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# Self-directed work groups and team competence

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The study examines the impact of self-directed group work on team competence. The sample consists of 83 production groups from 20 medium-sized enterprises: 44 self-directed work groups and 39 traditional work groups. Results based on process-analytic behavioural data, collected at the group level of analysis, show that self-directed teams are more competent than traditional work groups on seven out of 12 aspects of competence. Self-directed teams show greater methodological competence, to some extent greater professional and self-competence but no greater social competence when completing optimization tasks. In addition, the work characteristics participation, formal team communication, continuous improvement process, training and team-oriented tasks were related to team competence in the subsample of self-directed work teams.

The present study aims to investigate the impact of self-directed group work[1] on team competence. With the increasing popularity of self-directed work teams in organizations, research has begun to examine consequences of self-directed team work. Researchers have linked self-directed work teams to productivity, behavioural outcomes (e.g. absenteeism, turnover) and job-related attitudes (e.g. job satisfaction, organizational commitment) with varying degrees of success[2] (for an overview, see Cohen & Bailey, 1997; Sundstrom, McIntyre, Halfhil, & Richards, 2000). Furthermore, the contribution of self-directed group work to the development of competence is frequently referred to in relevant theorizing (e.g. Fröhlich & Pekruhl, 1996; Hackman, 1987; Locke & Wagner, 1997; Wegge, 2000). However, although the development of competence is assumed when self-regulating work groups are introduced, competence is not considered as a process or dependent variable in existing studies (for an overview, see Sundstrom *et al.*, 2000). This is particularly true for the group level of analysis.

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[1] *Following Sundstrom et al. (2000) I use the label self-directed work group as a synonym for self-managing, self-regulating, or autonomous work groups. Moreover, I use the terms 'work group' and 'team' interchangeably.*

[2] *While some authors have found self-directed work teams to be an effective way of improving employee attitudes and productivity (e.g. Cohen, Ledford, & Spreitzer, 1996; Cordery, Mueller, & Smith, 1991; Fröhlich & Pekruhl, 1996; Macy & Izumi, 1993; Pearson, 1992; Seers, Petty, & Cashmann, 1995), others emphasize that the empirical evidence for a causal relationship between participation and behavioural outcomes – especially long-lasting improvements – is by no means clearly established (e.g. Cohen & Bailey, 1997; Cotton, 1993; Wall, Kemp, Jackson, & Clegg, 1986).*

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Thus, it remains uncertain what teams really learn in self-directed group work and what the fundamental elements that promote work-related competence in self-directed teams actually are. In the current paper, I address this issue by investigating the relationship between participation and competence. Therefore, I first compare the team competence of traditional work groups with that of self-directed work groups. Second, I assess the self-managing teams with respect to six work characteristics identified by Frieling, Freiboth, Henniges, and Saager (1997) and relate these characteristics to team competence. The aim of the current study is to provide empirical evidence regarding the impact of self-directed work on competence at the group level of analysis.

### *Theoretical background*

Focusing on the relationship between participation[3] and human performance, researchers assume that process as well as outcomes have to be considered (Campbell, Glasser, & Oswald, 1996). Process-oriented approaches concentrate on knowledge, attitudes and behaviour that yield performance outcomes (Kozlowski, Gully, Nason, & Smith, 1999; McIntyre & Salas, 1995). A process-oriented model that both emphasizes human resources and describes a relationship between participation, competence and performance outcomes is the human resource model (HRM). The HRM presumes that participation results in a better utilization of the human potential, which in turn leads to superior performance (Miles, 1965). Thus, the model could be regarded as a concrete specification of an input–process–output model of group effectiveness (e.g. Guzzo & Dickson, 1996; Hackman, 1986; Hackman & Morris, 1975).

The relationship between participation and competence, the first part of the HRM, is supported by basic statements regarding learning potential in the job at the individual level of analysis. Involving employees in decision-making processes and in designing the working environment calls upon and promotes their competencies more than carrying out highly structured tasks. In combination with a high degree of decision latitude, learning will occur (cf. Baitsch & Frei, 1980; Deci & Ryan, 1985, 1987; Karasek, 1979). At the individual level, it can be shown that individuals with greater activity latitude, higher task variety, greater transparency as well as more opportunity for participation in the organization rate their levels of competence to be higher (cf. Bergmann, 2000). With the exception of these individual-level analyses using subjective ratings, however, there is little empirical evidence on the impact of participation on competence.

Nonetheless, it can be assumed that the participation granted to teams promotes competence at the group level. Self-directed teamwork stands for the change from behaviour-oriented to result-oriented management. Under behaviour-oriented management, which refers to traditional group work, work teams are directed by supervisors who decide what is done, how it is done and who does it. Under result-oriented management, which refers to self-directed group work, the team itself is left to decide how best to attain the goals set by management. Thus, decision latitude (cf. Langfred, 2000) and 'complete working acts' (Hacker, 1978, 1985; Volpert, 1990) as a result of self-directed team work emerge primarily for the team as a whole and not for the individual team member. Using self-reporting measures at the group level of analysis, Druskat and Kayes (1999) showed empirically in two small samples of 22 production and 11 maintenance teams that autonomy was positively related with cross-boundary

[3] *Self-directed work teams are the primary means by which substantive participation is attained (Fröhlich & Pekruhl, 1996; Guzzo & Dickson, 1996).*

team competencies in all teams and with proactive problem-solving in the maintenance teams. Therefore, I assume that self-directed teamwork provides the framework and determines the development of team competence.

