



University of Regensburg
Institute for Education
Dept. Prof. Dr. Hans Gruber

Research Report No. 14

Christian Harteis / Johannes Bauer / Dagmar Festner /
Hans Gruber / Helmut Heid

Learning from mistakes.
An interview-study in German enterprises

Paper presented at the
86th Annual Meeting of the American Educational Research Association

Montreal, Canada

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Harteis, C., Bauer, J., Festner, D., Gruber, H., & Heid, H. (2005). Learning from mistakes. An interview study in German enterprises (Research Report No. 14). Regensburg: University of Regensburg, Institute for Education, Dept. Prof. Dr. Hans Gruber.

Supported by the German Science Foundation (DFG): He 1158/4-2

Research Report No. 14, April 2005

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Institut for Education

Dept. Prof. Dr. Hans Gruber

Universitätsstraße 31

D-93040 Regensburg

GERMANY

Tel. +49-941-943 3783 - Fax: +49-941-943 4989

e-mail: hans.gruber@paedagogik.uni-regensburg.de

<http://www-edu.uni-r.de/paed3/>

Editor: Dr. Christian Harteis, Christian.Harteis@paedagogik.uni-r.de

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UBR 069034634837



609-1435

Summary

Purpose

Modern business philosophies proclaim permanent change and the need for employees' individual development. In complex structures mistakes cannot be avoided, thus, learning from mistakes becomes important for enterprises. The aim of this paper is (a) to discuss problems of defining mistakes and (b) to investigate the way of dealing mistakes in daily working life.

Design/Methodology/Approach

Interview study (semi-structured telephone interviews), qualitative and quantitative analyses.

Findings

The interviews show that employees differ in their understanding of mistakes. Only in dramatic cases of health endangering the majority of subjects agreed in the definition of mistakes. The results also show that the way of dealing with occurring mistakes in the subjects' daily work life is a constructive one.

Research limitations/implications

The paper reports interviews with 28 subjects from several German industrial and service enterprises, who participated voluntarily. Thus, results cannot be generalized and may be positively biased.

Practical implications

The paper shows the fuzziness of mistake definitions and contains useful information for reflecting daily work life.

Originality/value

The paper reports original research conducted by the authors at the Institute for Education at the University of Regensburg.

Key words: mistake culture, learning from mistakes, competence development

Modern industry and service enterprises follow business philosophies that stress the need for the permanent development of employees' individual competencies. This is considered as appropriate in the light of permanent changes in market requirements. Enterprises thus understand themselves as learning organisations. Their potential is related to their ability to react to unforeseeable demands. The handling of mistakes represents a particular form of inner-firm opportunities for professional learning. If flexible structures dismiss routines and if responsibility is left to the employees, the probability of mistakes occurring increases. A positive form of dealing with mistakes is to encourage drawing conclusions from them for the future – which means to learn from them. The commitment to a positive mistake-culture does not limit itself however, to learning from mistakes during daily working life. Following a discussion of theoretical preconditions for learning from mistakes, this paper reports on results from an interview-study about dealing with mistakes. This study was conducted in several German enterprises in the industrial and service sector.

A review of the theoretical concepts of mistakes and learning from mistakes

At first glance, the discussion about mistakes seems to address a well-structured issue: Something went *wrong*. Within the context of social networks like enterprises, however, the specification as to what is to be called a mistake is not so simple. Such a specification can be made according to four relevant levels that are analyzed in some detail:

1. Level of content: *What* is called a mistake?
2. Normative level: *Why* is something called a mistake?
3. Personal level: *Who* calls something a mistake?
4. Level of action: *What* led to the mistake, which consequences followed?

Level of content: What is called a mistake?

Oser, Hascher, and Spychiger (1999) broadly define mistakes as a circumstance or process which deviates from one or several norms. Therefore, on the one hand a mistake is something which deviates from prevailing perspectives. On the other hand, a mistake can be a fact as well as a process. If employees should experience support in learning from mistakes, a specification is necessary as to what they are expected to learn. If – for example – in a car manufacturer's plant a damaged car leaves the production line, the mistake can be manifold: The damaged car itself, processes of insufficient quality, the execution of wrong work steps, or wrong decisions at certain points of the production process. This example shows that the specification of mistakes is not at all well-structured and clear. Each focus takes only a particular section of reality into consideration and distinguishes important from non-important information. To call something a mistake rests upon a definition of reality which may differ interindividually to a great extent.

