.

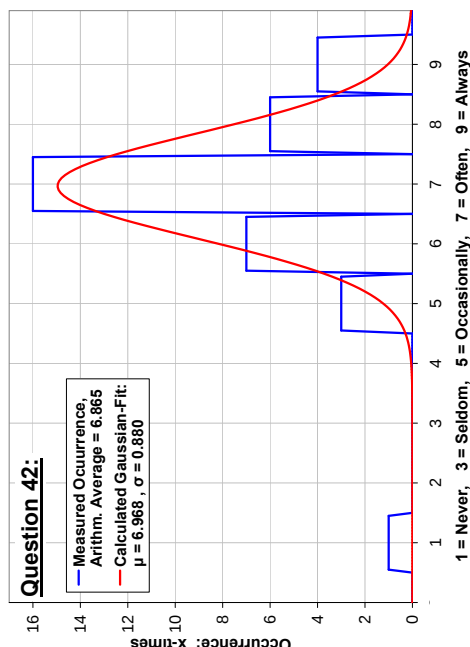


(d) Self-Appraisal: Question 40.

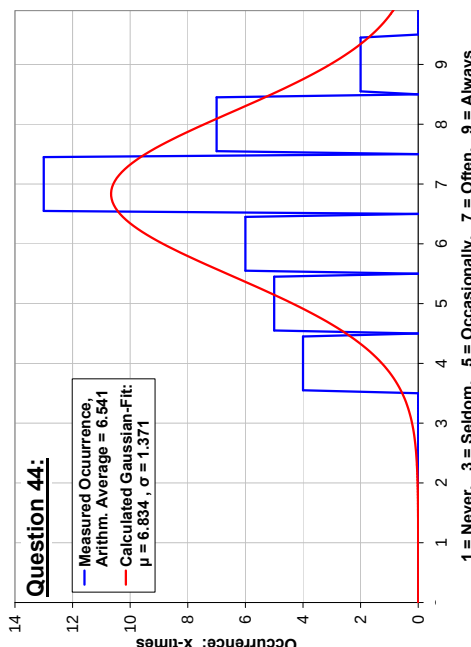
Figure C.61: *Question 37: Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.*
Question 38: Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.

Question 39: Makes decisions that are based only on his/her own ideas.

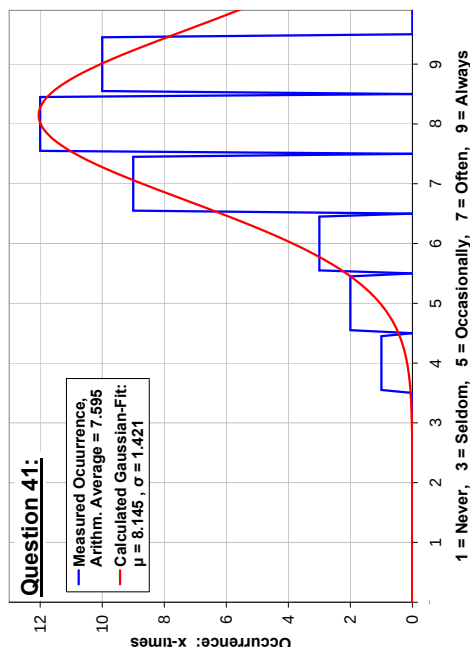
Question 40: Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.



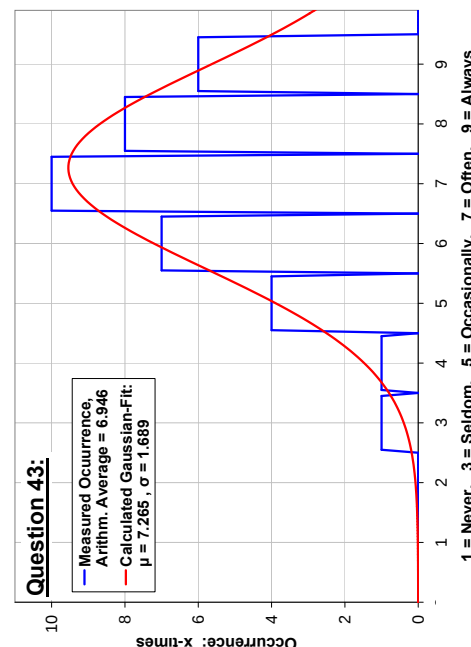
(b) Self-Appraisal: Question 42.



(d) Self-Appraisal: Question 44.



(a) Self-Appraisal: Question 41.



(c) Self-Appraisal: Question 43.

Figure C.62: *Question 41: When things go wrong, the main concern is to fix it, not to lay blame.*
Question 42: Is capable of juggling multiple demands.
Question 43: Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.
Question 44: Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).

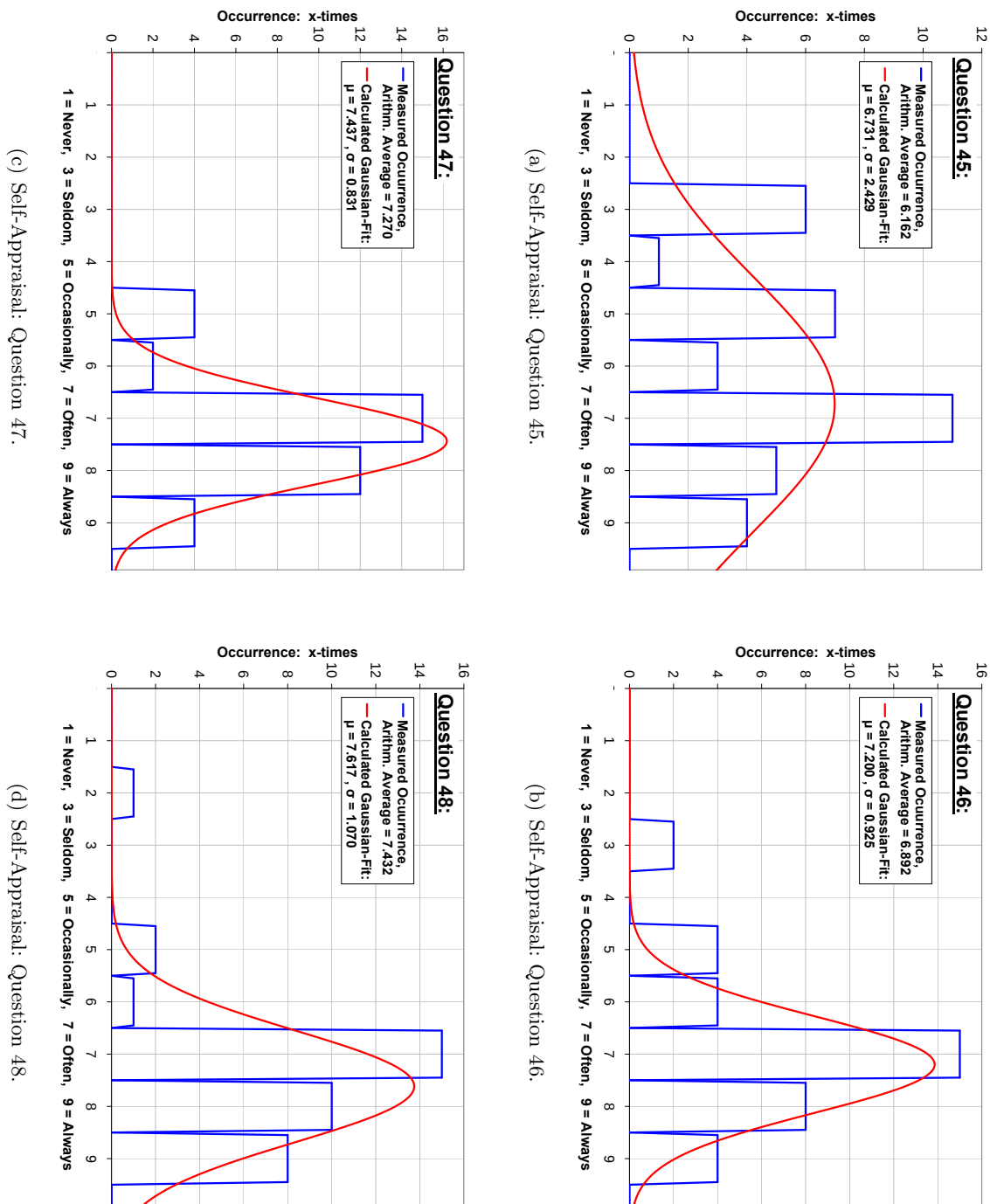


Figure C.63: Question 45: Likes to share her/his leadership power with subordinates.

Question 46: There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.

Question 47: The team members feel a real responsibility to make things work.

Question 48: Acknowledges others for their contributions and celebrates in their successes.

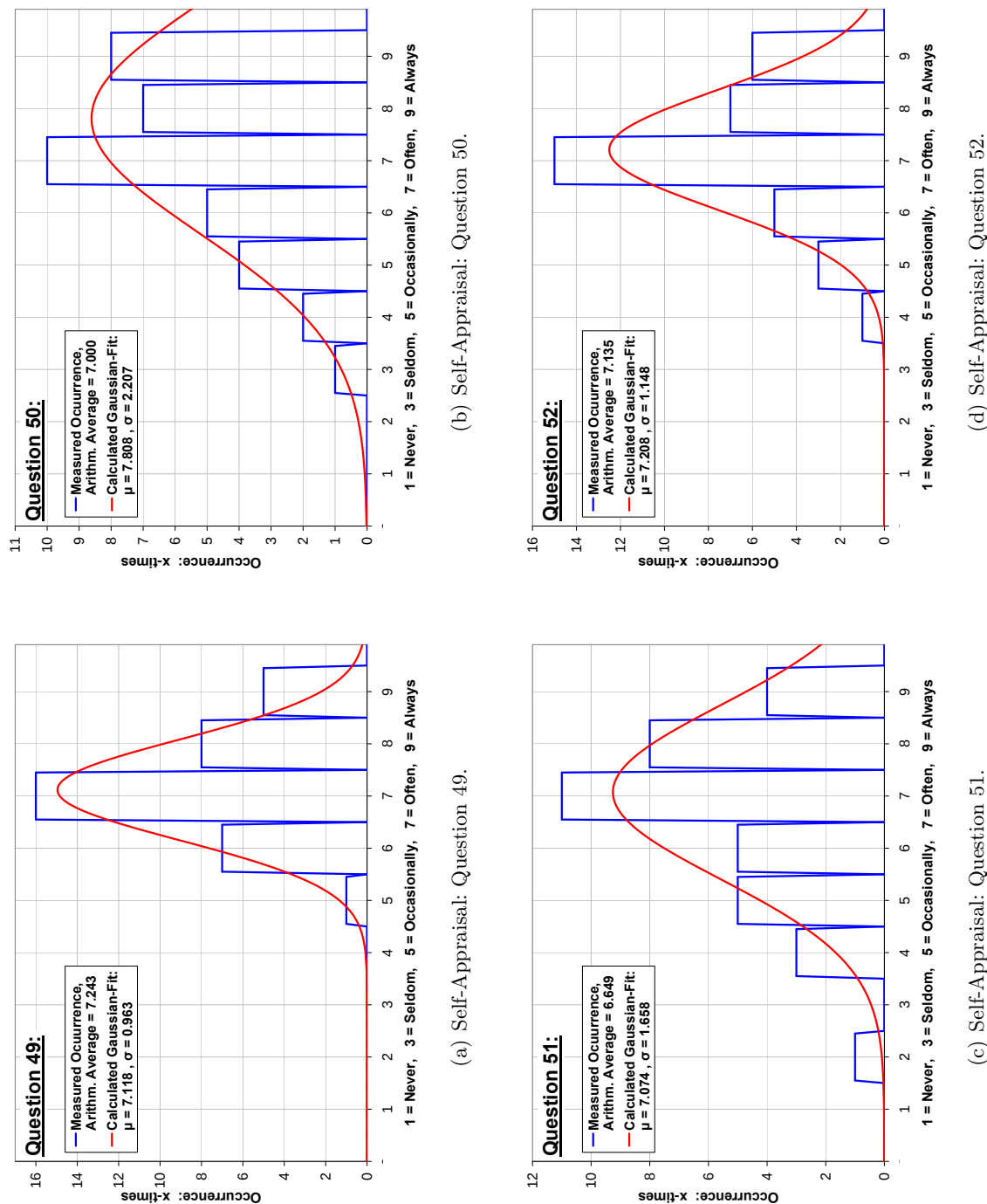


Figure C.64: Question 49: Recognizes the potential of her/his team members.
Question 50: Pays attention to team's performance. Supports and gives feedback.
Question 51: Likes to use her/his leadership power to help subordinates grow.
Question 52: Develops others by explaining or demonstrating relevant skills.