Before formulating concrete hypotheses, I will clarify what I mean by competencies in teams in terms of three specific aspects: (1) competence as a group-level variable, (2) the relation to demands and action and (3) the facets of competence.

### *Competence as a group-level variable*

Competence is interpreted as a more or less specialized system of abilities, proficiencies or skills, which enables a person, team or organization to act and react when completing concrete and familiar as well as novel working tasks (for an overview, see Weinert, 2001). If the conventional approach to identifying competence is used, the primary unit will be the individual. The team-level construct 'team competence' emerges from the lower level construct 'individual competence'. Team and individual competence have similar meanings across levels. However, the processes across levels are not entirely isomorphic. There are reciprocal relationships: team-level competence will be influenced by individual-level competence and vice versa. From a system theory point of view, treating groups as equivalent to individuals implies that the whole is considered as the sum of the individual group members and that these individuals are independent of each other. However, group members interact with each other. Through interaction, the behaviour, knowledge, attitudes and opinions of individual team members are mutually influenced, thus changing the group as a system (Bergius, 1976). Moreover, one feature of teams is their ability to compensate for the lack of competence in individual members by calling upon those of other team members. This idea corresponds with more recent reflections from action theory, which views groups as units: 'Groups are acting as units, they act as a whole. They exist to act and they cease to exist if they cease to act' (Cranach, 1996, p. 150). Competence, similar to group process, occurs simultaneously at the group level and at the individual level. However, in the present study I focus solely on the team (group-level) competence.

### *Demand and action relation: Assessment setting*

Competence occurs in the performance context of the workplace when successfully coping with concrete job requirements (cf. Fischer, Bullock, Rotenberg, & Raya, 1993; Kozlowski *et al.*, 1999). Therefore, competencies cannot be defined and examined abstractly. To measure team competence, a team setting in which competencies are linked to coping with concrete, relevant working tasks has to be identified. Meetings in which team members are expected to solve work process problems, increase cost effectiveness and improve workplace design are fundamental elements of teamwork (cf. Frieling *et al.*, 1997); further, they fulfil these requirements. These 'optimization discussions' are central to various management programmes (e.g. total quality management, continuous improvement schemes, organizational learning and knowledge management).

### *Facets of competence*

The definition of competencies is not consistent across scholars (for an overview, see Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995). In the following I will focus on the classification into professional, methodological, social and self-competence, which

shows a clear analogy with the theoretically based systematization of learning outcomes from vocational training programmes (cf. Kraiger, Ford, & Salas, 1993). Arguably, optimization discussions allow teams to exhibit each of these four facets of competence.

### *Self-directed group work and facets of competence*

As mentioned before, I assume that self-directed teamwork is beneficial to team competence; but are positive effects to be expected on all four facets of competence, or only on particular areas?

#### *Professional competence*

Professional competence is regarded as the sum of organizational-, process-, task- and workplace-specific professional skills and knowledge of a team. Moreover, the ability to classify and to assess organizational knowledge, to identify problems and to generate solutions is an integral part of professional team competence. The implementation of self-directed teamwork enhances the group's field of responsibility. Professional competence of teams is increased on the one hand by access to information about order processing, material availability and production capacity, and on the other hand by communication and argumentation within the group as well as with interface areas. Therefore, I hypothesize:

> *Hypothesis 1.* Self-managing teams show more professional competence than traditionally managed teams.

#### *Methodological competence*

Methodological competence describes the ability of a team to make means and resources available and to use them for the accomplishment of tasks. Methodological competence is revealed when the team structures tasks by, for example, introducing procedural suggestions, establishing priorities or visualizing main topics. Structuring is often considered as an appropriate measure to minimize process loss in group work (Steiner, 1972). Because the emphasis in self-directed workgroups has shifted from how the work is done to results-achieved, self-directed teamwork, there is a greater need for thorough structuring of the group. I therefore hypothesize:

> *Hypothesis 2.* Self-managing teams show more methodological competence than traditionally managed teams.

#### *Social competence*

Social competence is considered to be the ability of the team members to communicate and cooperate with each other in a self-organized way (Sonntag & Schaper, 1992). It is shown, for example, through active listening or positive remarks about other people. Increased demands for cooperation encourage self-directed work groups to learn how to reconcile the diverse needs of their members. The better teams learn to cope with conflicts the more social competence can evolve. Therefore, I hypothesize:

> *Hypothesis 3.* Self-managing teams show more social competence than traditionally managed teams.

*Self-competence*

Self-competence is understood as the team's willingness to create conditions in order to grow in the process of work. In self-directed group work, more responsibilities and greater action and decision latitude are assigned to the team. This should lead to teams showing initiative, taking on responsibilities and participating in the configuration of work. I hypothesize:

> *Hypothesis 4.* Self-managing teams show more self-competence than traditionally managed teams.