Even more complications arise when the omission of an action also becomes the object of a mistake-analysis. Such examples clearly show that mistakes do not necessarily correspond to something in the physical nature. Though a physical item can be called mistake, the definition of circumstances is always a process of valuing attribution to an item, action, or acting conditions. Items, (missed) activities, and decisions are not mistakes per se, but *are called* mistakes. This is important for further argumentation. It implies, that the category "mistake" describes a classification of an object of observation, which depends on criteria for valuation and thus is prone to discourse. This directly leads to the next level, the normative level.

Normative level: Why is something called a mistake?

Calling something a mistake implies the deviance from a status, which has been considered as normal. Someone argues that an object of observation misses a standard. Thus, errors are an evaluative category, which results from the relation between an object of observation and a constellation of norms and values.

As mentioned, the choice of the observation framework represents a selection from the entity of inner-firm reality. Similarly, the reference to norms and values represents a selection from a set of norms and values. It is possible that norms that were decisive for action are not congruent with those that are relevant for evaluating an action or a result as a mistake. This can be most problematic in cases of incompatible normative reference systems. Subjects might be unable to develop the insight that they made a mistake.

Personal level: Who calls something a mistake?

Inner-firm contexts normally have a complex structure, which sometimes conceals the relevant instance for categorizing mistakes. Enterprises do not consist of isolated individuals, but of a coordinated network of persons acting on a number of hierarchies. The hierarchical nature of most organizational structures frequently leads to the consequence that not the acting person but another one (usually of a higher level) decides as to whether something can be termed a mistake.

In such cases the question of legitimization arises: How far is the evaluating person able to generate well accepted judgments? Additionally, problems arise regarding the transparency of evaluation criteria. If an external person evaluates actions of another person, her standards may be transparent or intransparent. Even transparent criteria can be open for interpretation if imprecisely formulated.

Level of action: What led to the mistake, which consequences followed?

On the level of action, two important criteria for the description of mistakes can be distinguished: It has to be determined, where a mistake came from, and the question has to be answered, which consequences will result from the mistake. Although these questions are related to the evaluation of mistakes, they nevertheless are also connected with the definition and identification of mistakes.

Concerning the logic of action, a mistake's antecedent refers to the question, how far the acting person controlled the situation, if the mistake was foreseeable or avoidable. A mistake can be called an individual decision, even if the acting person had no or insufficient influence on the development of the situation due to lacking abilities, lacking knowledge or lacking accountability. The crucial factor leading to anticipating a mistake is part of individual declarative and procedural knowledge (Zapf, Frese, & Frey, 1999). The crucial factor in order to avoid making a mistake is the existence of realizable alternatives (Heid, 1991).

Consequences arising from a mistake primarily classify its weight. Deviances from a norm-status normally are seen as less important, if the deviance is a small one, and consequences are barely perceivable. If a bundle of heavy consequences arises from a mistake, it gains in importance.

After deciding that the discussion of mistakes has to take into account several theoretical levels, it became obvious that the issue "mistakes" is not at all clear and well-structured. When talking about mistakes, interpretations on different levels determine their evaluation. Another crucial prerequisite for learning from mistakes now can be analyzed: How to deal with mistakes.

Mistake-culture: How to deal with mistakes

Modern concepts of business organization feature tendencies of deregulating processes and of dissolving hierarchies. This leads to circumstances, under which mistakes are unavoidable (Kühl, 2000). The crucial factor of an organization's culture consists of the attitude towards mistakes and the kind of dealing with mistakes. This factor is called mistake-culture, which can be thought of as a continuum between two poles:

- Errors are misfortunes and have to be avoided as far as possible.
- Errors are unavoidable and, therefore, are a welcome learning opportunity.

Depending on the positioning of a firm's mistake-culture along this continuum, the way of dealing with mistakes varies substantially. Rybowskiak, Garst, Frese, and Batinic (1999) assume that the mistake culture influences the realization of modern concepts of business organization considerably, because the employees' readiness for taking over increased responsibility negatively correlates to the extent to which mistakes lead to negative consequences. When looking at several approaches of business organization, various features of characterizing mistakes can be found. In the following these characterizations and their consequences are discussed.

Particularly precarious examples can be found with business concepts proclaiming a "zero-mistake-strategy". These concepts – in Japan popularly called *Kaizen* (Imai, 1992) – were transferred and adopted in Western countries as "Total Quality Management" (Runge, 1994). They primarily aim at manufacturing a product free from mistakes and improving the production processes continuously. Mistakes do not lead to negative consequences, as long as an improvement of the processes arises. However, the characteristic styles, in which protagonists proclaim the advantages of these concepts, betray a strategy of mistake-avoidance. Münchrath and Runge (2000) – for example – talk about "perfection as a condition for a smooth operational sequence" (p. 102). This position has two disadvantages: Firstly, it is illusory to reach perfection in a complex system. Secondly, it focuses more on the avoidance of mistakes rather than on opportunities to learn from them. That is the reason why the authors speak of *improvement*, but not about *learning*.