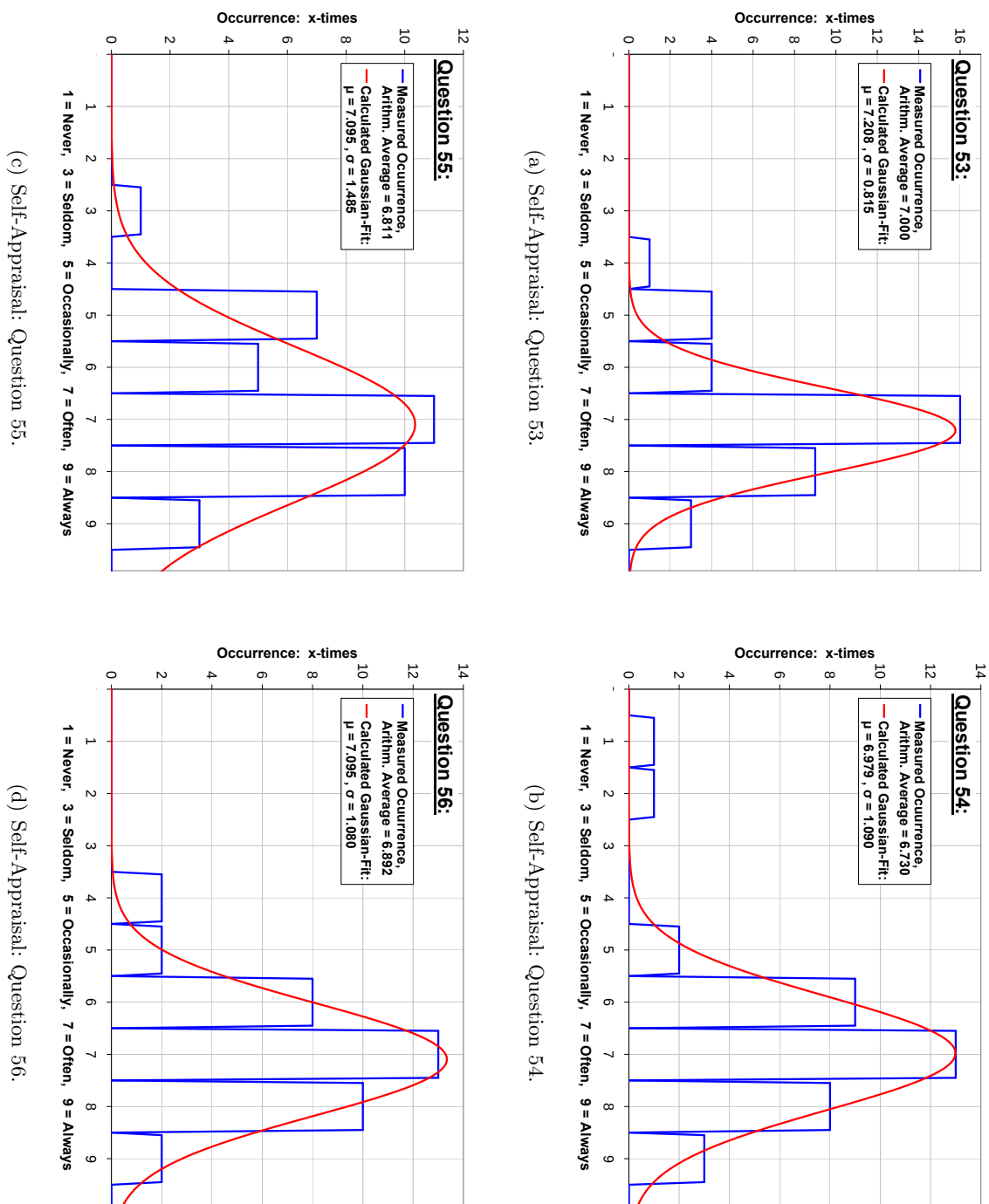
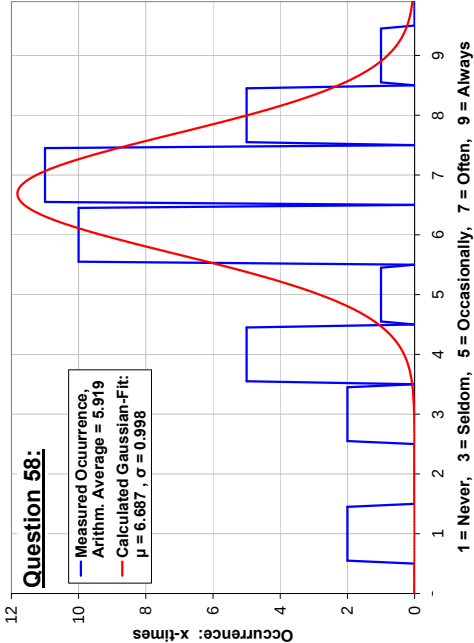


Figure C.65: Question 53: Encourages team members to solve problems on their own.

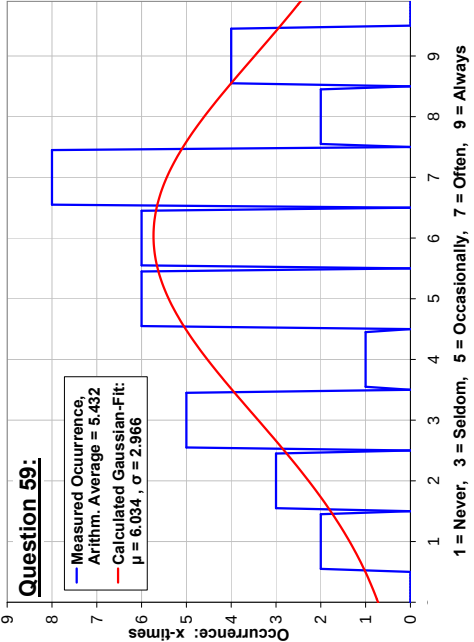
Question 54: Helps the team to focus on goals and objectives.

Question 55: Gets team members to look at problems from many different angles.

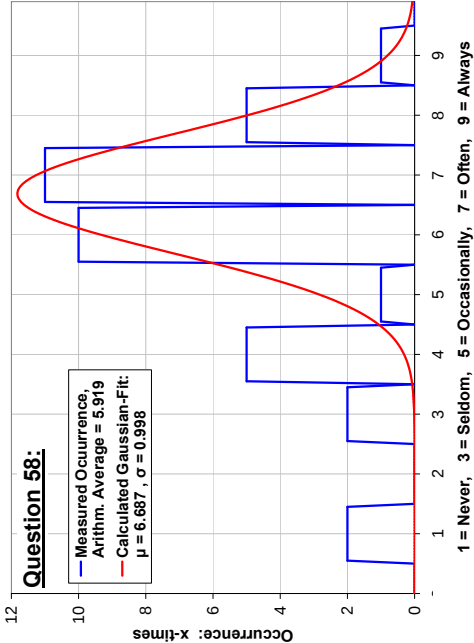
Question 56: Identifies causes of resistance and finds ways to overcome them.



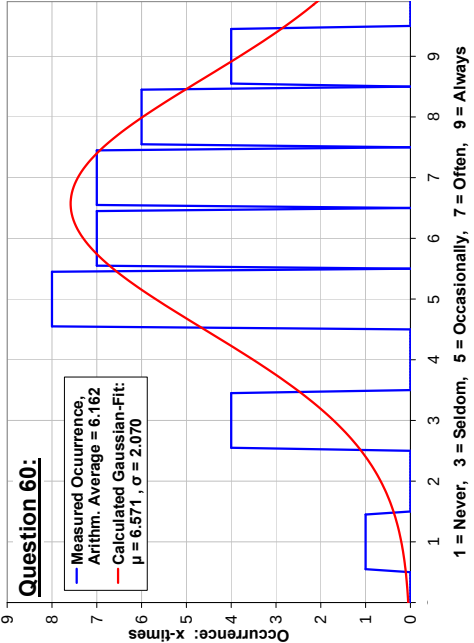
(a) Self-Appraisal: Question 57.



(c) Self-Appraisal: Question 59.



(b) Self-Appraisal: Question 58.



(d) Self-Appraisal: Question 60.

Figure C.66: Question 57: Spends time effectively teaching or mentoring team members.
Question 58: Explains how the team fits into the project or company objectives.
Question 59: Explains the purpose of the company's policies to the team.
Question 60: Explains rules and expectations.

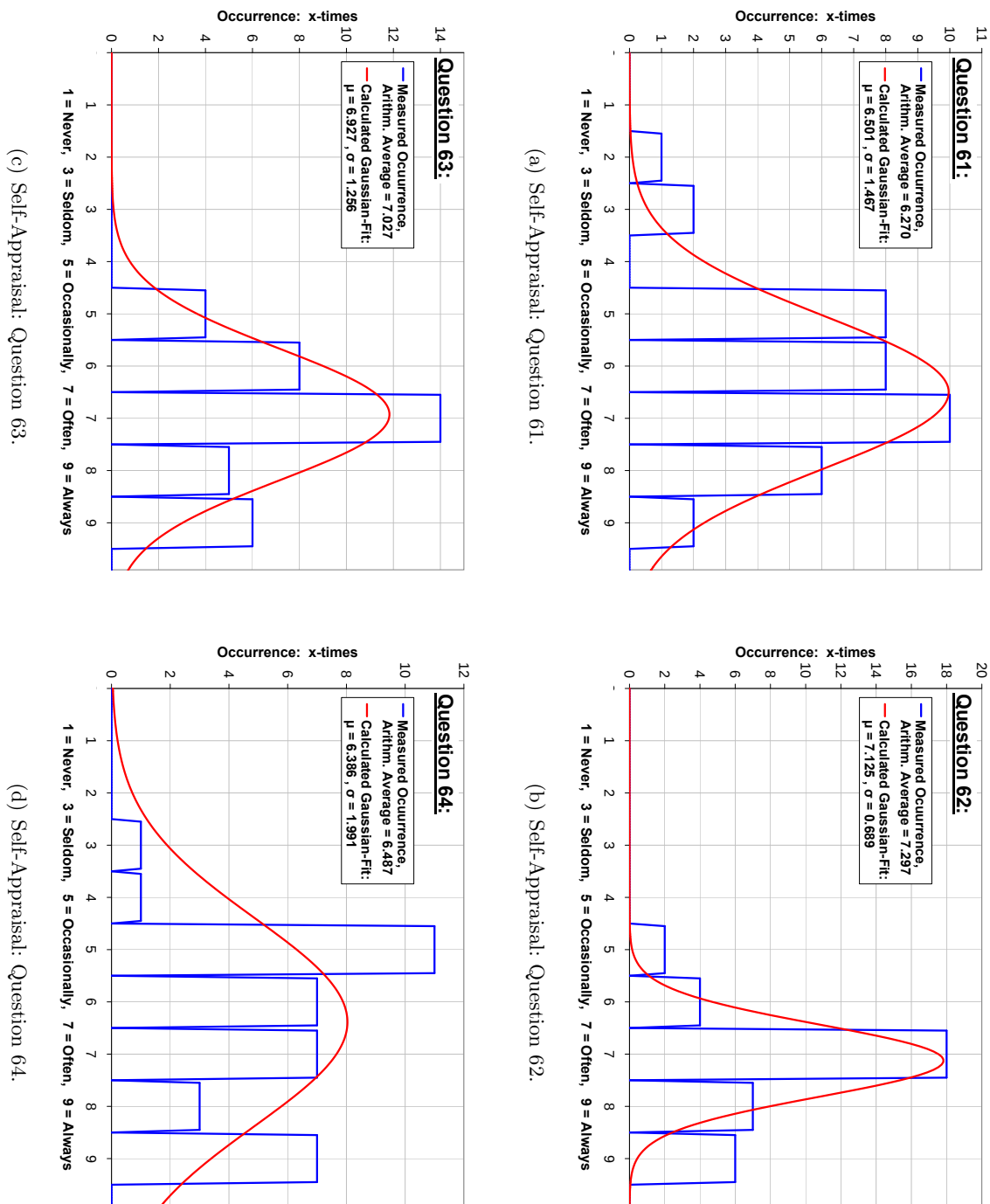
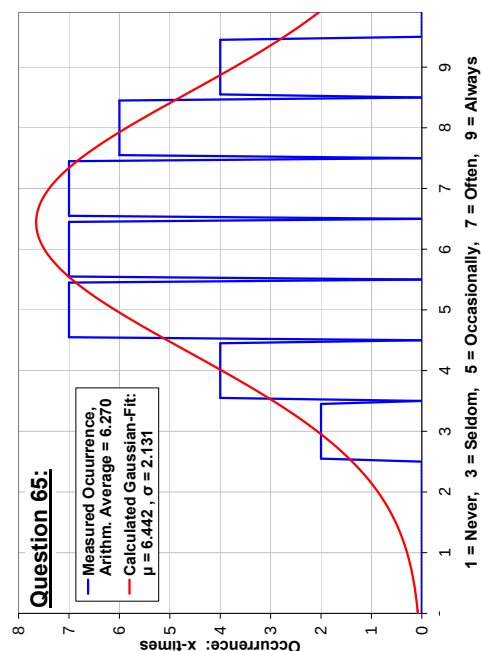


Figure C.67: Question 61: Explains (personal and company) decisions, actions, and goals.

Question 62: Openly shares information with others.

Question 63: Deals with issues in a straightforward manner.

Question 64: Able to calm others in stressful situations.

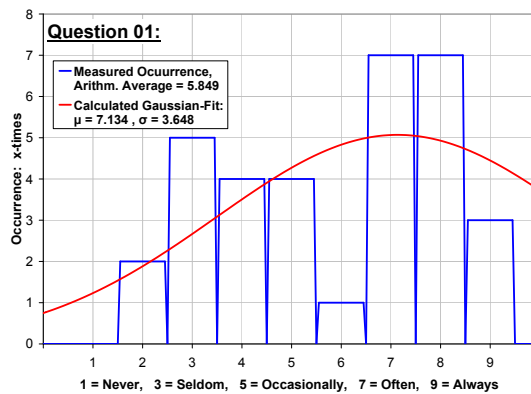


(a) Self-Appraisal: Question 65.

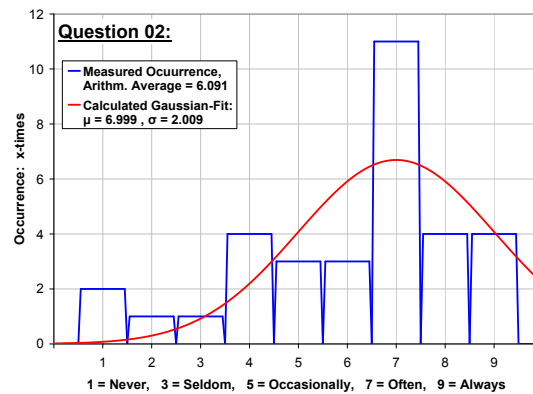
Figure C.68: *Question 65: Handles difficult people and situations effectively.*

C.5 Supervisor

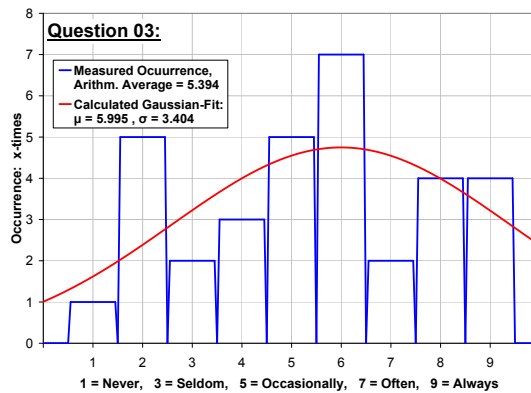
The Supervisor group contains the data for supervisors and team leaders of the participants collected by the questionnaires. The obtained occurrence values for the supervisor (or team-leader) were summed up for each question and performance category and visually presented in the following graphs.