### *Different views on what self-directed teamwork actually is*

Overall, there are substantial differences in research findings regarding the effects of autonomous work groups (e.g. Guzzo & Dickson, 1996). This variance may be caused by widely varying, and indeed conflicting, views of what self-directed group work is, often even within one company (Fröhlich & Pekruhl, 1996). Besides participation, there are other aspects of human resource policy and practice to consider that might have an impact on competence (Heller, 2003; Sundstrom *et al.*, 2000). The checklist for the assessment of self-directed teams' work organization developed by Frieling *et al.* (1997) offers a concrete operationalization of six work characteristics: organizational framework, team activities, team participation, team communication, qualification and continuous improvement process. First, the organizational framework (team size, leadership or existence of a team-related wage system) is included to establish whether the necessary prerequisites for successful teamwork and, in particular, for the development of team competence are present. According to Sundstrom *et al.*, the organizational context has often been neglected in previous studies. Second, self-directed teamwork includes the accomplishment of indirect activities relating to quality, maintenance, logistics and so on, which were formerly carried out by supporting departments. How far advanced the inclusion of indirect activities is may influence team competence. Third, as pointed out before, it is essential for team competence that teams have some opportunities to make autonomous decisions regarding their work process. Fourth, a fundamental element of self-directed teamwork is formal team communication. Communication has long been shown to influence effectiveness in laboratory studies (Deutsch, 1949; Leavitt, 1951) and is considered in many current models (e.g. Gladstein, 1984; Pearce & Ravlin, 1987). Communication, for example the number of team meetings and the amount of formal team communication, may enhance team competence. Fifth, the amount of training and qualification is considered. The aim of training is to enhance competence to perform new tasks. Finally, attempts to involve the team in a process that calls for a continuous striving for the improvement of work processes (Imai, 1992) may enhance team competence.

These work characteristics have been examined empirically in terms of their ability to predict team competence. I hypothesize:

> *Hypothesis 5.* Work characteristics of self-directed teams' work organization predict team-based professional, methodological, social and self-competence in self-directed teams.

Campion, Medsker, and Higgs (1993) showed that self-management and participation were slightly more predictive of effectiveness criteria than were other work characteristics. Therefore, and based on the considerations about participation and competence, I assume:

*Hypothesis 6.* Participation is the most important predictor of team-based professional, methodological, social and self-competence in self-directed teams.

## Method

### *Sample*

A total of 140 companies who had participated in a management survey on enterprise flexibility (cf. Bernard, 2000) were invited to take part in the study. Of these, 20 medium-sized established enterprises from the automotive supply industry, the metal, electrical and packaging industries as well as utilities agreed to do so. All participating companies stated prior to the study that optimization discussions of the employees' working field are carried out regularly. Ten enterprises with 39 traditional work groups (241 employees) defined as a group of employees who hierarchically depend on the same supervisor, and 10 other enterprises with 43 self-directed work groups (278 employees) were included. In most cases, between one and six groups from the production department of each company participated in the study with one exception: 16 groups with traditional teamwork from one company were included as well as 15 groups with self-directed teamwork from another company.[4] It was up to the management to decide which groups to include. The management of the companies was asked to select groups that were representative of their company (concerning, for example, production ratios). Furthermore, it was shown in one of the companies that the selected groups were average concerning self-rated working conditions and work satisfaction.

Self-directed teamwork was implemented in 'brown field' sites 2–5 years before the study began ($M = 3.80$, $SD = 1.28$). Previous to this, no principle of voluntary participation in group work had existed on these sites. Self-directed teamwork was implemented throughout the production division. Companies used either self-directed or traditional workgroups; no company used both traditional and self-directed workgroups in production. The optimization discussions involved five to seven members from each work group. This number was assumed to be favourable for problem-solving processes in groups. Furthermore, the number of participants in the discussion remained fairly constant. When a group consisted of more than seven members, the management was asked to select seven members for the optimization discussion. The management organized the selection together with the team members.[5] No participant was subordinate to another member of the group.

Employees of traditional ($N = 231$) and self-directed ($N = 228$) work groups who participated in the optimization discussion did not differ significantly in terms of age ($\chi^2 = 5.12$; $p = .27$) or the hours spent attending further education over the last 10 years[6] ($t = 0.17$, $df = 278$, $p = .86$). The proportion of women was significantly higher in self-directed work teams (42 women) than in traditional work groups (11 women; $\chi^2 = 15.65$; $p < .01$). Furthermore, there were significantly more unskilled workers in self-directed teams – 36 workers in total, compared with 11 unskilled workers in

[4] *The following mean differences could be replicated in the subsamples.*
[5] *In reality, not all team members take part in optimization discussions. Some team members have to keep working to ensure that production levels are maintained, others are on holidays or are ill. Furthermore, one feature of teams is that they compensate for the lack of competence in individual members by calling upon the competencies of other team members. This also applies when individual team members are missing. Thus, I assume that the reduced team satisfactorily represents the whole team.*
[6] *The measures could only be assessed in a reduced partial sample.*

traditional work teams ($\chi^2 = 16.04$; $p < .01$). This indicates that self-directed teams were not introduced in companies with specially qualified employees.