A culture of handling mistakes which expects employees to avoid or even conceal mistakes can have fatal consequences for the enterprise. It usually comprises the bureaucratic regulation of processes aiming at mistake prevention; such a strategy inhibits creativity and innovation (Ulrich, Jick, & Glimow, 1993). It rather prompts employees working to rule and is liable to the misconception of a linear relation between cause and effect. Evidence from economy (Loistl & Betz, 1996), psychology (Dörner, 2003), and cybernetics (Vester, 2003) indicates the opposite:

Events in complex systems are not linearly determined, and collateral effects lead to delayed impact. More appropriate than avoiding mistakes is the assumption that mistakes also have a positive component, because they also can be seen as prerequisite for evolution and further development (Rollett, 1999).

The negative consequences from concealing mistakes are obvious: Mistakes that are not generally known in the enterprise lose their potential for drawing insights. In the worst case the same mistake occurs repeatedly in daily working life. The tendency to conceal mistakes however arises with the likelihood that mistakes lead to negative consequences.

Taken as a whole, the evidence suggests that only a form of mistake culture seems appropriate, which acknowledges the existence of mistakes and, thus, interprets mistakes as learning opportunities. In such a mistake culture the analysis of causes is more important than personalisation and the question of guilt. Spychiger, Oser, Hascher, and Mahler (1999) outline both a climate of trust and an insightful analysis of causes as cornerstones of a positive mistake culture. Prerequisite for such a focus on constructing learning processes from probable mistakes are discussed in the next chapter.

Learning from mistakes

Learning from mistakes is an (implicit) part of several psychological learning models (learning through trial and error; learning through problem solving), but has not received much attention in educational research so far (Oser et al., 1999). Following Oser and Spychiger (2005) and their theory of negative knowledge, learning from mistakes requires three prerequisites: Interruption, concernment, and reflection. Interruption means to pause for a moment during actions, in order to give attention to the deviance from the standard. Concernment leads to the comprehension that the person herself is the cause for the deviance, which finally leads to reflection about antecedences of and possible alternatives for action. Thus, people build

up knowledge, how and why things do *not* work as originally planned. Such *negative knowledge* helps to prevent mistakes in new situations.

Oser's approach presumes precise criteria for the validation of mistakes. As mentioned above, enterprise contexts frequently do not provide such criteria, especially if managers detect mistakes made by their subordinates. A lack of such criteria, however, prevents people from developing insights into the causes of mistakes. Thus learning from mistakes in enterprises only seems possible, if criteria for the validation of mistakes are both well-known and precisely operationalized.

Another precondition implied in Oser's theory is feedback about the deviation for the acting person. Such feedback is important in enterprises, because in complex systems the impact of one's own actions is not always observable immediately. Feedback given to failing persons, when mistakes are detected, increases the potential for reflection about the mistake.

Learning from mistakes profits from a culture of constructive and supportive acquaintance that is free from fear. Spychiger et al. (1999) identified three categories how dealing with mistakes influences learning opportunities:

1. The teacher's or superior's reaction to the mistake is the first crucial influence on learning opportunities: In order to support learning processes the reaction should include feedback for the person, who made the mistake, but must not place the blame on her.
2. The self-concept of one's competence in dealing with mistakes is important, because learning processes require the feeling that the situation is under control of the person of action.
3. Emotional aspects play a crucial role. Other people's reaction to mistakes is related to the emotional status of the person who made the mistake. If the situation activates shame, the person will tend to avoid the situation without an analysis of the causes.

The theoretical frame of preconditions for learning from mistakes can be summarized as following:

1. Compliance is necessary between all concerned about what is termed a mistake.
2. Compliance is necessary between all concerned about criteria, why something is called a mistake.
3. Contact and feedback are necessary between a person who detects a mistake and the person who made the mistake.
4. A positive mistake culture is necessary.

Research questions

Modern concepts of business organization proclaim a positive mistake culture and attribute high importance to learning from mistakes among all employees (managers as well as working staff members). The realization of these concepts in the context of daily work life is not trivial, however. It is more difficult to conduct a theoretically sophisticated and precise analysis and usage of mistakes than to utter simplifying business rhetoric. Hence this study addresses three questions:

1. What is usually called a mistake in real inner-firm contexts?
2. In enterprises who participates in the definition and identification of mistakes?
3. How are mistakes dealt with in enterprises?