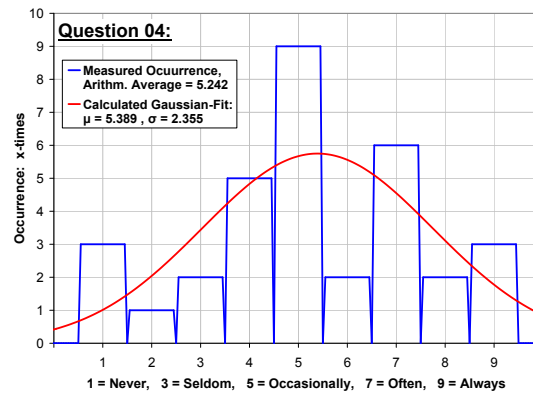
(a) Supervisor: Question 01.



(b) Supervisor: Question 02.



(c) Supervisor: Question 03.



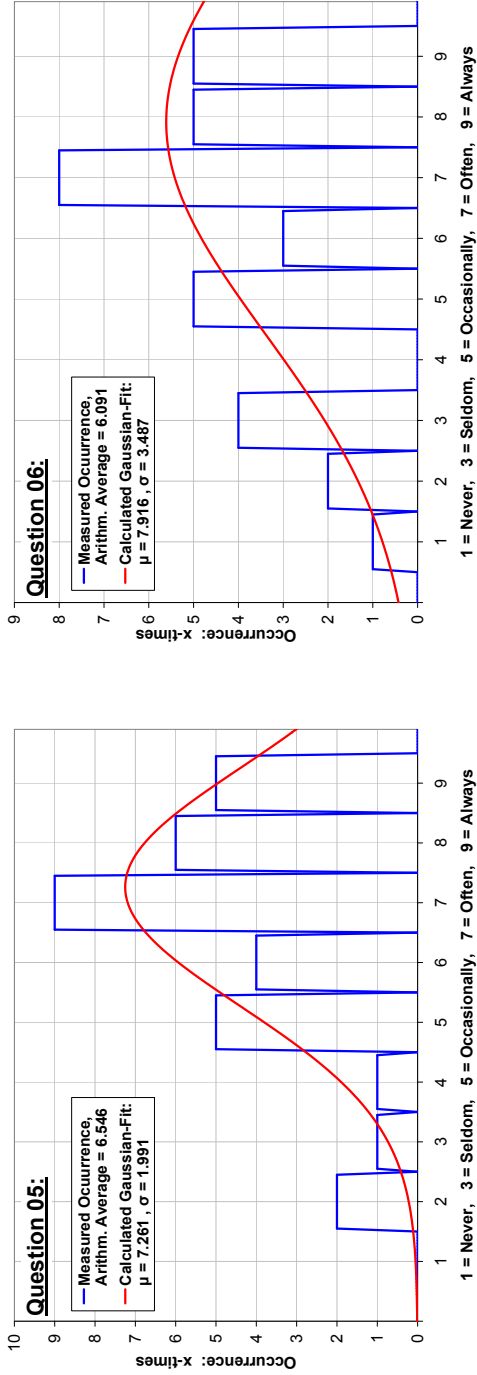
(d) Supervisor: Question 04.

Figure C.69: Question 01: Let team members know what they are supposed to do: shifts, detailed tasks, etc. (develops and suggests a plan of action for the group).

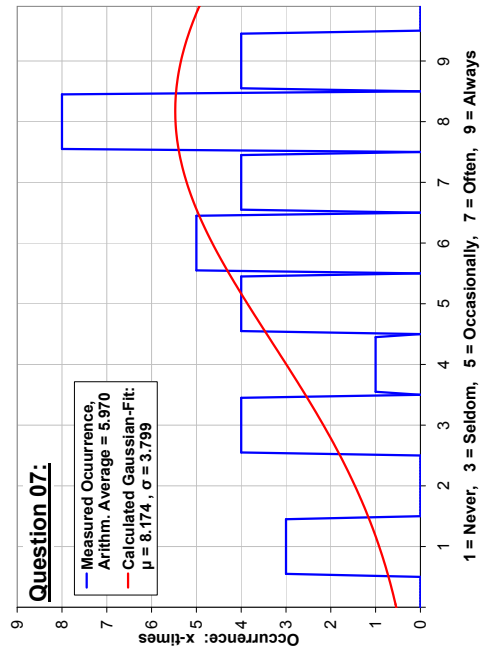
Question 02: Makes suggestions about how to solve problems and sets standards of performance for group members.

Question 03: Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.

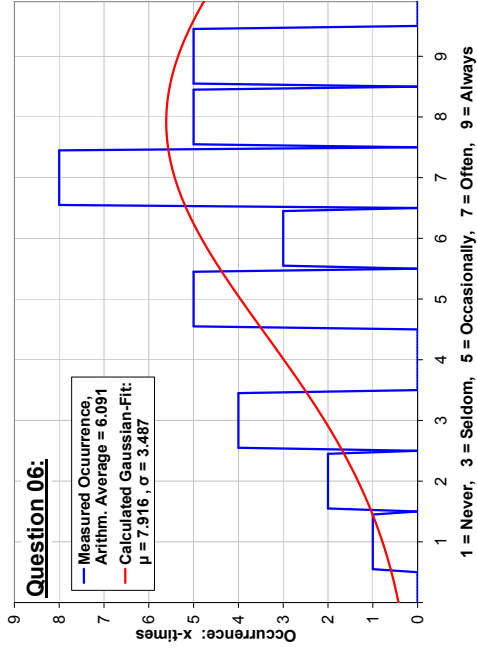
Question 04: Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.



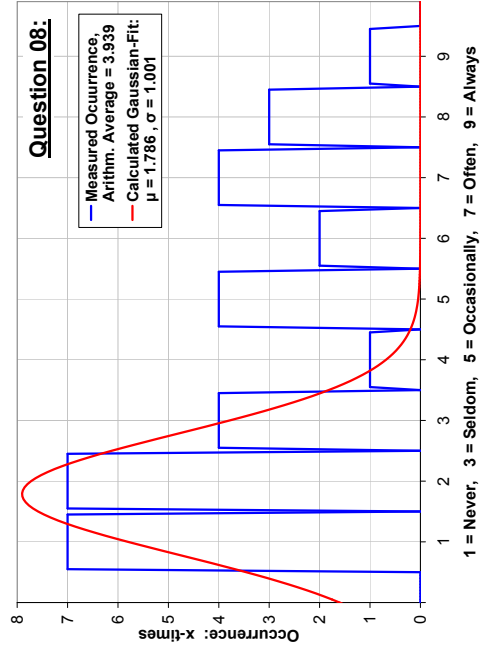
(a) Supervisor: Question 05.



(c) Supervisor: Question 07.



(b) Supervisor: Question 06.



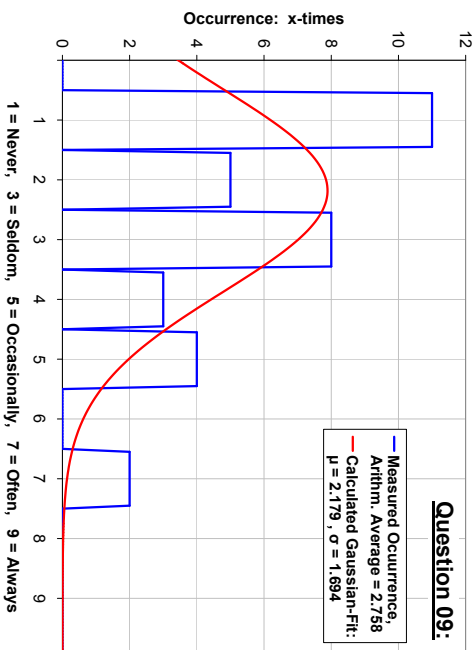
(d) Supervisor: Question 08.

Figure C.70: Question 05: Recognizes what needs to be done and takes the initiative to make it happen.

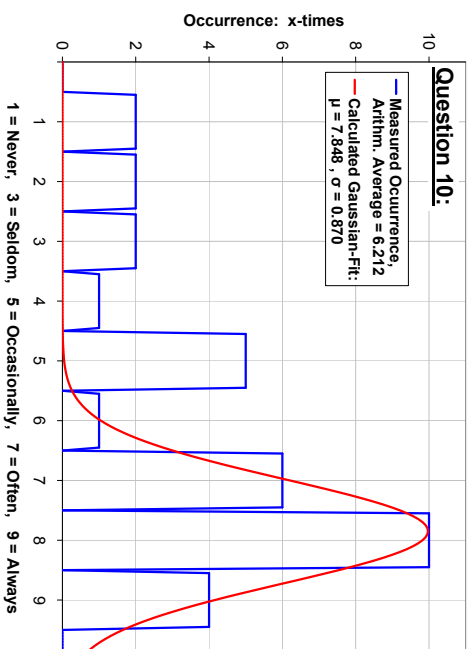
Question 06: Prioritizes key objectives and focuses the groups activity on them.

Question 07: Effectively allocates available resources, e.g., time, people, money.

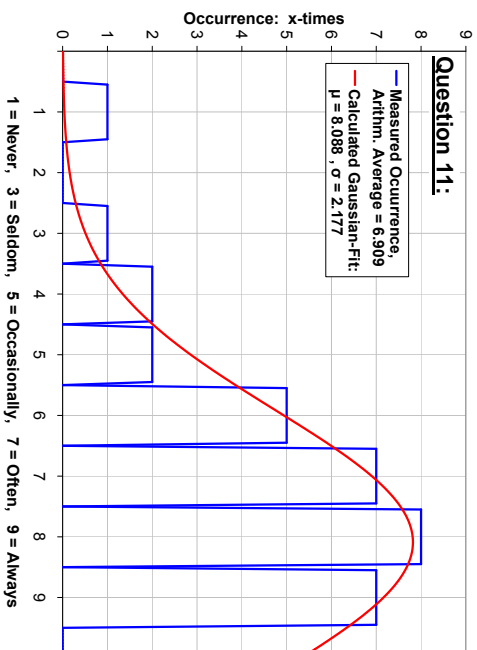
Question 08: Gives vague or misleading explanations to team members.



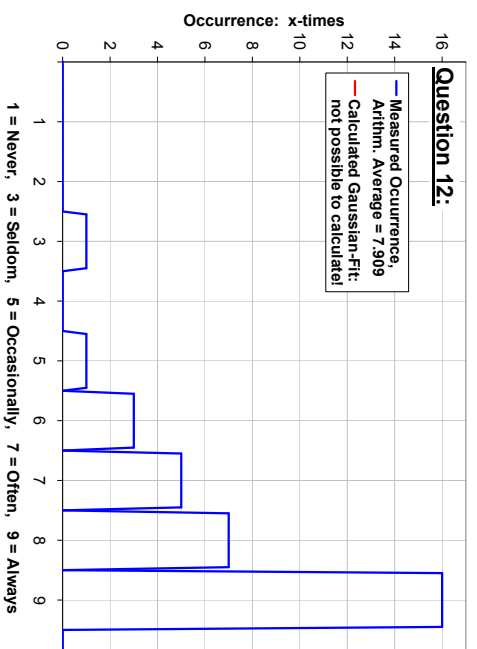
(a) Supervisor: Question 09.



(b) Supervisor: Question 10.



(c) Supervisor: Question 11.



(d) Supervisor: Question 12.

Figure C.71: Question 09: Makes NO suggestions (because she/he has no clue at all).

Question 10: Enjoys getting into the details of how things work.

Question 11: Is good at making things work and completing the assigned tasks.

Question 12: Knows and understands how to do basic things.

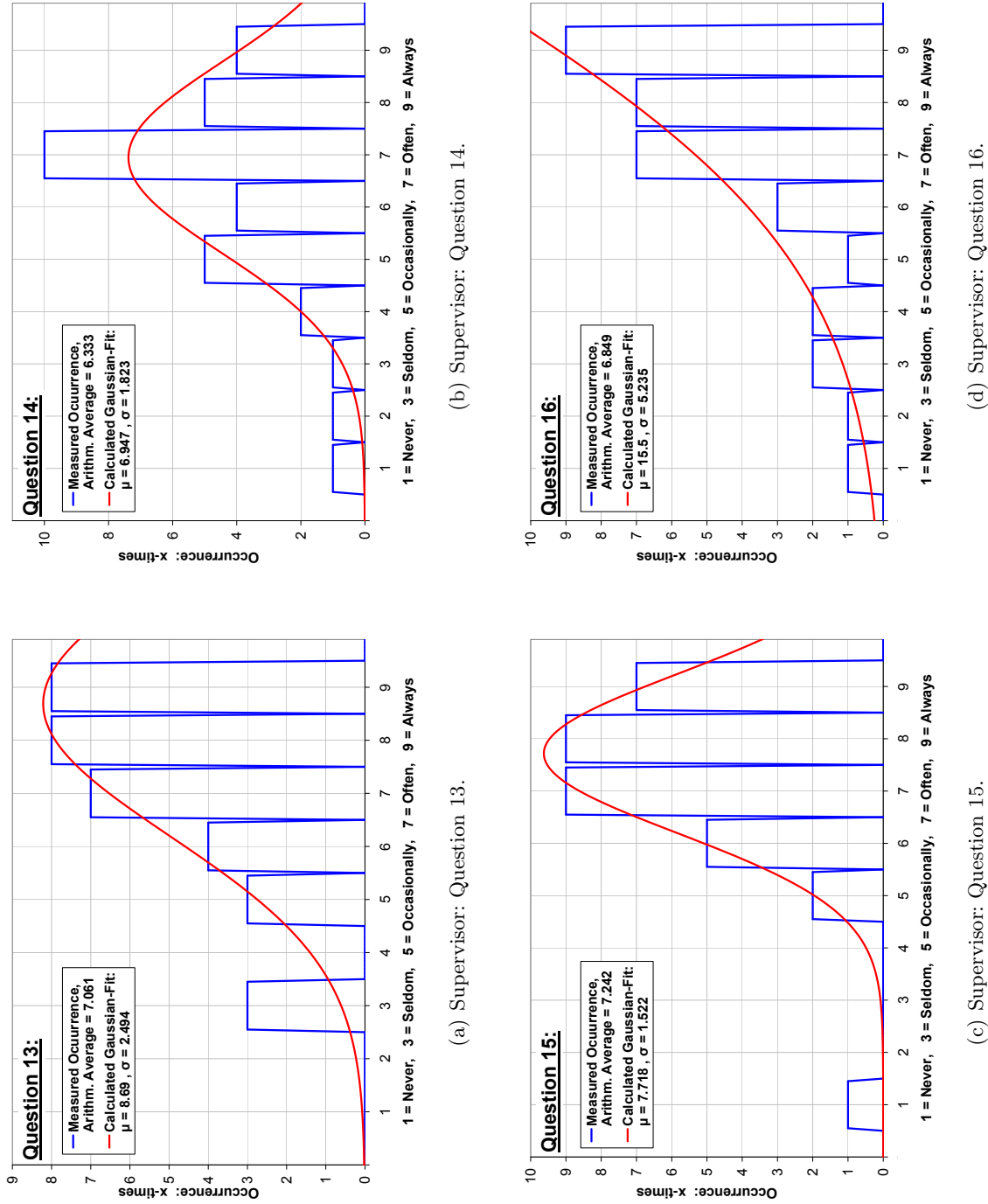


Figure C.72: *Question 13: Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.*

Question 14: Knows (exactly and in detail) what work is being done in the team.