### *Procedure*

The data were collected while groups completed an actual optimization task relevant to their specific work activities (e.g. How can quality be improved?). The optimization tasks were adapted for each specific group. The tasks had to be related to actual daily work to arouse the participants' interest in contributing to the optimization discussion. Prior to data acquisition, the supervisors, as well as the groups, agreed that it was important to work on that optimization. Thus, the outcomes of the discussions were both relevant and occurred within the groups' actual environment. Moreover, the team members agreed that $1\frac{1}{2}$ hours would be sufficient to find possible solutions and to plan first measures to be taken.

Discussions were videoed. The participants were advised to ignore the videotaping and the trainer and to discuss the topic as they would do under normal circumstances. Afterwards, the groups characterized the discussion as typical for meetings with the given line-up. The data collection took place at the beginning of 1-day workshops. A workshop, carried out by two qualified trainers, was the reward for the participating companies. The checklist for the assessment of self-directed teams' work organization was completed by management for the 43 self-directed work groups concurrently.[7]

### *Measures*

All data were collected and analysed at the group level.

#### *Cassel competence grid*

In order to measure team competence, the Cassel Competence Grid (CCG; Kauffeld, 2006) was used. The CCG is based on process-analytical group research (e.g. Bales, 1950, 1970; Cooke & Szmal, 1994; Hirokawa, 1983) and measures groups' work-related competency when completing a real, group-relevant optimization task. The team competence in the optimization discussion is manifest in the participants' utterances. To analyse the discussion using the CCG, the videotaped verbal statements from the optimization discussion are transcribed and then subdivided into units. A unit is defined as a communication that in its context may be understood by another member as equivalent to a single simple sentence (Bales, 1950). *Sentence* itself is grammatically defined as a declarative formation that contains or at least implies a subject and a predicate. Consistent with Bales (1950), the analysis on the CCG is an act-to-act encoding: a unit to encode contains a sentence, a thought, a statement, a thematic reference or a unit of sense. Whenever the speaker alternates, a new unit of sense is assigned. If the description of the same circumstance lasts longer than 20 seconds, the same category is encoded again so that the sequence can be reconstructed chronologically. The same category is also encoded again when interrupted by a contribution that is encoded differently.

Each unit is then allocated to one of the 45 exclusive criteria of the CCG (cf. Appendix). The derivation of the criteria and the aggregation to 12 aspects and four facets (professional, methodological, social and self-competence) is theoretically driven and based on research about competence, expertise, groups and problem-solving

[7] *For one group, the checklist was not available.*

processes. For the methodological, social and self facets of competence, both positive and negative criteria are considered. 'Losing the train of thought in details' is an example for the negative aspect of methodological competence; 'running others down' exemplifies the negative aspect of social competence and 'moaning about the *status quo*' is an example of the negative aspect of self competence.

For statistical analysis, the number of units for each competence criterion is enumerated. The criteria of a competence aspect are summed up across members within a team and used for further analysis. For example, the utterance 'Let us visualize our solutions' is categorized as a procedural suggestion. All positive remarks concerning the structuring of the discussion are summed up to assess the aspect 'positive methodological competence'. Since the length of the discussions varies between 60 and 90 minutes, the data are based on a 60-minute period. Therefore, the number of codes per criterion is divided by the length of the videotape in minutes and then multiplied by 60.

### *Coding and analysis*

In the present study, the CCG rating was carried out by two trained researchers. Inter-rater agreement is established by encoding six optimization discussions, selected at random, twice. The first rater transcribes the videotaped verbal statements, subdivides the statements into units and encodes each unit with one of the categories of the CCG. The second rater then encodes the units again based on the transcription and subdivision provided by the first rater. The high inter-rater consistency, especially for rating systems, of Cohen's (1960) $\kappa = .90$ point to a clear and definite encoding. The internal consistencies of the aspects can be considered as at least sufficient ($\alpha > .60$; cf. Table 1).

### *Checklist for the assessment of self-directed teams' work organization*

The checklist by Frieling *et al.* (1997) provides 43 criteria to describe the six work characteristics of self-directed teams: work organization, team-oriented activities/tasks, participation/autonomy, formal team communication, qualification and continuous improvement process (CIP). For most of the criteria, three different levels awarding 1, 2 or 3 points representing the degree of self-directed team work are used. For example, the work characteristics 'Team oriented activities/tasks' includes the criterion 'Contact with Customers/Suppliers'. When completing the checklist, the manager has to specify whether up to 30% (1 point), between 30% and 70% (2 points) or over 70% (3 points) of the team members have contact with customers or suppliers. The absence of a criterion leads to a zero score. The rating points are summed up for the six work characteristics. Alpha coefficients range from $\alpha = .65$ to $\alpha = .90$ (cf. Table 2). The intercorrelations of the six self-directed work group characteristics range from $r = -.31$ (between organizational structure and qualifications) up to $r = .76$ (between formal team communication and CIP). In particular, the three characteristics of participation/autonomy, formal team communication and continuous improvement process show high intercorrelations. This suggests that a single factor may underlie the categories.

## Results

Results are presented in the order in which the analyses were undertaken. First, the multivariate ANOVA (MANOVA) is described followed by an assessment of the relationships between work characteristics and team competence.