Particular attention is given to differences between managers and working staff members, because these groups might participate differently.

Ad question 1. The study intends to investigate the variety of employees' interpretations of typical mistakes in their working fields; studies whether the group congruently evaluates mistake situations.

Ad question 2. Enterprises consist of groups of people working together based on cooperation and division of labor. Thus it is probable that mistakes are detected

not only by the acting person, but by others as well. We investigate as to whether this increases the transparency of the criteria for the validation of mistakes.

Ad question 3. We shall investigate the mistake culture; in particular whether different levels of mistakes lead to different reactions.

Methods

Design and sample

The sample included $N=30$ employees from large and middle-sized German industrial and service companies, equally distributed to $n_1=15$ managers and $n_2=15$ working staff members. Subjects were part of a group of participants in a larger survey study about *Error-Orientation* (Bauer, Festner, Harteis, Heid, & Gruber, 2004). The selection for this study aimed at the equal distribution of positions and companies.

Instrument

The inquiry was conducted as semi-structured telephone interviews based on a dialogue manual which displayed the theoretical framework discussed above. Though there was a planned sequence of questions, subjects could answer free from any time pressure and without interruption. They were allowed to change the order of the questions if appropriate. It was warranted that all subjects answered all questions. The dialogue manual contained open questions as well as closed ones.

After brief instructions about the interview procedure, the manual addressed all three research questions.

Question 1 (What is usually called a mistake in real inner-firm contexts?) was investigated via two open questions and a bundle of closed ones. Subjects were asked to describe those areas of their working field in which mistakes occur, and those in which mistakes occur most frequently. The closed ended issues covered ten abstract situations. Subjects had to decide whether they would be called mistakes in their company. In order to get further information and to ensure that sub-

jects understood the abstract situations provided, concrete examples had to be described for them.

Question 2 (Who participates in the definition and identification of mistakes in enterprises?) was conceived on the basis of a concrete example. Subjects had to describe a past case from their working field, in which somebody made a grave mistake. During the case description the interviewers attached importance to experience, if the mistake was avoidable or if it was foreseeable, how the mistake was detected and how large its impact was. Considering this, subjects had to describe the criteria for evaluation involved and explain the instances involved in the specification of these criteria.

Additionally, subjects had to describe how mistakes were dealt with in order to get answers to question 3. Special attention was given to the analysis of causes, the reflection of alternatives, and efforts to avoid the mistake in future. Finally it was asked whether the failing person experienced negative consequences and whether they had opportunities to explain their perspective.

The interviews were held by six trained interviewers. The manual was tested in a couple of pilot interviews in order to increase reliability.

Analysis

The interviews took between 20 and 40 minutes. For open and closed data the analyses proceeded separately. The closed questions were directly transformed into quantitative data; the answers to the open questions were first scanned for keywords by all six interviewers in order to mark the core statements. Afterwards those keywords were aggregated in categories by discourse and agreement of all interviewers. Finally, quantitative data were produced. During the analysis two interviews (each one of both groups) were excluded from further interpretation, because all interviewers agreed that these subjects did not answer the questions accordingly. Thus, the answers of 28 subjects were analyzed.

The quantitative data generated were of nominal and ordinal level. For statistical tests of differences between both groups, thus, chi²-tests were calculated.

Results

The presentation of results follows the logic of the three research questions. Differences between managers and working staff members were mentioned if they were of interest.

Question 1

The opening question of the interviews referred to areas in the subjects' working fields, in which mistakes can happen. Table 1 shows the answers.

Table 1. Frequencies of answers to the question, in which areas of test persons' working field mistakes can happen. Separate analysis for the two groups sorted by the total number of answers.

	Total	Managers	Working staff
Communication	14	8	6
Working processes	10	3	7
Flow of information	9	4	5
Work performance	8	7	1
Customer relations	6	2	4
Working routines	5	3	2
Controlling and safety	3	1	2
Human failure	2	1	1
Too slow reactions	2	1	1
Teamwork	2		2
Leadership behavior	2	1	1
Error decisions	1		1
Lacking awareness of relations	1	1	
Concealing of mistakes	1		1
Lacking educational quality	1	1	
Missing readiness for innovation	1		1
Workplace bullying	1	1	
Personal administration	1	1	
Restructuring of processes	1		1
Operating efficiency	1		1
Total	72	35	37

When asked for areas, in which mistakes occur most frequently, the subjects answered as shown in table 2.

Table 2. Frequencies of answers to the question, in which areas mistakes occur most frequently.
Separate analysis for the two groups sorted by the total number of answers.