Question 15: Treats people as equals, fairly and consistently (behaves predictably).

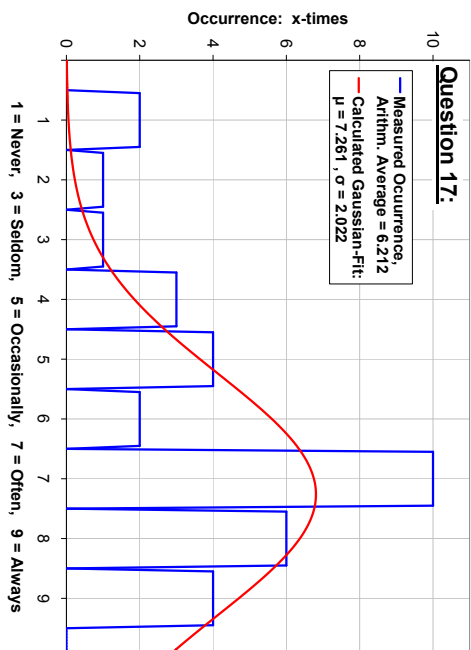
Question 16: Communicates actively (i.e., starts conversations) with team members.

Figure C.73: *Question 17: Acknowledges her/his own mistakes and takes corrective action.*

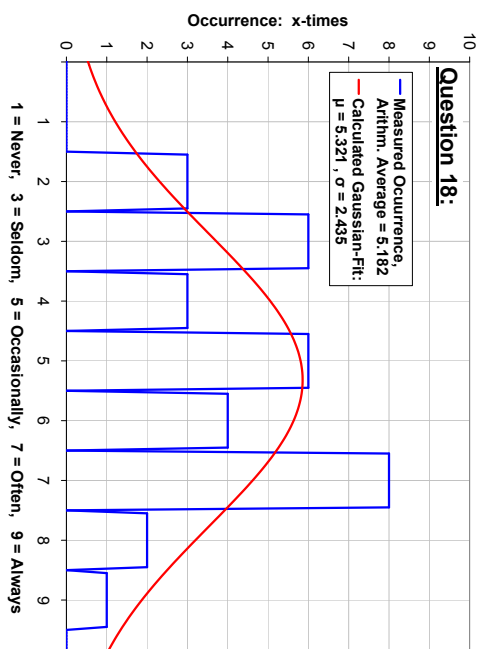
Question 18: Discloses thoughts and feelings to group members.

Question 19: Gives team members honest and fair answers.

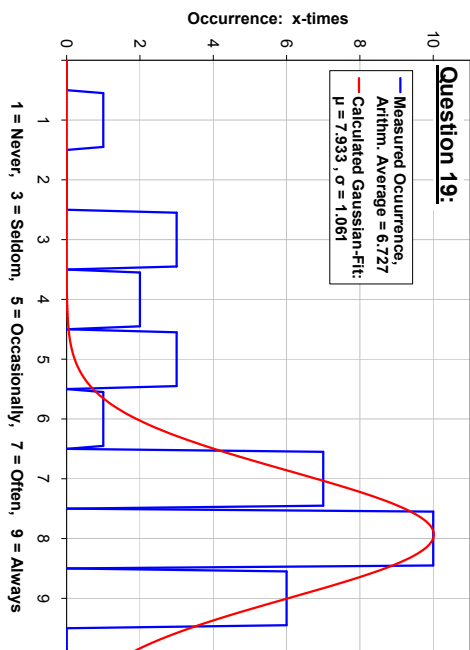
Question 20: Does not worry about jeopardizing relationships when correcting mistakes.



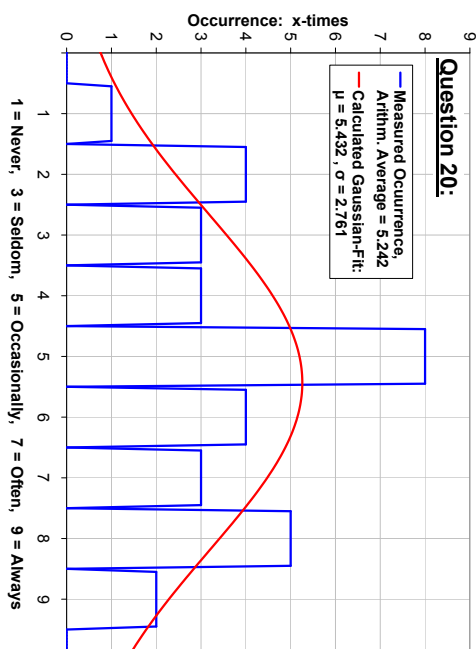
(a) Supervisor: Question 17.



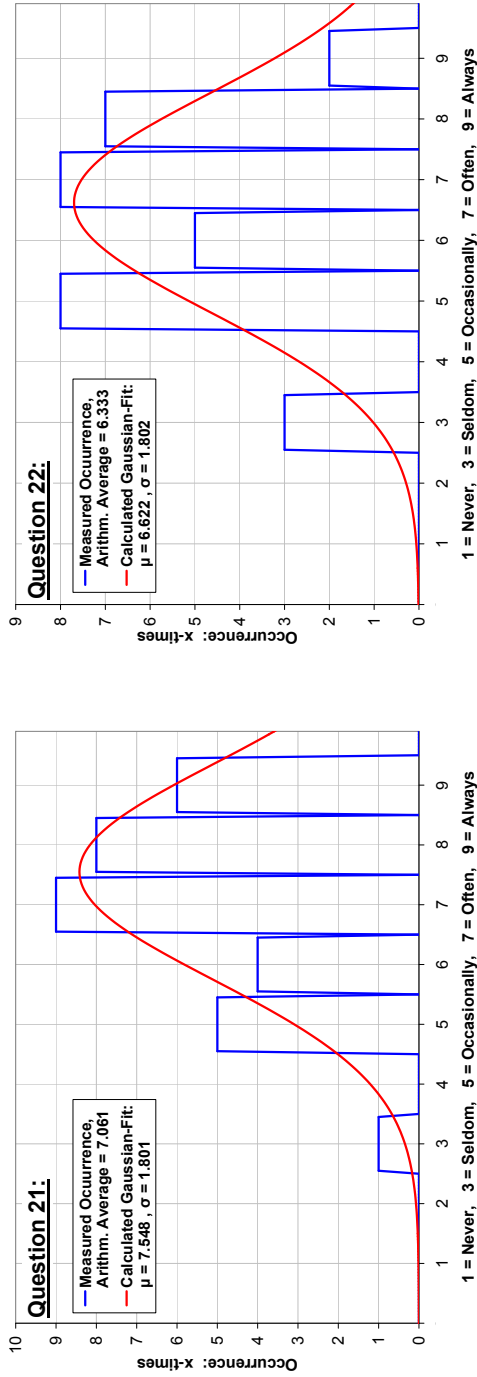
(b) Supervisor: Question 18.



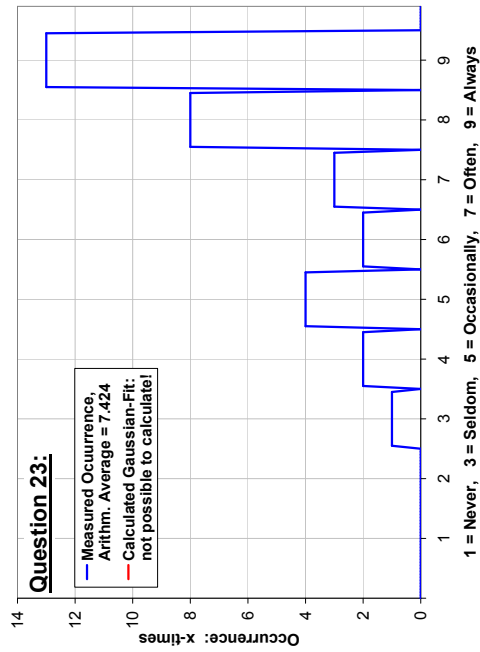
(c) Supervisor: Question 19.



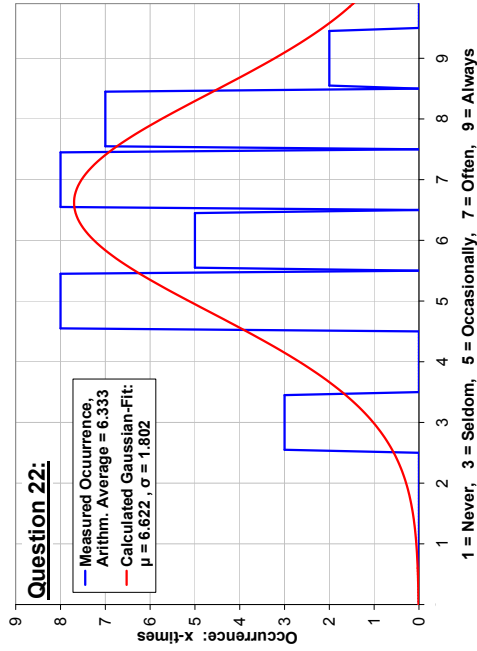
(d) Supervisor: Question 20.



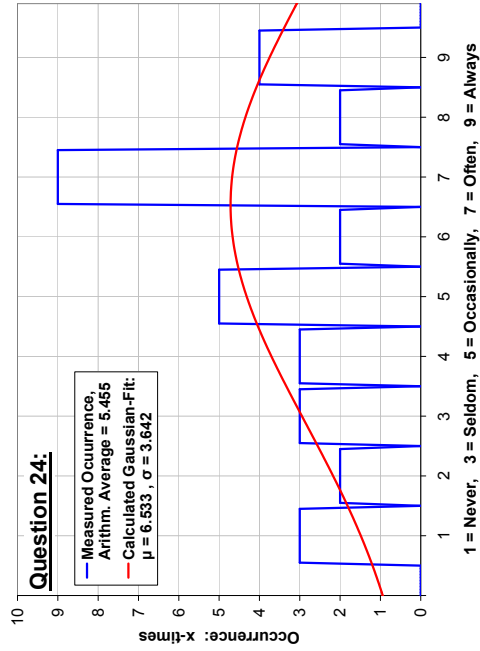
(a) Supervisor: Question 21.



(c) Supervisor: Question 23.



(b) Supervisor: Question 22.



(d) Supervisor: Question 24.

Figure C.74: Question 21: Honors other people's (personal) boundaries.

Question 22: Regularly achieves "win-win" outcomes.

Question 23: Identifies and promotes opportunities for collaboration.

Question 24: Is concerned with how her/his decisions affect the lives of others.

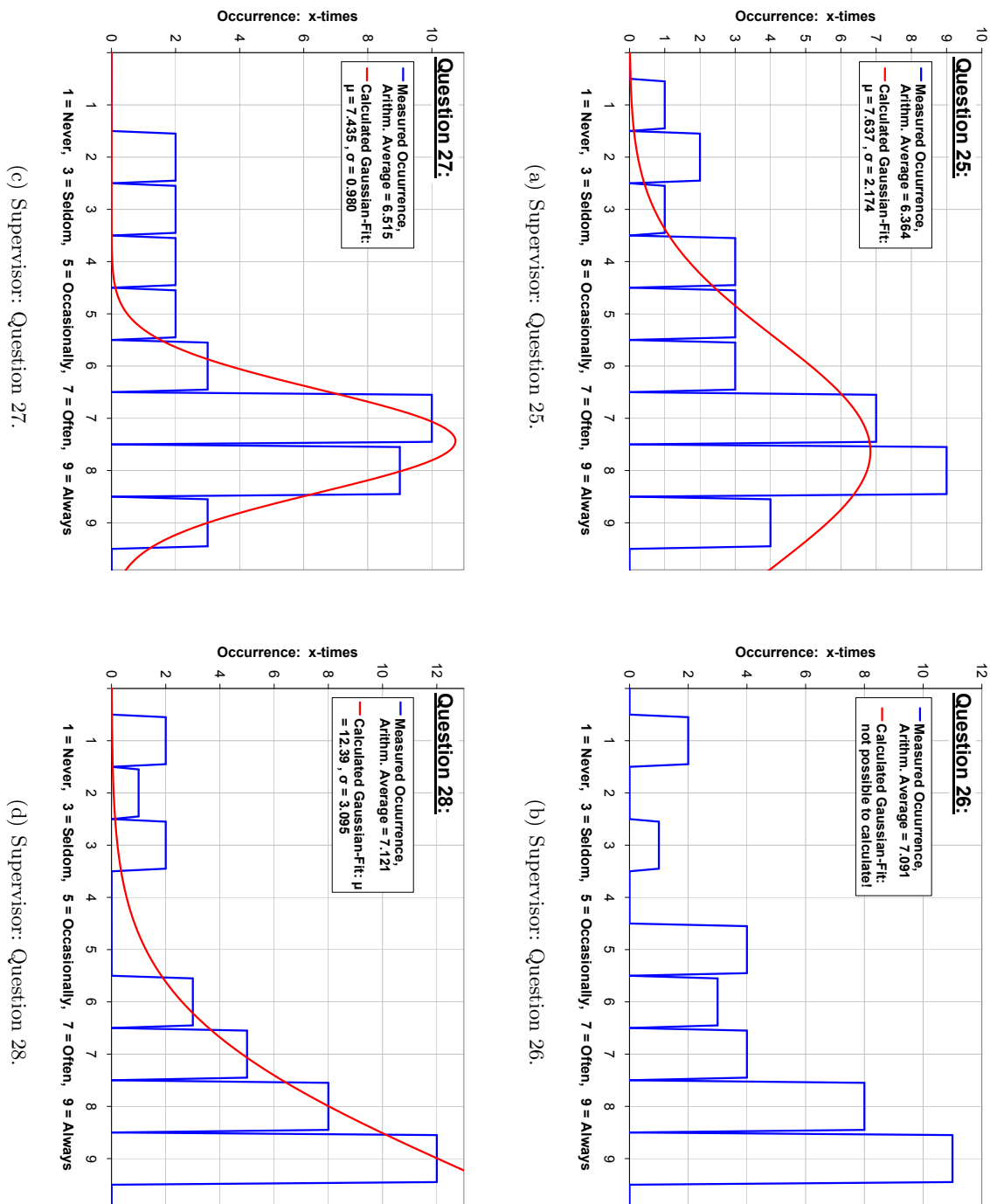
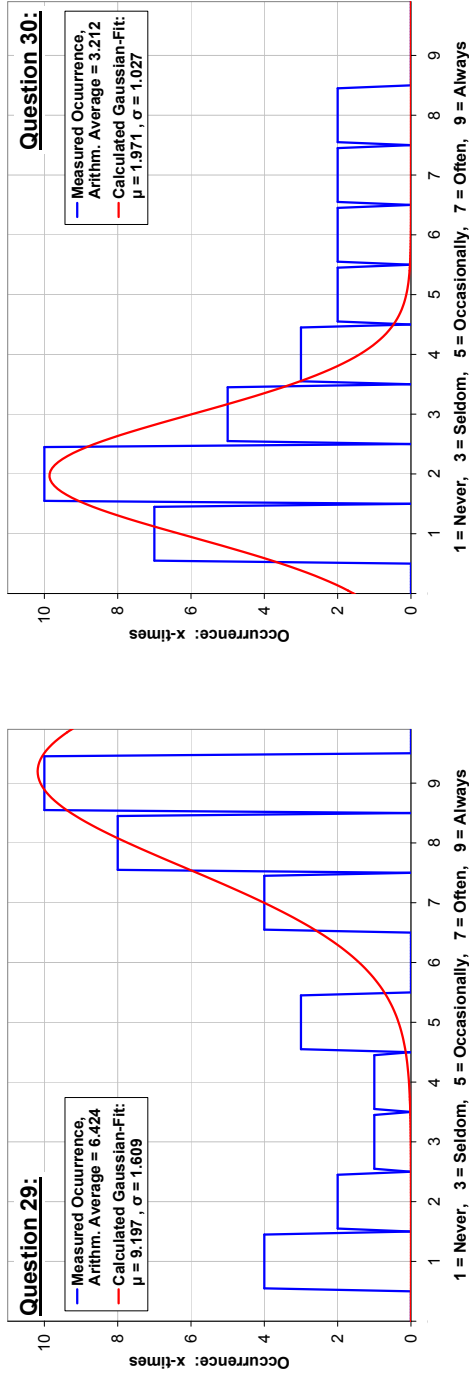