**Table 1.** Group means, standard deviations and intercorrelations among the competence aspects and alpha coefficients for all aspects

| Variable | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Differentiation problems | 79.50 | 50.27 | (.75) | | | | | | | | | | | |
| 2. Cross-linkage problems | 29.11 | 17.48 | .21* | (···) | | | | | | | | | | |
| 3. Differentiation solutions | 60.92 | 37.16 | .40** | −.21* | (.64) | | | | | | | | | |
| 4. Cross-linkage solutions | 30.45 | 21.69 | .16 | .07 | .66** | (.77) | | | | | | | | |
| 5. Organization | 79.23 | 35.01 | .05 | −.06 | .13 | .12 | (···) | | | | | | | |
| 6. Knowledge management | 45.20 | 30.24 | .45** | .02 | .41** | .19* | .34** | (.62) | | | | | | |
| 7. Structuring (pos.) | 63.87 | 63.44 | .01 | .14 | .37** | .34** | −.20* | .34** | (.85) | | | | | |
| 8. Structuring (neg.) | 40.61 | 39.92 | .02 | −.36** | −.02 | −.33** | −.05 | −.14 | −.42** | (···) | | | | |
| 9. Socio-emotional (pos.) | 198.21 | 93.37 | .48** | −.08 | .55** | .15 | .24* | .57** | .15 | .28** | (.71) | | | |
| 10. Socio-emotional (neg.) | 125.64 | 67.30 | .38** | −.16 | .17 | −.09 | .32** | .36** | −.24* | .28** | .42** | (.60) | | |
| 11. Participation (pos.) | 17.75 | 14.74 | .24* | −.09 | .59** | .46** | .21* | .41** | .16 | .03 | .43** | .14 | (.61) | |
| 12. Participation (neg.) | 70.28 | 47.28 | .16 | −.35** | −.06 | −.36** | .16 | .08 | −.48** | .66** | .41** | .39** | .08 | (.68) |

*Note*. Level of analysis is the group ($N = 83$). *M*: Mean; *SD*: Standard deviation. Reliabilities in parentheses. (···) One criterion accounts for the aspect so reliability cannot be calculated. *$p < .05$; **$p < .01$ (two-tailed).

**Table 2.** Group means, standard deviations and intercorrelations among the work characteristics of self-directed teams' work organization and alpha coefficients for all work characteristics

| Variable | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Organizational structure | 18.07 | 2.23 | (.65) | | | | | | |
| 2. Team-oriented activities/tasks | 16.95 | 3.13 | .37* | (.67) | | | | | |
| 3. Participation/autonomy | 23.07 | 4.25 | .15 | .55** | (.85) | | | | |
| 4. Formal team communication | 13.70 | 1.52 | .17 | .53** | .61** | (.78) | | | |
| 5. Qualification | 17.47 | 2.57 | −.31* | .02 | .25 | .56** | (.68) | | |
| 6. Continuous improvement process | 12.67 | 3.94 | .26 | .65** | .75** | .76** | .41** | (.90) | |
| 7. Composite | 16.99 | 2.16 | .35* | .75** | .86** | .91** | .42** | .94** | (.79) |

*Note.* Level of analysis is the group ($N = 43$). *M*: Mean; *SD*: Standard deviation. Reliabilities in parentheses. *$p < .05$; **$p < .01$ (two-tailed).

### *MANOVA and ANOVA results*

Hypotheses 1 to 4 predict that self-directed work groups are more competent than traditional work groups. MANOVA reveals a significant effect for the quasi-experimental factor, $F(12, 70) = 4.96$, $p < .001$, $\eta^2 = .46$, indicating that self-directed teams overall are more competent when solving an optimization task than traditional work groups.[8] In Table 3, the results of the 12 follow-up univariate ANOVAS are shown.

#### *Professional competence*

The self-directed work groups are shown to be better than traditional work groups at describing problems in a differentiated manner. Above all, the superiority of self-directed teams at linking problems (i.e. searching for causes or naming consequences of problems) and at linking solutions (i.e. naming advantages and disadvantages of solutions and embedding them into the problem as a whole) is shown. No significant differences between self-directed and traditional work groups emerge concerning identifying requirements and solutions, organizational knowledge and knowledge management (e.g. reference to specialists or questions about opinions). Thus, Hypothesis 1 is supported for three out of six competence aspects.

#### *Methodological competence*

The superiority of self-directed work groups is shown in the positive as well as in the negative aspect of methodological competence. Self-directed work groups structure themselves better and less often lose the train of thought in details and examples than traditional work groups. Therefore, Hypothesis 2 is fully supported.