	Total	Managers	Working staff
Communication	8	4	4
Working processes	6	5	1
Flow of information	6	1	5
Working routines	4	2	2
Strategic planning and management	2		2
Error decisions	2	2	
Work performance	1		1
Misinterpretations	1		1
Controlling and safety	1	1	
Customer relations	1	1	
Teamwork	1		1
Too slow reactions	1		1
Neglect of quality	1		1
Total	35	16	19

A block of closed questions completed the data referring to question 1. The results are shown in table 3.

Table 3. Frequencies of answers to the questions, what is called mistake in the subjects' working fields.
Separate analysis for the two groups sorted by the total number of answers.
The figures show acceptance/decline referring to the statements. Rate = Percentage of acceptances.

Statement	Total	Managers	Working staff	Rate %
If something goes wrong in the manufacturing...	25/3	14/0	11/3	89.3
If something goes wrong in customer relations ...	22/6	11/3	11/3	78.6
If work is organized in a way that does not use the full capacities of the workers ...	10/16	8/6	2/10	38.5
If work is organized in a way that affects the quality of work processes ...	23/3	10/2	13/1	88.5
If a company is organized in a way that neglects employees' interests ...	12/15	4/9	8/6	44.4
If a company uses the employees' abilities only insufficiently ...	15/13	9/5	6/8	53.6
If employees receive no support for developing their competencies ...	18/9	7/6	11/3	66.7
If work is organized in a way that imperils employees' health ...	26/2	13/1	13/1	92.9
If the relations between managers and subordinates are affected ...	18/9	10/4	8/5	66.7
If relations between colleagues are affected ...	15/13	8/6	7/7	53.6

Question 2

Subjects had to describe a concrete example of a grave mistake. The examples covered the areas shown in table 4. One subject described two examples, so that the total number of cases is 29.

*Table 4. Concrete examples of grave mistakes.
Separate analysis for the two groups sorted by the total number of answers.*

	Total	Managers	Working staff
Planning mistakes in the broadest sense	8	4	4
Delinquencies of different nature (missing dates, delays)	4	3	1
Mix ups	4	3	1
Thievery	2	1	1
Excessive demands due to inappropriate tasks	1	1	
Wrong specification of production machinery	1	1	
Using wrong working materials	1		1
Inappropriate sense of safety	1		1
Inattention due to well-rehearsed routines	1		1
Wrong decision during introduction of new technologies	1	1	
Customer dissatisfaction	1		1
Price fight between departments	1		1
False estimation of technology	1	1	
Publication of unreleased information	1		1
Delayed diagnoses	1		1
Total	29	15	14

In 22 of these 29 cases subjects provided information about how the mistakes were detected (table 5).

*Table 5. Information about how the mistakes were detected.
Separate analysis for the two groups sorted by the total number of answers.*

	Total	Managers	Working staff
Detection by inner-firm departments	7	3	4
Failing person detected herself by self-controlling	5	3	2
Feedback from external instances	5	3	2
Mistake was not detected until later inhouse consequences arose	2	2	
Detection by chance	2	1	1
Detection after inadequate dunning letter (no products delivered, but invoiced)	1		1
Total	22	12	10

Table 6 contains information about whether subjects believed that these mistakes had been avoidable or foreseeable.

Table 6. Frequencies of answers to the question, whether the mistakes were avoidable or foreseeable. Separate analysis for the two groups sorted by the total number of answers.

	Total	Managers	Working staff
The mistake was avoidable	17	10	7
The mistake was not avoidable	5	2	3
The mistake was foreseeable	15	6	9
The mistake was not foreseeable	5	4	1

Another question referred to the scope of impact of the mistakes (table 7).

Table 7. Frequencies of answers to the question addressing the scope of impact of the mistakes. Separate analysis for the two groups sorted by the total number of answers.

	Total	Managers	Working staff
The mistake had an impact only on the department concerned	1	1	
The mistake only had an in-house impact	9	5	4
The mistake made an impact on our customer	8	3	5

During the interview subjects had to consider and decide, if their cases of mistakes were based on evaluation criteria which could be called "hard fact" or "objective". If this was the case, they were asked to describe another case, in which instead of a hard-fact criterion, a vague or moral one led to the classification as mistake. Those subjects, who first mentioned a case based on a vague criterion, were asked to bring an example for a hard-fact mistake afterwards. For both cases, subjects had to indicate whether they themselves had had the opportunity to influence the definition of the evaluation criterion (table 8).

Table 8. Frequencies of answers to the question addressing subjects' influence on the specification of criteria. Separate analysis for the two groups sorted by the total number of answers.