Figure C.75: Question 25: Sets high and clear standards for others by her/his own behavior.

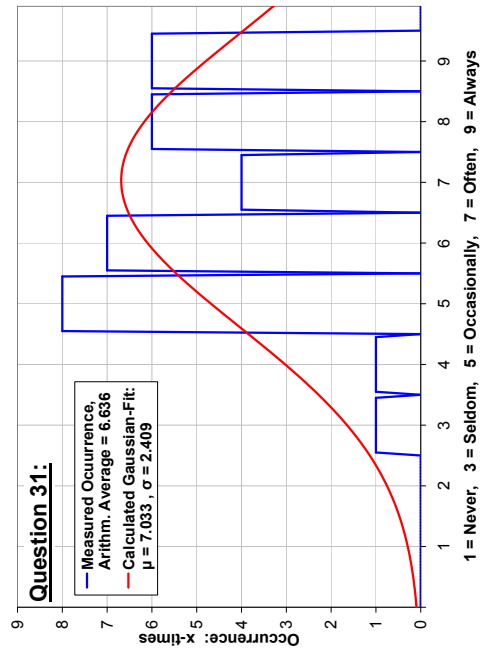
Question 26: Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.

Question 27: Models positive team attributes such as mutual respect, open communication, and full participation.

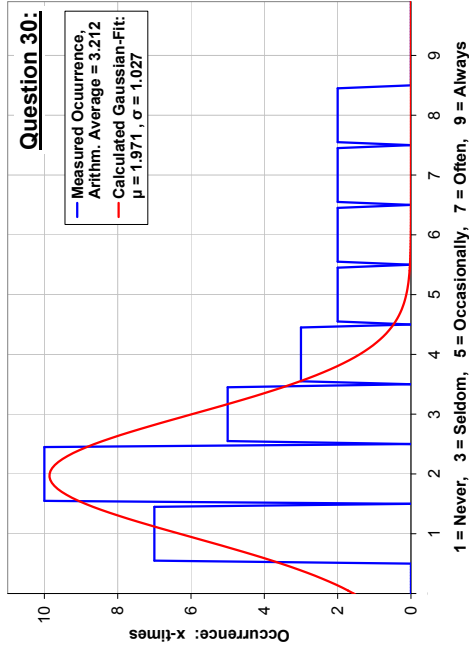
Question 28: Has high moral standards. Can be trusted with confidential information.



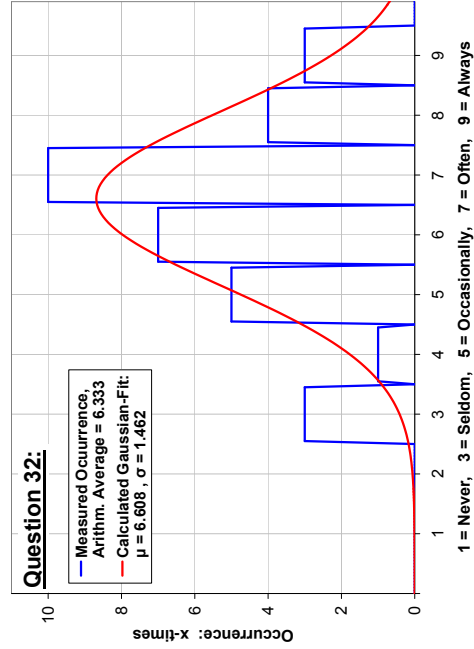
(a) Supervisor: Question 29.



(c) Supervisor: Question 31.



(b) Supervisor: Question 30.



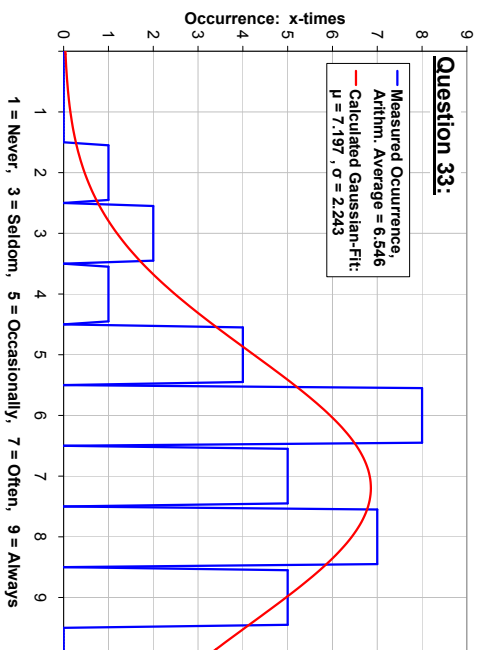
(d) Supervisor: Question 32.

Figure C.76: Question 29: Would never try to take credit for other people's ideas.

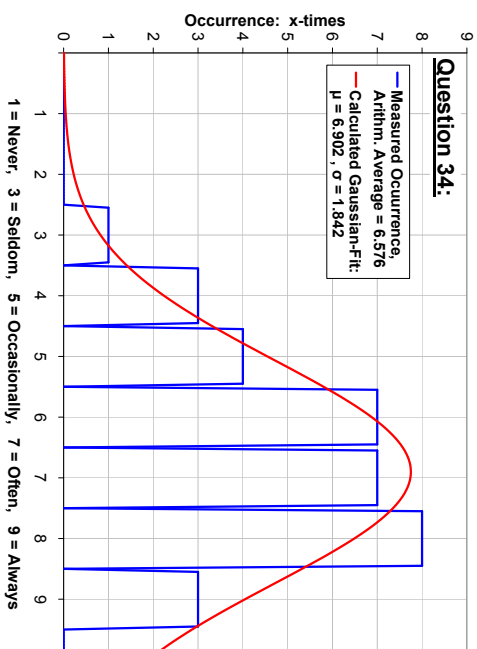
Question 30: Shows favoritism (in an unfair amount) towards some people.

Question 31: Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.

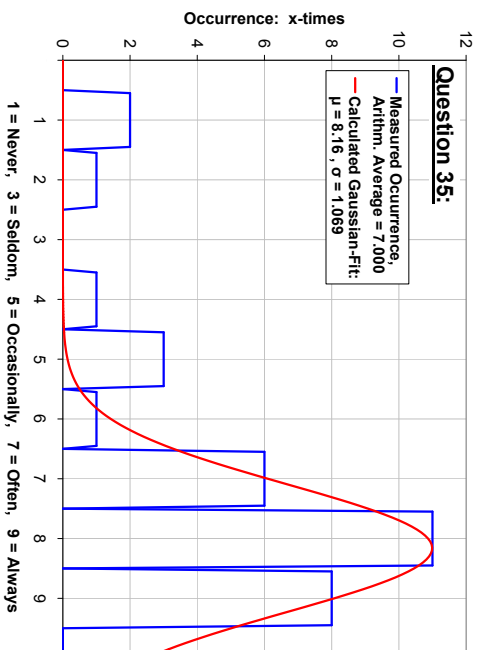
Question 32: Possesses awareness of her/his own strengths and weaknesses.



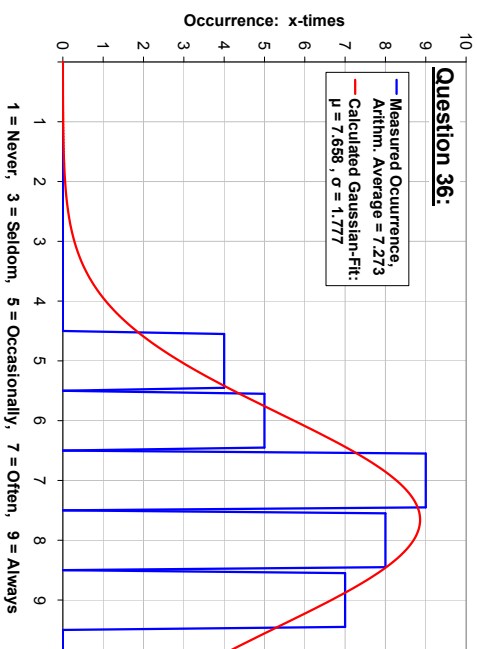
(a) Supervisor: Question 33.



(b) Supervisor: Question 34.



(c) Supervisor: Question 35.



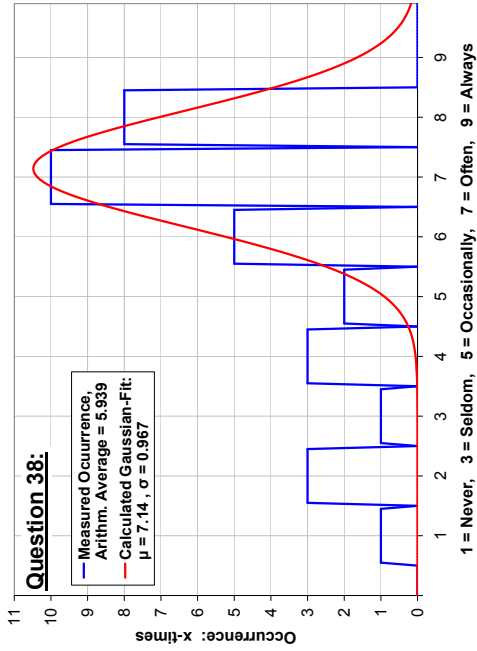
(d) Supervisor: Question 36.

Figure C.77: Question 33: Is open to feedback from others. Encourages others to give feedback.

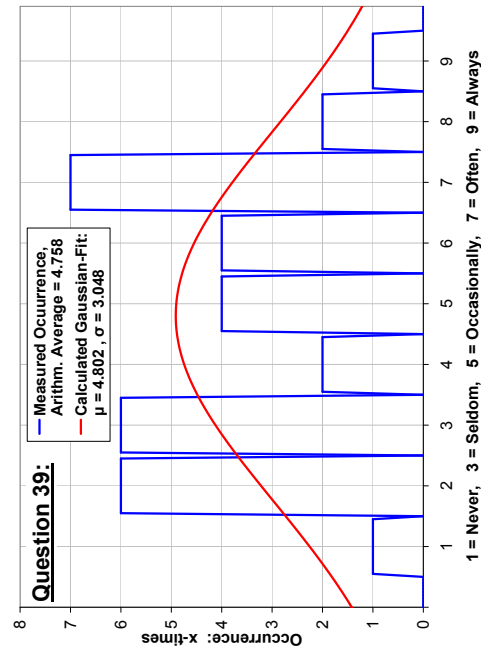
Question 34: Learns from own experiences and also those of others. Seeks opportunities for self-development.

Question 35: Speaks up even when her/his opinion is in the minority.

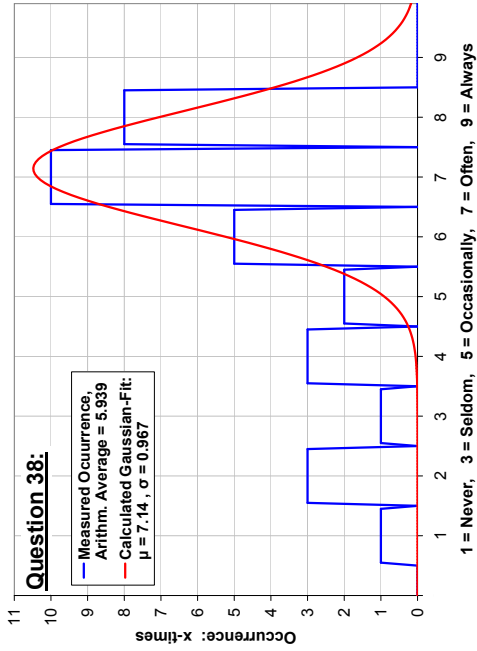
Question 36: Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.