#### *Social competence*

No significant differences between self-directed and traditional work groups emerge concerning social competence. Employees working in self-directed group work make as many positive or negative judgments about persons or their activities in the discussion

[8] *Since the traditional and self-directed workgroups are not assigned to the organizations in a way that varies (cf. paragraph sample), considering the organization as a level of analysis does not generate any additional information because all organizational characteristics are contained in the group level of analysis. Therefore, organization is not treated as a covariate in the MANOVA.*

**Table 3.** Univariate follow-up analyses of variance for the aspects of competence

| Competence aspect | Work group | *N* | *M* | *SD* | *F* | $\eta^2$ |
|---|---|---|---|---|---|---|
| *Professional competence* | | | | | | |
| Differentiation problems | Self-directed | 44 | 89.67 | 62.70 | 3.97* | .05 |
| | Traditional | 39 | 68.02 | 27.43 | | |
| Cross-linkage problems | Self-directed | 44 | 35.59 | 17.37 | 15.05*** | .16 |
| | Traditional | 39 | 21.81 | 14.64 | | |
| Differentiation solutions | Self-directed | 44 | 65.04 | 38.94 | 1.15 | .01 |
| | Traditional | 39 | 56.29 | 34.96 | | |
| Cross-linkage solutions | Self-directed | 44 | 37.62 | 25.40 | 11.58*** | .13 |
| | Traditional | 39 | 22.35 | 12.58 | | |
| Organization | Self-directed | 44 | 78.51 | 39.92 | .04 | .00 |
| | Traditional | 39 | 80.04 | 28.98 | | |
| Knowledge management | Self-directed | 44 | 49.54 | 32.41 | 1.96 | .02 |
| | Traditional | 39 | 40.30 | 27.17 | | |
| *Methodological competence* | | | | | | |
| Structuring (positive) | Self-directed | 44 | 86.72 | 74.08 | 14.09*** | .15 |
| | Traditional | 39 | 38.10 | 34.47 | | |
| Structuring (negative) | Self-directed | 44 | 19.71 | 17.47 | 36.84*** | .31 |
| | Traditional | 39 | 64.20 | 44.92 | | |
| *Social competence* | | | | | | |
| Socio-emotional (positive) | Self-directed | 44 | 188.85 | 81.49 | .94 | .01 |
| | Traditional | 39 | 208.78 | 105.26 | | |
| Socio-emotional (negative) | Self-directed | 44 | 155.71 | 70.76 | 2.07 | .03 |
| | Traditional | 39 | 136.84 | 62.17 | | |
| *Self-competence* | | | | | | |
| Participation (positive) | Self-directed | 44 | 19.69 | 15.89 | 1.64 | .02 |
| | Traditional | 39 | 15.56 | 13.18 | | |
| Participation (negative) | Self-directed | 44 | 51.43 | 36.51 | 17.94*** | .18 |
| | Traditional | 39 | 91.54 | 49.41 | | |

*Note.* Level of analysis is the group. *N*: number of work groups; *M*: Mean; *SD*: Standard deviation. *$p < .05$; **$p < .01$; ***$p < .001$. $df = 1; 81$. If I apply a Bonferoni correction, the results remain the same except for the aspect 'differentiation problems'. If I apply a Holm correction (1979), the results remain the same with no exceptions.

as their colleagues in traditional work groups. Criticism and running others down as a criterion of negative social competence (cf. Appendix) even appears significantly more frequently in self-directed work groups than in traditional work groups ($M = 26.25$ vs. $M = 15.8$, $F = 31.89$, $df = 1; 82$, $p < .01$). Hypothesis 3 is therefore not supported.

*Self-competence*

Results for self-competence must be considered separately for both positive and negative aspects. The superiority of self-directed work groups is shown in the negative aspect of self-competence. Self-directed work teams make fewer negative remarks concerning participation, for example, moaning or denial of optimization opportunities, than traditional work groups. For the positive aspect of self-competence no significant differences between self-directed and traditional work groups occur. Only one of the three positive criteria shows a significant difference: in planning measures to realize solutions, self-directed work groups perform better than traditional work groups ($M = 3.71$ vs. $M = 1.60$, $F = 4.73$, $df = 1; 82$, $p < .05$). Overall, Hypothesis 4 is only partly supported.

***Relationships between work characteristics and team competence***

First, consistent with the approach taken by other team researchers (Campion *et al.*, 1993), each of the six self-directed work group characteristics was correlated with each of the 12 competence aspects. Second, to consider the high interrelationship among some of the work characteristics of self-directed teams' work organization (cf. Table 2), the predictiveness of all characteristics together was examined, thus controlling for experiment-wise error rate. Therefore, the six work characteristics were averaged to yield a composite ($\alpha = .79$) as recommended by Frieling *et al.* (1997) and correlated with the competence aspects (Table 4). The correlations only involve the $N = 43$ self-directed teams.

Initial analyses of the six categories show that participation/autonomy was related to seven of the 12 competence aspects. With coefficients between $r = .38$ ($p < .01$, differentiation problems) and $r = .61$ ($p < .01$, differentiation solution), the correlation of participation/autonomy is the highest among the work characteristics for six specific competence aspects. Formal team communication and continuous improvement process are both moderately correlated in the predicted direction. Qualification shows four and team-oriented activities/tasks show three significant correlations in the predicted direction, although these were smaller in size. Organizational structure reveals no significant correlation (cf. Table 4).

Supplementary analysis with the composite shows that eight of 12 correlations were significant (cf. Table 4), ranging from $r = .30$ ($p < .05$; differentiation problem) to $r = .51$ ($p < .01$; differentiation solution). Both aspects of self-competence, two-thirds of the aspects of professional competence and the positive aspects of methodological and social competence could be predicted. Overall, the positive aspects of competence are more successfully predicted by work characteristics than the negative aspects. The negative aspect of social competence is completely unrelated to the specification of self-directed group work.