	Total	Managers	Working staff
I had influence on the definition of the hard-fact criterion	18	9	9
I had no influence on the definition of the hard-fact criterion	8	3	5
I had influence on the definition of the vague criterion	18	10	8
I had no influence on the definition of the vague criterion	5	1	4

The interview also aimed at explaining the criteria and at bringing forward instances to specify the criteria (tables 9, 10, 11). There were no utilizable results for the explication of vague criteria, because all test subjects referred to moral aspects.

*Table 9. Frequencies of explanations of hard-fact mistake criteria.
Separate analysis for the two groups sorted by the total number of answers.*

	Total	Managers	Working staff
Defined numeric values	12	9	3
Programmatic directives	5	2	3
Material consistencies of working substances	3		3
Success	1	1	
Call for action	1		1
Acting guidelines	1		1
Efficiency of applied resources	1		1

*Table 10. Frequencies of answers to the question addressing the instances for specification of hard-fact criteria.
Separate analysis for the two groups sorted by the total number of answers.*

	Total	Managers	Working staff
Inner-firm instances	16	12	4
External instances (e.g. legislator, expert panel, customer)	5	2	3
Acting person herself	1	1	

*Table 11. Frequencies of answers to the question addressing the instances for specification of vague criteria.
Separate analysis for the two groups sorted by the total number of answers.*

	Total	Managers	Working staff
Inner-firm instances	10	8	2
Acting person herself	8	4	4

Question 3

The method of dealing with mistakes was investigated through further questions referring to the cases described by the subjects. At first they were asked to characterize the handling of mistakes in a few words (table 12).

Table 12. Brief characterization of the handling of mistakes.
 Separate analysis for the two groups sorted by the total number of answers.

	Total	Managers	Working staff
Conversations were held	12	9	3
The case was cleared constructively	10	6	4
Those concerned were informed about alternative action	4	3	1
The priority was laid on debt assignment	2		2
Common attempt of camouflage	1	1	
Appointment of referees	1	1	
The mistake was ignored	1		1
Charge and dismissal without notice	1		1
The superior received an outburst of fury	1	1	

After characterizing the handling of the mistake the subjects were asked to describe steps which should correct the mistake. 22 subjects reported efforts of correcting the mistake (table 13).

Table 13. Answers to the questions addressing the steps to clear the mistakes.
 Separate analysis for the two groups sorted by the total number of answers.

	Total	Managers	Working staff
The mistake was corrected	6	4	2
There was concerted work on a solution	4	1	3
Rapid processing of the reclamation	4	1	3
The mistake was not cleared	2	1	1
Definition of new working processes	2	1	1
Apologizing to the customer	1	1	
Ex post dismissal	1	1	
Return of stolen goods	1		1
The mistake was burked	1	1	

On a higher level subjects were asked if any efforts have been made to prevent the mistake in future. They reported 30 examples, 22 of them were reported by managers (table 14).

Table 14. Answers to the question addressing efforts of future mistake prevention. Separate analysis for the two groups sorted by the total number of answers.

	Total	Managers	Working staff
Discussion within the department.	7	6	1
Definition of new working processes.	7	5	2
Constitution of new check-up and supervision strategies.	7	4	3
Sensitizing the people for the problem.	4	3	1
Deep causal analysis.	3	3	
Stipulating more precise agreements.	1	1	
Calling a task force.	1		1

In order to receive an impression of the reported cases, the subjects had to answer several closed questions. As shown in table 15, the questions were not answered by all subjects. It is not the case that subjects were not asked, but they didn't answer.

Table 15. Answers to closed questions addressing ways of dealing with the mistakes. Separate analysis for the two groups sorted by the total number of answers. The figures show acceptance/decline referring to the statements.

	Total	Managers	Working staff
Have there been any efforts to clear the mistake?	19/2	10/1	9/1
Have there been any efforts to avoid this mistake in future?	19/5	11/2	8/3
Was there any documentation of the mistake?	16/7	9/3	7/4
Had the failing person opportunities to explain her position?	22/1	12/1	10/0

Comparison between managers and working staff members

One purpose of the study was to compare managers and working staff members as to their perception of mistakes. This has been done by comparing the answers from both groups on the closed questions which had a dichotomy answer format ("yes" or "no"). The following tables show the results of Fisher-Yates-tests which is based on the comparison of given empirical and expected values. In those cases of $p=1$ both groups answered similarly.

Table 16. What is called a mistake in the test persons' working fields.
Test of differences between managers and working staff members with Fisher-Yates.