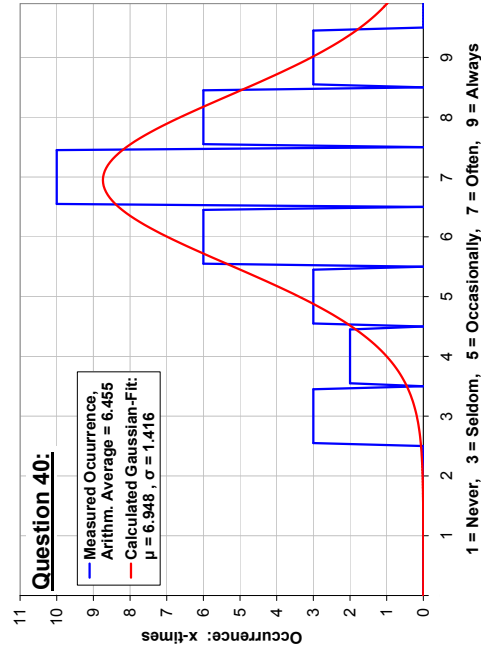
(a) Supervisor: Question 37.



(c) Supervisor: Question 39.



(b) Supervisor: Question 38.



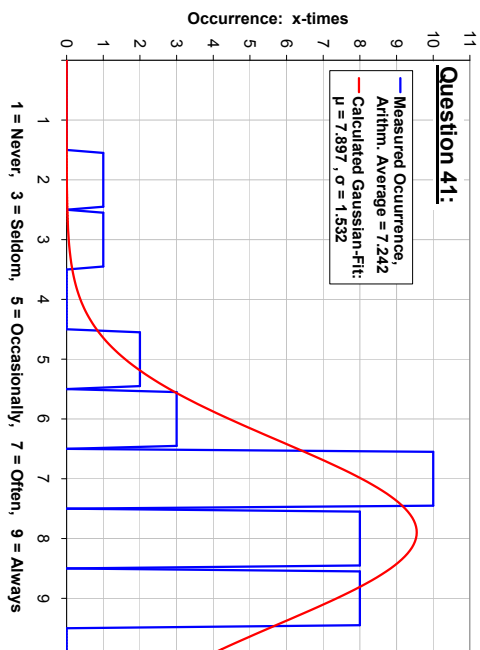
(d) Supervisor: Question 40.

Figure C.78: Question 37: Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.

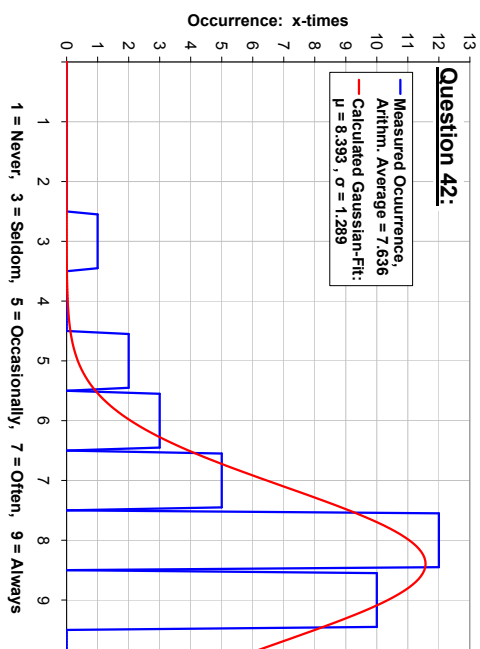
Question 38: Listen receptively to team members ideas and suggestions and considers team's ideas even when she/he disagrees with them.

Question 39: Makes decisions that are based only on his/her own ideas.

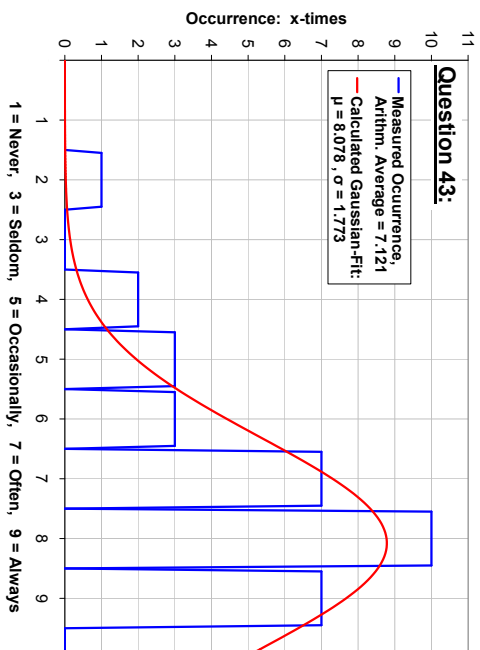
Question 40: Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.



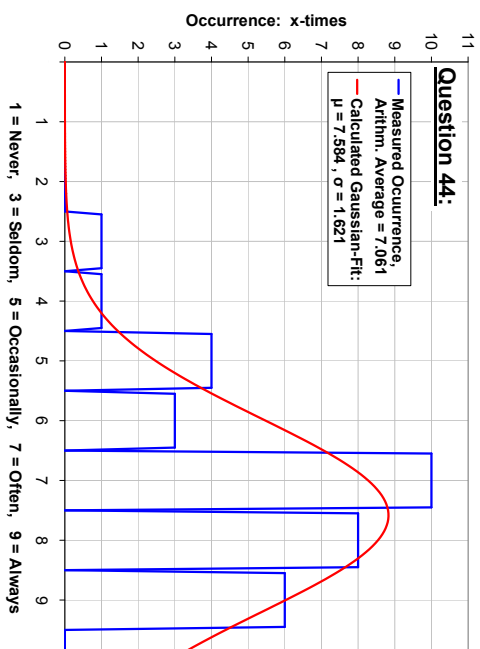
(a) Supervisor: Question 41.



(b) Supervisor: Question 42.



(c) Supervisor: Question 43.



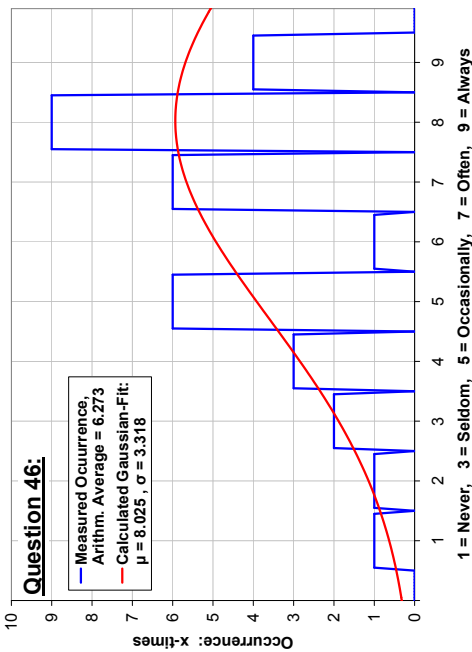
(d) Supervisor: Question 44.

Figure C.79: Question 41: When things go wrong, the main concern is to fix it, not to lay blame.

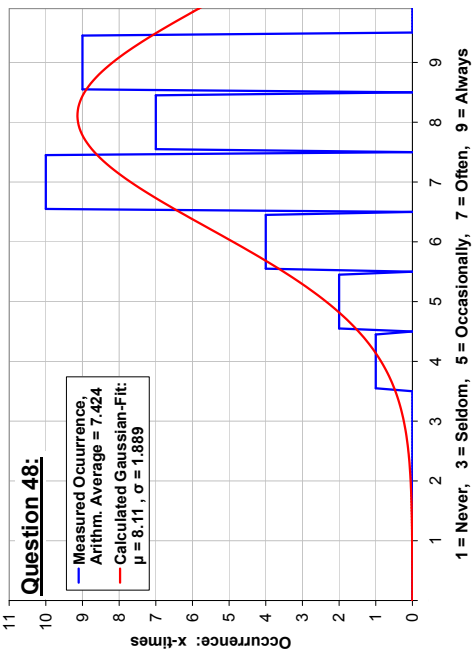
Question 42: Is capable of juggling multiple demands.

Question 43: Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.

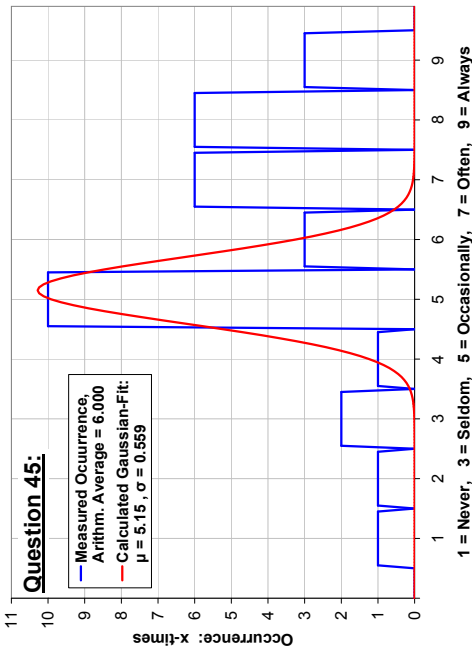
Question 44: Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).



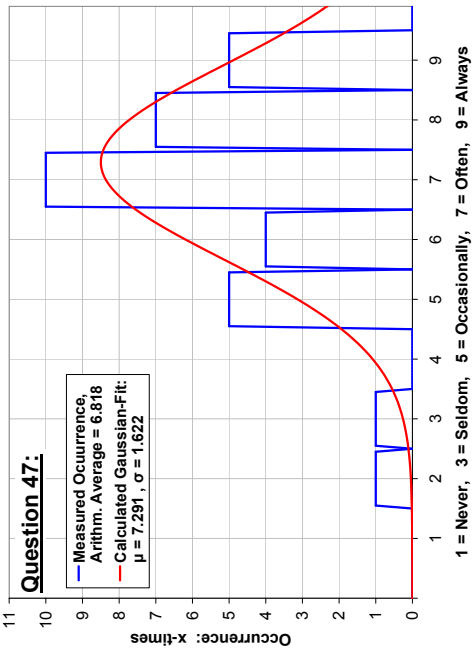
(b) Supervisor: Question 46.



(d) Supervisor: Question 48.



(a) Supervisor: Question 45.



(c) Supervisor: Question 47.

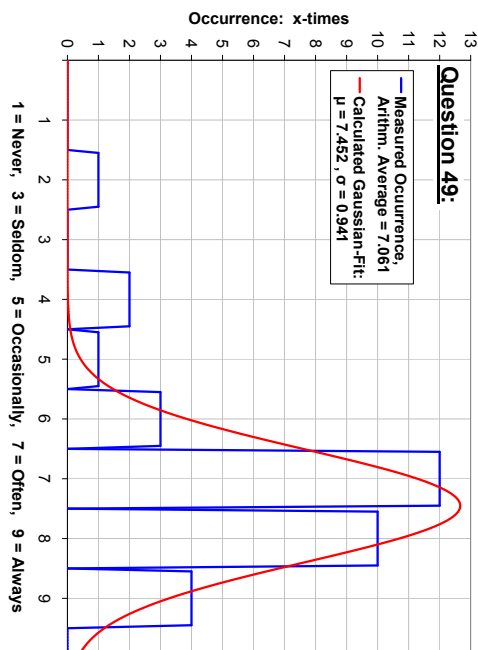
Figure C.80: Question 45: Likes to share her/his leadership power with subordinates.
Question 46: There is a real feeling of teamwork in the team. Team members feel they are part of the project or organization.
Question 47: The team members feel a real responsibility to make things work.
Question 48: Acknowledges others for their contributions and celebrates in their successes.

Figure C.81: Question 49: Recognizes the potential of her/his team members.

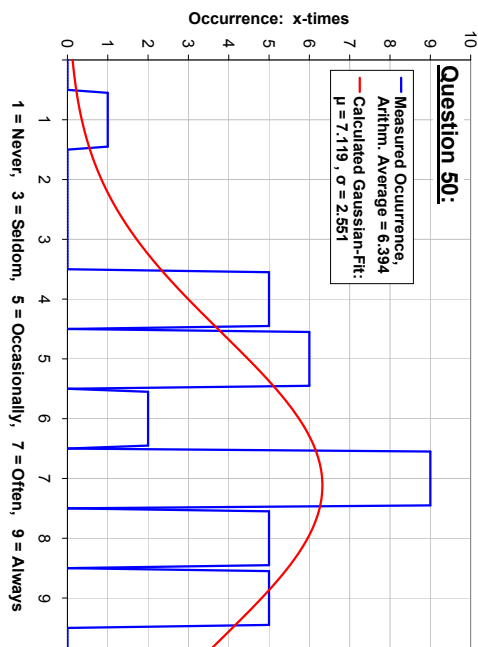
Question 50: Pays attention to team's performance. Supports and gives feedback.

Question 51: Likes to use her/his leadership power to help subordinates grow.

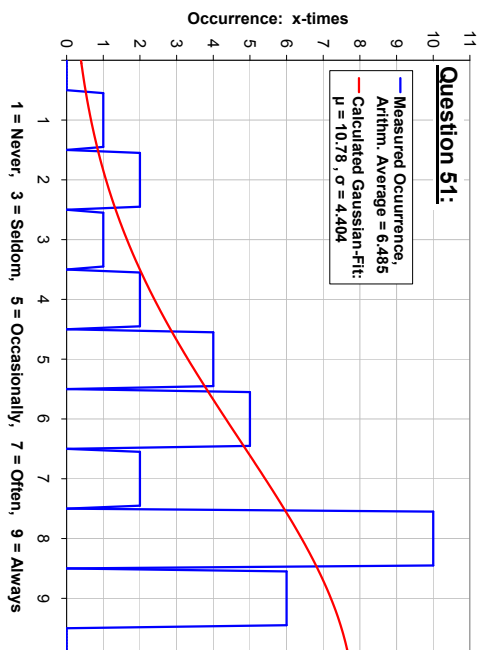
Question 52: Develops others by explaining or demonstrating relevant skills.