In summary, many relationships are observed between work characteristics and team competence. Five out of six work characteristics predicted some of the competence aspects. Thus, Hypothesis 5 is largely supported. Above all, participation/autonomy, but also formal team communication and continuous improvement process, are more predictive than qualification, team-oriented activities/tasks and organizational structure in particular. Hypothesis 6 is therefore supported to a large extent.

## Discussion

The data show mainly a positive relationship between group participation and group competence. This is shown in two ways: first, by comparing traditional work groups with self-directed work groups on various aspects of group competence and, second, by relating these aspects of competence to work characteristics of self-directed teams' work organization.

The results show that self-directed teams are more competent in completing optimization tasks than traditional work groups in seven out of 12 competence aspects. The hypotheses are fully supported for methodological competence, partially supported for professional and self-competence and not supported for social competence.

For professional competence the advantage of self-directed teams over traditional work groups is shown in three out of six competence aspects. Self-directed teamwork does not lead to exchanging organizational knowledge, managing knowledge or generating solutions. As a result, self-directed work groups do not exhibit more

**Table 4.** Correlation of work characteristics of self-directed teams' work organization with competence aspects

| Variable | Organizational structure | Team-oriented activities/tasks | Participation/ autonomy | Formal team communication | Qualification | Continuous improvement process | Composite |
|---|---|---|---|---|---|---|---|
| *Professional competence* | | | | | | | |
| Differentiation problems | .13 | .23$^{+}$ | .38** | .31* | .08 | .14 | .30* |
| Cross-linkage problems | −.10 | −.11 | −.08 | .03 | .08 | −.04 | −.06 |
| Differentiation solutions | .09 | .26* | .61** | .50** | .26* | .41** | .51** |
| Cross-linkage solutions | −.10 | .17 | .49** | .38** | .14 | .33* | .36** |
| Organization | −.01 | −.06 | −.05 | .02 | −.07 | .01 | −.04 |
| Knowledge management | .03 | .25$^{+}$ | .52** | .44** | .24$^{+}$ | .28* | .42** |
| *Methodological competence* | | | | | | | |
| Structuring (positive) | .09 | .15 | .36* | .36** | .38** | .39** | .41** |
| Structuring (negative) | −.14 | −.11 | −.18 | −.23$^{+}$ | −.20$^{+}$ | −.19 | −.23$^{+}$ |
| *Social competence* | | | | | | | |
| Socio-emotional (positive) | .01 | .29* | .59** | .45** | .31* | .38** | .49** |
| Socio-emotional (negative) | .05 | .04 | .10 | .03 | −.06 | −.06 | .03 |
| *Self-competence* | | | | | | | |
| Participation (positive) | .19 | .28* | .60** | .39** | .07 | .32* | .45** |
| Participation (negative) | .05 | −.15 | −.12 | −.36** | −.38** | −.26* | −.26* |

*Note.* Level of analysis is the group. All analyses were based on $N = 43$ self-directed teams. $^{+}p < .10$; $*p < .05$; $**p < .01$ (one-tailed).

professional competence than traditional work groups in general.[9] However, self-directed teams use their knowledge in a more goal-oriented manner than traditional work groups. Because of the better cross-linkage, existing solutions are better thought through and closer to being implemented. The impression that self-directed teams proceed more stringently than traditional workgroups is supported by their noticeably superior methodological competence.

For both aspects of social competence, the advantage of self-directed work groups over traditional work groups could not be confirmed. Interestingly, self-directed work groups even scored higher on the criterion criticism/running others down. These results correspond with the findings of Druskat and Kayes (1999), who showed that autonomy was neutrally or slightly negatively related to interpersonal team competencies. Although conflicts arising from Tayloristic labour division are eliminated, the findings suggest that in self-directed teamwork new sources of friction emerge due to the delegation of decisions. For example, conflicts occur about quality problems, missing parts or short-term deadlines and about remuneration for work performed collectively due to different capabilities within the group (Glasl, 1994; Minssen, 1994). Thus, it seems to be a mechanistic oversimplification of 'learning by doing' to derive the development of social competencies from the mere fact that self-directed teams have to cope with an increasing number of conflict situations.

As hypothesized, self-directed teams make fewer negative remarks concerning participation than, traditional teams. Concerning the positive aspect of competence, it appears that, although self-directed work groups are more engaged in the planning of activities to attain a solution, they do not show more interest in change and personal responsibility taking than the traditional work groups. One reason might be that the introduction of self-directed work groups is associated with many changes in the team's area of responsibility. Between 2 and 5 years after the introduction of self-directed team work, the initial euphoria may have faded and disillusion and saturation with change may have set in. Often the need for change in external conditions beyond the team's area of responsibility remains. One way to promote the positive aspect of team self-competence could be to enhance the team's scope of influence. This ties in with the result in the sub-sample of self-directed teams that the degree of self-directed teamwork and, above all, the participation granted is beneficial for the team's positive self-competence.