Statement	p
If something goes wrong in the manufacturing...	.22
If something goes wrong in customer relations ...	1
If work is organized in a way that does not use the full capacities of the workers05*
If work is organized in a way that affects the quality of work processes58
If a company is organized in a way that neglects employees' interests25
If a company uses the employees' abilities only insufficiently45
If employees receive no support for developing their competencies24
If work is organized in a way that imperils employees' health ...	1
If the relations between managers and subordinates are affected70
If relations between colleagues are affected ...	1

Note: Exact testing, two-sided.

The only significant difference occurred in the interpretation of insufficient use of workers' capacities. As table 17 indicates, there was no significant difference found in the estimation of avoidability and foreseeability.

Table 17. Statements about avoidability and foreseeability.
Test of differences between managers and working staff members with Fisher-Yates.

	p
The mistake was avoidable.	.62
The mistake was foreseeable.	.30

Note: Exact testing, two-sided.

The subjects had to estimate their chances of influencing valuation criteria for hard-fact criteria as well as for vague criteria. The Fisher-Yates test showed no significant differences between managers and working staff members (table 18).

Table 18. Subjects' influence on the valuation criteria.
Test of differences between managers and working staff members with Fisher-Yates.

	p
I can influence the specification of hard-fact criteria.	.68
I can influence the specification of vague criteria.	.32

Note: Exact testing, two-sided.

One component of the interview was the characterization of the way of dealing with mistakes. The values shown in table 19 confirm the first view of the descriptive data level (see table 15) that managers and working staff members answer almost identically.

Table 19. Dealing with mistakes.

Test of differences between managers and working staff members with Fisher-Yates.

	P
Have there been any efforts to clear the mistake?	1
Have there been any efforts to avoid this mistake in future?	.67
Was there any documentation of the mistake?	.67
Had the failing person opportunity to explain her position?	1

Note: Exact testing, two-sided.

Discussion

The present research posed three questions, which were asked in general as well as with respect to differences between managers and working staff members. The discussion of the findings first follows the three research questions and ends with a view on group differences.

Question 1: What is usually called a mistake in real inner-firm contexts?

The two open questions at the beginning of the interview about areas in which mistakes can occur and in which they occur most frequently, were answered unanimous insofar as the areas *communication*, *working processes* and *flow of information* received the most nominations in both cases. All three areas point out tuning processes between at least two interfaces. In statistical analyses, no significant difference between both hierarchies (managers and working staff members) were found, but on a descriptive data level an interesting distinction can be found when referring to the most frequent mistakes (table 2): *Working processes* and *flow of information* – each with six nominations as the most prominent mistake area – show striking distributions between hierarchies, because working processes received five nominations from the superior group and only one from working staff members, whereas for flow of information the same distribution occurred vice versa. This can be seen as the result of a different attribution of possibly the same processes. If mistakes occur during work operations, managers ascribe the mistake to the acting persons (and therefore to the *working processes*), whereas working staff members ascribe the mistake to the managers (and therefore to the *flow of information*). At a first glance this interpretation stands on a weak basis, which can yet be reinforced by additional

interpretation of the opening question about areas, in which mistakes can occur (table 1). Seven answers from the working staff members accounted for *working processes* and three from the managers. More working staff members than managers have this area in mind when thinking more about principle opportunities for mistakes. Only the focus on the most frequent mistakes implied by the interview led to the striking redistribution that managers mentioned working processes much more than working staff members do.

Besides the open questions a catalogue of ten different descriptions of mistakes was presented to the subjects. Their task was to assess whether the illustrated cases would have been called mistakes in their own working fields. The answers help to determine the degree of conformity in the comprehension of mistakes. As the rates of acceptance ("the case would be called mistake") indicate (table 3), in only four cases more than three-quarters of the subjects thought the cases would be called a mistake in their company. The highest acceptance found the case of threatening employees' health (93%), followed by breaking down the manufacturing (89%), affecting the quality of work processes (89%), and affecting customer relations (79%). The lowest rates addressed neglect of employees' interests (44%) and deficient use of employees' capacities (39%).

From an educational point of view, those cases were of primary interest, which referred to deficient use of capabilities and insufficient support of competence development. In the subjects' view the deficient use of capabilities would be called a mistake in about 54% of their workplaces. Insufficient support of competence development would be called a mistake in 66%. These findings allow an ambivalent interpretation: On the one hand the share of those who accept the neglect of employees' capacities is large, on the other hand the majority of subjects indicate a mistake when neglecting the development and use of competencies.

Question 2: In enterprises who participates in the definition and identification of mistakes?