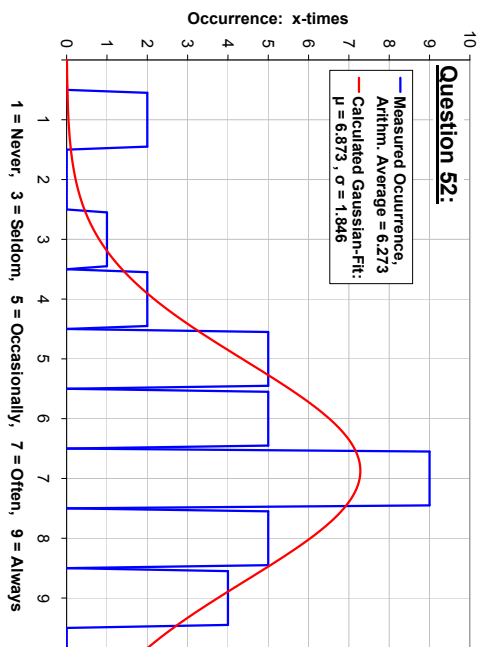
(a) Supervisor: Question 49.



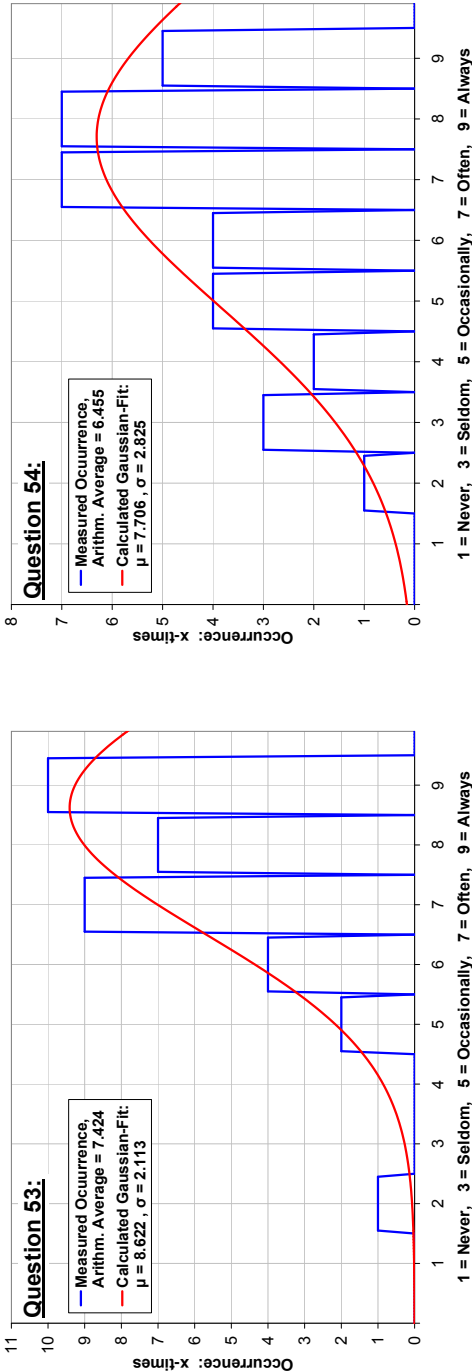
(b) Supervisor: Question 50.



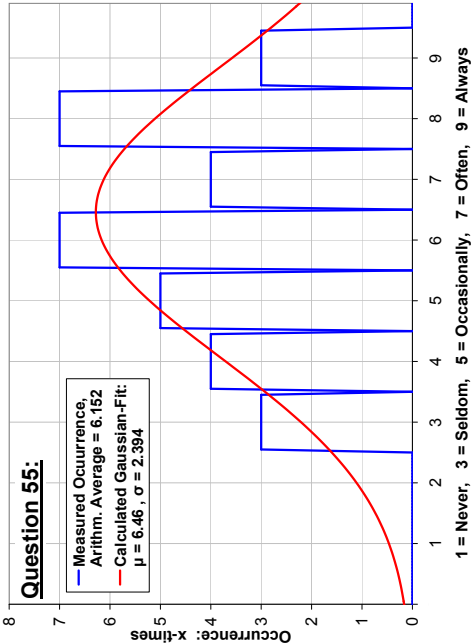
(c) Supervisor: Question 51.



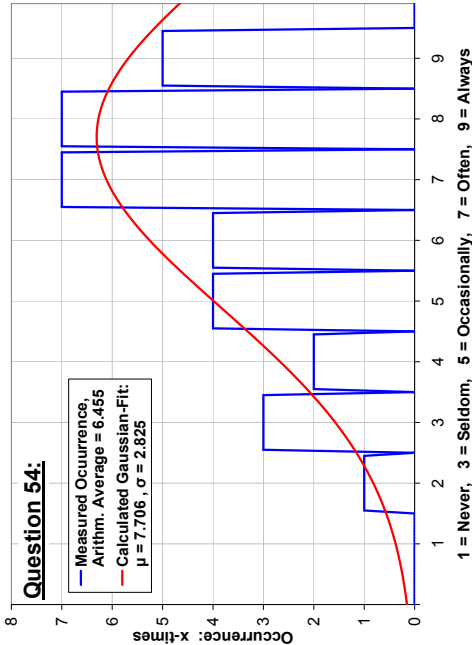
(d) Supervisor: Question 52.



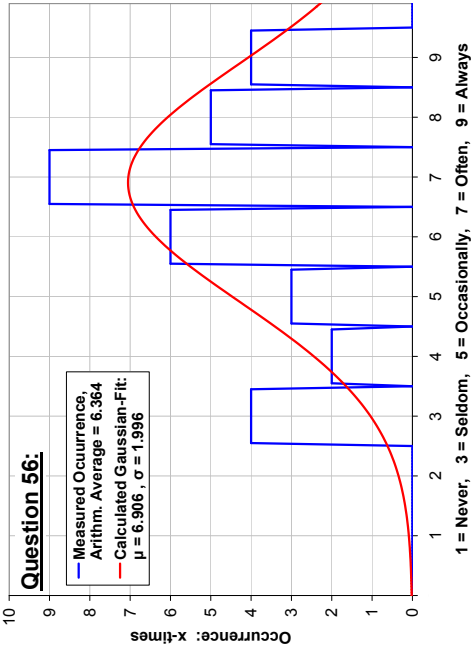
(a) Supervisor: Question 53.



(c) Supervisor: Question 55.

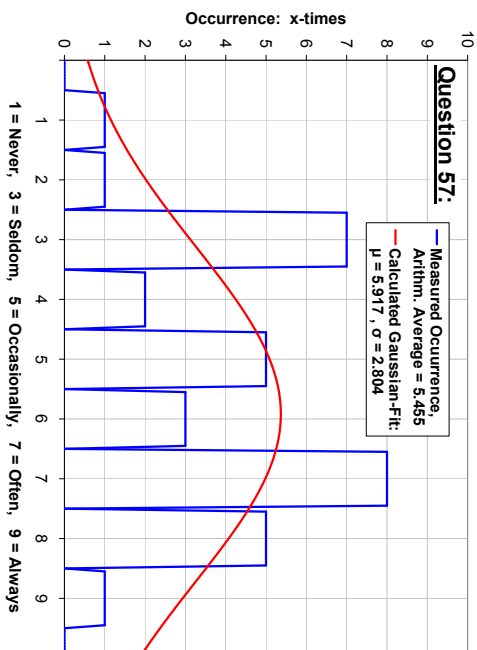


(b) Supervisor: Question 54.

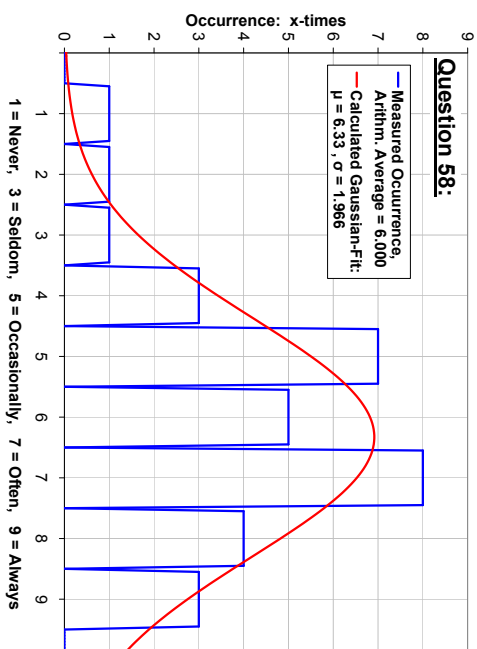


(d) Supervisor: Question 56.

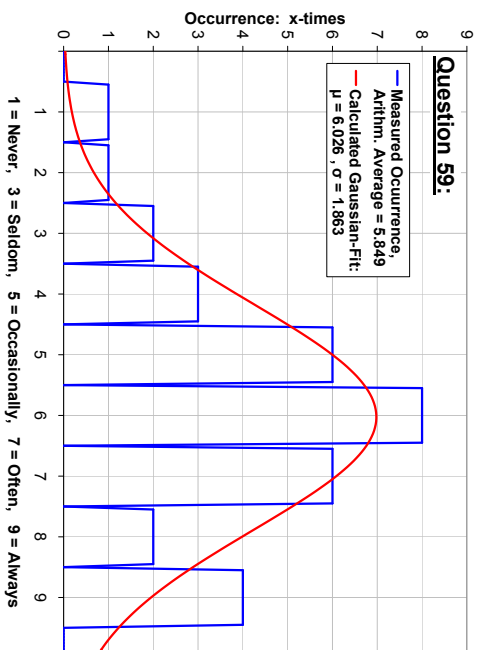
Figure C.82: *Question 53: Encourages team members to solve problems on their own.*
Question 54: Helps the team to focus on goals and objectives.
Question 55: Gets team members to look at problems from many different angles.
Question 56: Identifies causes of resistance and finds ways to overcome them.



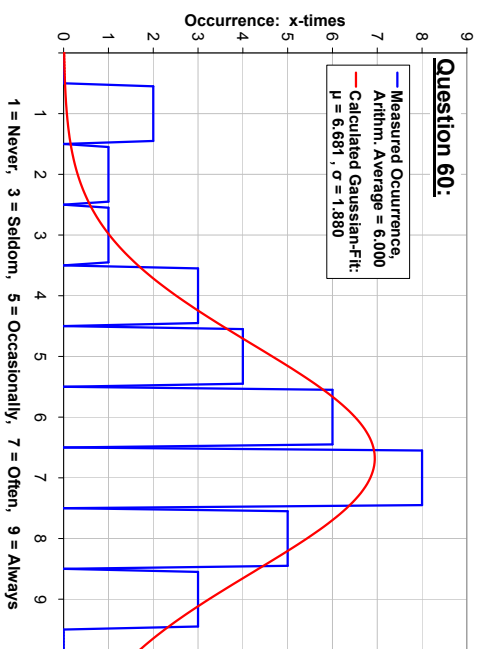
(a) Supervisor: Question 57.



(b) Supervisor: Question 58.



(c) Supervisor: Question 59.



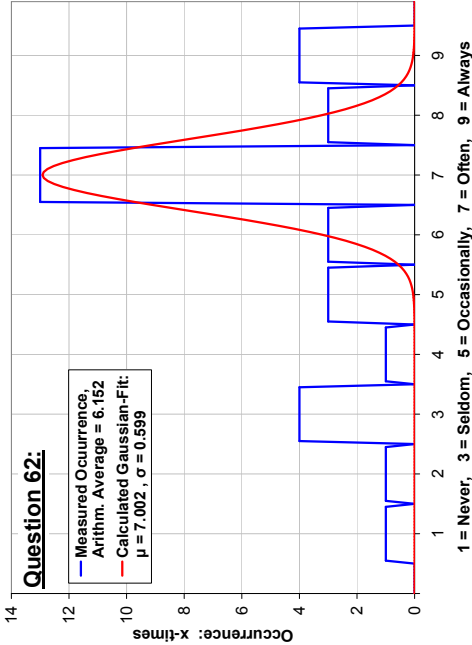
(d) Supervisor: Question 60.

Figure C.83: Question 57: Spends time effectively teaching or mentoring team members.

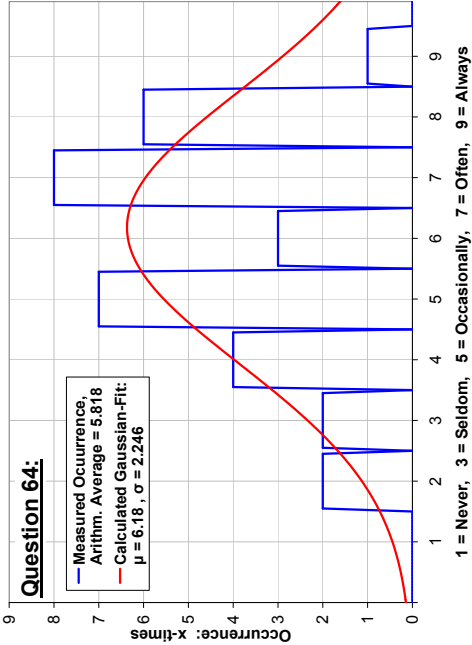
Question 58: Explains how the team fits into the project or company objectives.

Question 59: Explains the purpose of the company's policies to the team.

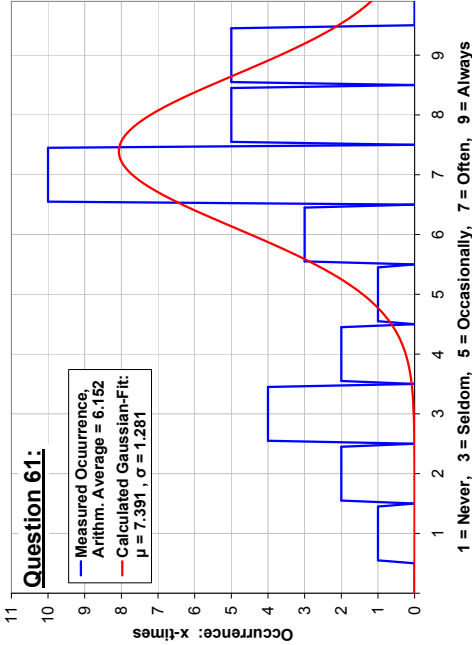
Question 60: Explains rules and expectations.



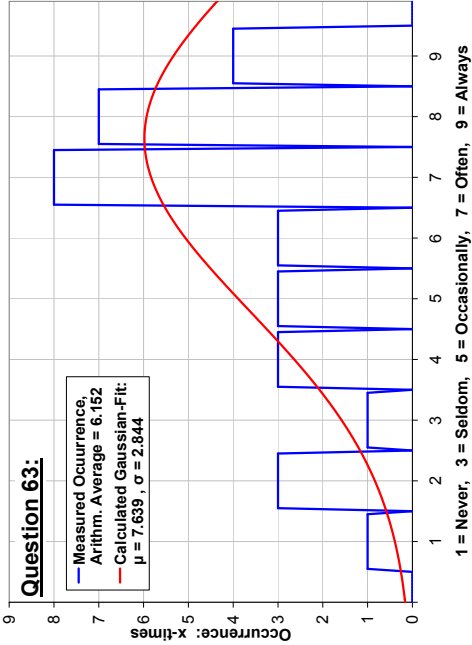
(b) Supervisor: Question 62.



(d) Supervisor: Question 64.



(a) Supervisor: Question 61.



(c) Supervisor: Question 63.

Figure C.84: Question 61: Explains (personal and company) decisions, actions, and goals.
Question 62: Openly shares information with others.
Question 63: Deals with issues in a straightforward manner.
Question 64: Able to calm others in stressful situations.

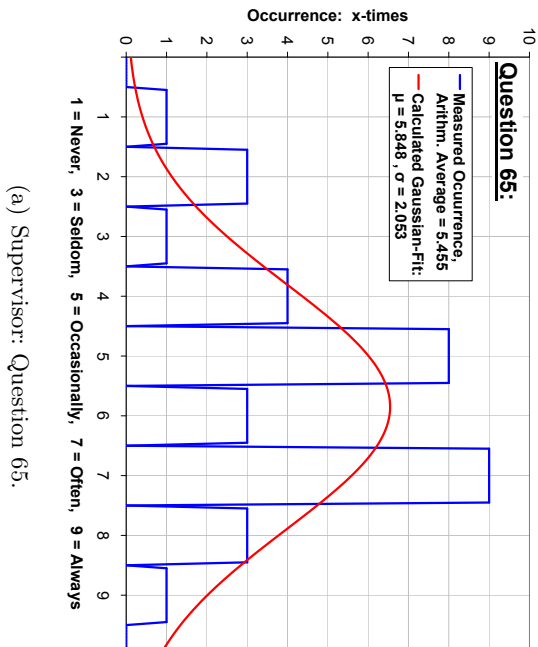


Figure C.85: Question 65: Handles difficult people and situations effectively.

Appendix D

Final Questionnaire

The following final leadership questionnaire was obtained after the analysis of the causal correlations and content overlaps of the individual questions within the first leadership questionnaire (Appendix A, page 263). This final questionnaire consists of 62 questions distributed over the following five leadership dimensions:

- 1.) **Task Focus:** Questions 1 to 12 focus on task focus, directing, and achievement orientation.
- 2.) **Relationship Behavior:** Questions 13 to 24 deal with relationship behavior, showing concern, and interaction with the team.
- 3.) **Leading by Example:** Questions 25 to 36 study integrity and “leading by example”.
- 4.) **Participative Behavior:** Questions 37 to 48 examine participative behavior and democratic decision-making.
- 5.) **Informing and Coaching:** Questions 49 to 62 analyze informing and coaching.
 - (a) Questions 49 to 57 look into coaching, developing others, and intellectual stimulation.
 - (b) Questions 58 to 62 explore informing, communication, conflict management, and leader-member exchange.

Leadership Questionnaire

Please note the time that you need to fill in the questionnaire!

Thanks a lot!

**Your data will be treated
ABSOLUTELY CONFIDENTIALLY
and will NOT be given to third persons!!!**

Performance Key:

1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

Does the person in question:

01:	Let team members know what they are supposed to do: shifts, detailed tasks, etc.		seldom		often					
			never		occasionally		always			
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9

02:	Makes suggestions about how to solve problems and sets standards of performance for group members.		seldom		often					
			never		occasionally		always			
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9

03:	Believes that nothing is more important than accomplishing a goal or task in time: defines milestones and monitors closely.		seldom		often					
			never		occasionally		always			
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9

04:	Ensures that large and complicated projects are broken into small manageable tasks and that every detail is accounted for.		seldom				often			
			never	occasionally				always		
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9
05:	Recognizes what needs to be done and takes the initiative to make it happen.		seldom				often			
			never	occasionally				always		
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9
06:	Prioritizes key objectives and focuses the groups activity on them.		seldom				often			
			never	occasionally				always		
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9
07:	Effectively allocates available resources, e.g., time, people, money.		seldom				often			
			never	occasionally				always		
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9
08:	Gives vague or misleading explanations to team members.		seldom				often			
			never	occasionally				always		
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9
09:	Makes NO suggestions (because she/he has no clue at all).		seldom				often			
			never	occasionally				always		
		Candidate	1	2	3	4	5	6	7	8 9
		Self-Appraisal	1	2	3	4	5	6	7	8 9
		Supervisor	1	2	3	4	5	6	7	8 9

10:	Enjoys getting into the details of how things work.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
11:	Is good at making things work.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
12:	Knows and understands how to do basic things.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
13:	Shows concern for the personal problems and well being of others. Helps others (especially newcomers) feel comfortable in the group.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
14:	Knows (exactly and in detail) what work is being done in the team.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
15:	Treats people as equals, fairly and consistently (behaves predictably).		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

16:	Communicates actively (i.e., starts conversations) with team members.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
17:	Acknowledges her/his own mistakes and takes corrective action.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
18:	Discloses thoughts and feelings to group members.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
19:	Gives team members honest and fair answers.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
20:	Does not worry about jeopardizing relationships when correcting mistakes.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
21:	Honors other people's (personal) boundaries.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

22:	Regularly achieves “win-win” outcomes.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
23:	Identifies and promotes opportunities for collaboration.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
24:	Is concerned with how her/his decisions affect the lives of others.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
25:	Sets high and clear standards for others by her/his own behavior towards team members.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
26:	Works (at least) as hard as anyone in the work group. Thereby motivating others to achieve and stretch performance.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
27:	Models positive team attributes such as mutual respect and full participation.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

28:	Has high moral standards. Can be trusted with confidential information.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
29:	Would try to take credit for other people's ideas.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
30:	Shows favoritism (in an unfair amount) towards some people.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
31:	Enjoys establishing challenging goals for themselves and goes above and beyond what is expected.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
32:	Possesses awareness of her/his own strengths and weaknesses.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
33:	Is open to feedback from others. Encourages others to give feedback.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

34:	Learns from own experiences and also those of others. Seeks opportunities for self-development.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
35:	Speaks up even when her/his opinion is in the minority.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
36:	Is capable of staying focused and thinking clearly under pressure or in difficult situations when experiencing strong emotions.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
37:	Encourages team members to express ideas/suggestions and gives ALL team members a chance to voice their opinions.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
38:	Considers team's ideas even when he/she disagrees with them.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
39:	Makes decisions that are based only on his/her own ideas.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

40:	Consults with team members when facing an upcoming task or problem. However, the leader maintains the final decision making authority.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
41:	When things go wrong, the main concern is to fix it, not to lay blame.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
42:	Is capable of juggling multiple demands.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
43:	Easily shifts priorities when the situation calls for it. Deals with rapid change easily and effectively.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
44:	Allows team members to determine what needs to be done and how to do it (because team members know best how to do their specific tasks).		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
45:	Likes to share her/his leadership power with subordinates.		seldom	often					
			never	occasionally	always				
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

There is a real feeling of teamwork in the team.									
46:	Team members feel they are part of the project or organization.		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
47:	The team members feel a real responsibility to make things work.		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
48:	Acknowledges others for their contributions and celebrates in their successes.		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
49:	Recognizes the potential of her/his team members.		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
50:	Is aware of the team's actual performance. Gives feedback to support team members.		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
51:	Likes to use her/his leadership power to help subordinates grow and evolve (within the team's/company's hierarchical structure).		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

52:	Develops others by explaining or demonstrating relevant skills (on the spot or during work processes).		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
53:	Encourages team members to solve problems on their own.		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
54:	Helps the team to focus on goals and objectives.		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
55:	Gets team members to look at problems from many different angles.		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
56:	Identifies causes of resistance and finds ways to overcome them.		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9
57:	Spends additional time effectively teaching or mentoring team members (outside regular work processes).		seldom			often			
			never	occasionally			always		
		Candidate	1	2	3	4	5	6	7 8 9
		Self-Appraisal	1	2	3	4	5	6	7 8 9
		Supervisor	1	2	3	4	5	6	7 8 9

58:	Explains rules, expectations, and the purpose of the company's policies and how the team or individual team members can fulfill company objectives.		seldom	often							
			never	occasionally	always						
		Candidate	1	2	3	4	5	6	7	8	9
		Self-Appraisal	1	2	3	4	5	6	7	8	9
		Supervisor	1	2	3	4	5	6	7	8	9

59:	Explains personal decisions and actions.		seldom	often							
			never	occasionally	always						
		Candidate	1	2	3	4	5	6	7	8	9
		Self-Appraisal	1	2	3	4	5	6	7	8	9
		Supervisor	1	2	3	4	5	6	7	8	9

60:	Shares relevant and important information openly with others.		seldom	often							
			never	occasionally	always						
		Candidate	1	2	3	4	5	6	7	8	9
		Self-Appraisal	1	2	3	4	5	6	7	8	9
		Supervisor	1	2	3	4	5	6	7	8	9

61:	Deals with issues in a straightforward manner.		seldom	often							
			never	occasionally	always						
		Candidate	1	2	3	4	5	6	7	8	9
		Self-Appraisal	1	2	3	4	5	6	7	8	9
		Supervisor	1	2	3	4	5	6	7	8	9

62:	Able to calm others in stressful situations. Handles difficult people and situations effectively.		seldom	often							
			never	occasionally	always						
		Candidate	1	2	3	4	5	6	7	8	9
		Self-Appraisal	1	2	3	4	5	6	7	8	9
		Supervisor	1	2	3	4	5	6	7	8	9

Time needed to answer the questionnaire:

Thanks a lot for your participation and help!!!

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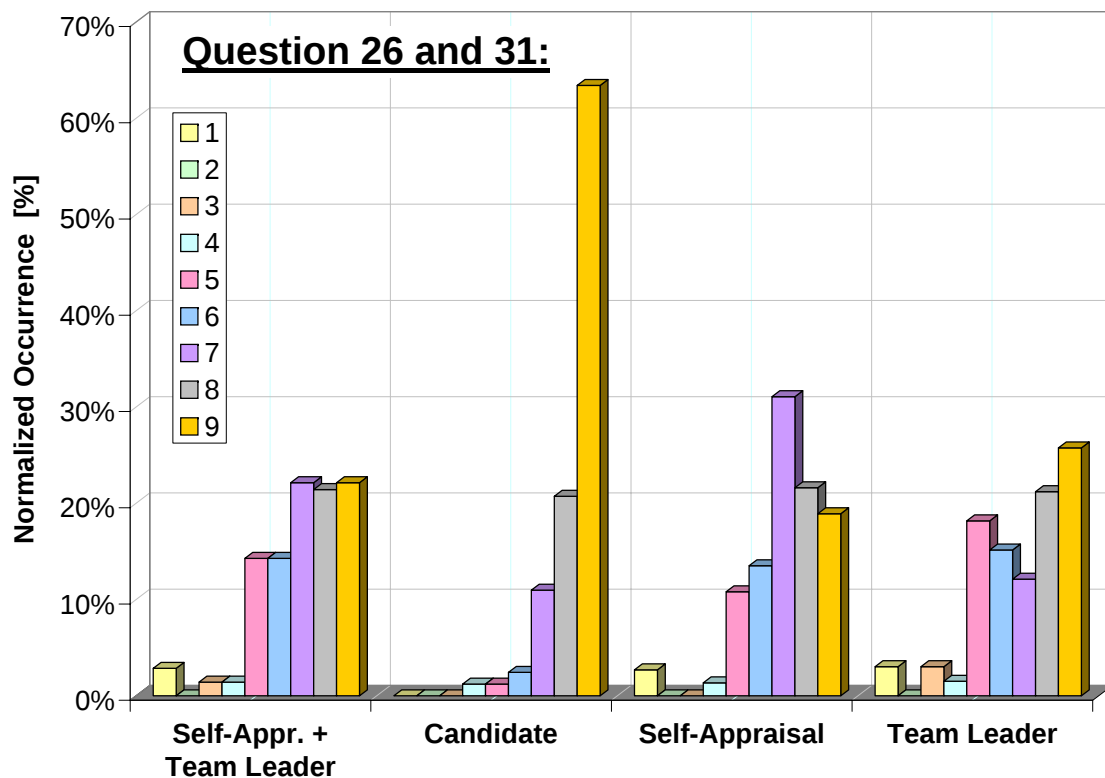
CURRICULUM VITAE

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	January 2006	Doctor of Technical Sciences , Vienna University of Technology. Doctoral Thesis: “ <i>Proton Induced Thermal Stress-Wave Measurements for ISOLDE and CNGS</i> ”, ISBN 92-9083-266-5. Viva passed with “summa cum laude”, January 18 th , 2006. Academic degree “Doctor technicæ”, January 23 rd , 2006.
	2002 – 2005	Doctoral Student at CERN, ISOLDE (AB/ATB/IF), Topics: Radioisotope Production, Generation of Radioactive Ion Beams, Isotope Separation On-Line (ISOL), ISOL Targets and Ion Sources, Emittance Measurements, Proton Induced Thermal Stress-Waves in Solids, Laser Doppler Vibrometry, Magnetic Horns.
	1996 – 2002	Study of Technical Physics , Vienna University of Technology. Master thesis: “ <i>Dosimetrie von klinisch angewandter Protonen-Strahlung</i> ”, (“ <i>Clinical Dosimetry in Medical Proton Beams</i> ”). Diploma in Technical Physics with “summa cum laude”. Academic degree “Diplom-Ingenieur”, July 04 th , 2002.
	1995 – 1996	Study of Electronics, Vienna University of Technology.
	1994 – 1995	Civil Service in the Army (Basic Military Service).
	1989 – 1994	College of Electronics and Communication Engineering HTBLuVA Mödling, incl. vocational training, school leaving examination (general qualification for university entrance) passed with “summa cum laude”, June 09 th , 1994.

“Beyond commitment . . .
lies courage.”



Performance key: 1 = Never; 3 = Seldom; 5 = Occasionally; 7 = Often; 9 = Always.

Question 26: *Works (at least) as hard as anyone in the work group.*

Question 31: *Enjoys establishing challenging goals and goes above and beyond what is expected.*

“There are no answers . . .
only choices.”