The background to this question was the circumstance of organizing enterprises based on the division of labor. The transparency and precise specification of crite-

ria for calling something a mistake is one precondition for learning from mistakes. Only in this case is a person able to reliably avoid this mistake in similar future cases. Otherwise the avoidance of the mistake would happen by chance or by causeless omission of similar activities. Both processes cannot be called "learning from mistakes".

In only five of the 22 described cases the acting person detected the mistake herself (table 5). In five cases external mistake detection was mentioned, in the rest some internal departments detected the mistake.

The data does not allow statements about the transparency of the valuation criteria for calling something a mistake. The only exceptions are the five cases when the acting persons themselves detected the mistake. For them, a positive condition for learning from mistakes can be assumed, because the acting persons knew the valuation criteria. For the other cases one has to abstain from speculations and refer to findings about dealing with mistakes investigated with question 3.

The answers about instances specifying valuation criteria were very interesting. Only in one of the 22 cases, in which a hard-fact criterion was used for identifying the mistake, the acting person herself had constituted the criterion. In 16 cases inner-firm departments and in five cases external instances – for example the legislative or the customers – constituted the criteria. The majority (56%) of the subjects guessed that they could influence the constitution of hard fact criteria anyway (table 8). Another situation can be seen when referring to the 18 cases of vague valuation criteria. In eight of these cases the acting person herself constituted the criterion, and 78% of the subjects mentioned that they can influence the constitution of vague criteria:

If one assumes that a principle opportunity to influence the specification of valuation criteria corresponds with acquaintance of the conventions as to how to identify mistakes in the company, then positive conditions for learning from mistakes seem to prevail. The majority of the acting persons knew the standards for the valuation of their actions.

Question 3: How are mistakes dealt with in enterprises?

The subjects had to characterize how they dealt with the mistakes they had described before (table 12). Most answers indicated a reflected way of dealing with mistakes; only five cases suggested a problematic processing by initiating debt assignment (two cases reported), camouflaging or ignoring the mistake, and by an executive receiving an outburst of fury. Additionally, one case was reported, in which the failing person was charged and was dismissed without notice following a theft. In total the subjects expressed 33 examples for striking mistakes, of which only these six (18%) indicated a way of handling, which a priori looks like a bad condition for learning from mistakes. In all other cases conversations were held, alternatives discussed, and the incident was cleared constructively. Of course such a kind of case description depends on interpretations and is vulnerable to biases. The case descriptions do not indicate barriers for learning from mistakes in principle, however.

The consent on the general question, whether efforts of future mistake avoidance were undertaken, was 79%. Almost 70% of the subjects confirmed that the mistake was documented in order to make it accessible for others (table 15). Significant differences between managers and working staff members could not be found. The majority of subjects confirm activities of avoiding similar mistakes in future, and thus learning from mistakes. When asked for examples of efforts of mistake avoidance, subjects mentioned conversations (7 nominations), definitions of new working processes (7 nominations), and the constitution of new check-up and supervision strategies (7 nominations). Moreover four subjects reported efforts of sensitizing the workers for the problem, three reported deep causal analyses (table 14).

More differences between managers and working staff members

Tables 14-16 show the test results of differences between managers and working staff members. Only one significant difference was found.

This significant difference addressed whether insufficient utilization of workers' capacities should be called a mistake. Most of the managers (57%) said this case would be called a mistake in their working fields, whereas only 17% of the working staff members agreed. Obviously and expectedly, plant utilization seems to be a value to be realized within the superior group. Yet, the rate of acceptance within the managers group is not very great – the significance of the difference between the groups is mainly based on the large degree of working staff members' denial.

Concerning all other issues, no significant differences were found. Programmatic claims of modern concepts of business organization have apparently been realized in so far, that the decrease of hierarchical differences referring to competence supporting working conditions are fulfilled.

Conclusions

The evidence presented allows a first rough analysis of the data. The interviews asked which events are called mistakes in the working field, which subgroups participate in the identification of mistakes, and in what way mistakes were dealt with. Interest was placed on the conditions of opportunities for learning from mistakes. On the basis of the interviews, no conclusions could be drawn as to who learned from mistakes to what extent. The handling of mistakes in the subjects' working fields seems to be reflected and constructive. No generalizable differences between managers and working staff members were found.

Further evidence indicates that there is only a small overlap of issues, which subjects would commonly characterize as mistakes. Only a few cases were found, which were termed as "mistakes" by more than three quarters of the subjects. These cases stem from areas which normally should be indisputable (e.g. threat of health). So Billett's (in press) argument is supported in that cognitive issues in the field of professions have to regard individual as well as social dimensions.

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