The specification of self-directed team work explains further variance in the sub-sample of self-directed work teams, which by definition are provided with participation: a composite of work characteristics is useful in predicting eight out of 12 competence aspects. Of the work characteristics, participation/autonomy show the strongest relations with the various aspects of competence. This is consistent with claims about the importance of the participation construct (e.g. Guzzo, Yost, Campbell, & Shea, 1993; Shea & Guzzo, 1987). All the characteristics except organizational structure show moderate to high relationships with some competence aspects, as assumed. In comparison with other teams for which data was collected on this measure, the self-directed work teams in this study score significantly higher (cf. Frieling & Sonntag, 1999), suggesting a ceiling effect. Therefore, in other teams, organizational structure might emerge as a predictor of competence.

[9] *This corresponds with the finding in this sample that traditional work groups contain even more skilled workers than self-directed work groups.*

### *Implications*

What are the theoretical and practical implications of this study? From a theoretical point of view, the study is valuable as it systematically examines the impact of specific contextual antecedents on specific processes of an input–process–output model. The study provides some support for the first part of the HRM (Miles, 1965). As often theoretically assumed but seldom empirically proved (Heller, 2003; Sundstrom *et al.*, 2000), it is shown that the participation granted to teams and team competence are related to a considerable extent.

Overall, the results of this study have a number of practical implications for work group design, training and team development. Intervention strategies for management seeking to enhance team competence could include the implementation of self-directed work groups. In addition, identifying and validating work characteristics related to team competence is a first step in learning how to design competent work groups. In order to promote team competence, management could assign the groups more challenging work and allow more latitude to groups in managing their tasks.

In addition, this study extends previous work in several respects. First, a new criterion variable – namely, team competence – that is distinct from those examined in most previous studies is used. Second, the study follows the recommendations of researchers to measure team competence in terms of specific behaviours that are objectively observable or audible to raters (e.g. Smith-Jentsch, Zeisig, Acton, & McPherson, 1998). Third, I analysed participation and competence at the group level. As recent multi- and cross-level studies in the organizational literature consistently document, it is not at all clear that findings on the individual level generalize to the level of the group (Klein, Dansereau, & Hall, 1994; West, 1996; Yammarino & Naughton, 1992). Fourth, the study follows the recommendations of researchers to study groups in the organizational contexts in which they are embedded (Argote & McGrath, 1993; Sundstrom *et al.*, 2000). Fifth, in the current study, involving 20 established middle-sized companies with and without self-directed teamwork, the methodological criticism concerning the explanatory power of one-enterprise case studies (Cohen & Bailey, 1997) can be countered. Moreover, I focus on long-lasting improvements in behavioural data 2–5 years after the implementation of group work for which less confirmation exists than for short-term effects (Levine & Tyson, 1990).

### *Limitations*

There are several limitations to this study. First, there is a reduced operationalization of the competence construct. Completing optimization tasks in groups is only *one* situation of in-firm reality, which calls for team competence. Findings based on optimization discussions cannot be generalized to other operational situations, for example, machine operating. In CCG validation studies (Kauffeld, 2006), however, it has been shown that the competence to manage daily routine work does not seem to be totally independent from the competence to complete optimization tasks. Furthermore, the completion of optimization tasks is far from a trivial matter; rather, experts regard it as increasingly important as it releases potential for innovation and extends across professions, companies and branches. In addition, some potentially important competence aspects such as establishing and maintaining contacts to other groups or management (social competence) cannot be measured with the CCG. However, some central aspects of competence related to the groups' productivity or organizational development are captured (Kauffeld, 2006).

Second, the data presented here are cross-sectional, making it impossible to assess causality. The true causal direction can only be ascertained using experimental or longitudinal data collection methods, but it has to be recognized that the implementation of self-directed group work and the design of basic work characteristics in the companies that took part in the investigation were determined by the management and not influenced by the competence of the groups. This becomes evident when the following issues are considered. Neither employee nor team competence was taken into account when management decided to implement self-directed teams. This is evident because the self-directed work groups contain more unskilled workers than the traditional work groups. Furthermore, employees who have greater competence are not more likely to get chosen for and/or self-select for self-managed teams because they had no choice. The management decided to use either self-directed or traditional workgroups. Employees not wishing to work in self-directed teams could only decide to quit. This did not happen: management reported no drop-outs from the process. The rate of staff turnover in participating companies has not changed since the implementation of self-directed teamwork. Moreover, it was up to the management to decide which groups were to be included in the study. The management was asked to choose groups that were representative for their company. All in all, these facts support the interpretation that self-directed teamwork and participation lead to competence and not vice versa.

Third, the traditional and self-directed work groups belong to different enterprises. Besides the programme covering self-directed work groups, there may have been further organizational variables on which the companies differ and which could have influenced the findings. However, none of the variables assessed on the company surveys revealed differences between enterprises using traditional or self-directed work groups.

Finally, the sample consists of production teams; therefore, a generalization to other types of teams (e.g. project teams) or to teams from other areas (e.g. service teams) is not possible. In addition, the correlation analysis of self-directed work groups is based on a small sample size ($N = 43$). In part, this is an inherent challenge in conducting team-level research. However, such small sample sizes reduce the ability to detect significant effects.

### *Suggestions for future research*

Despite these limitations, this article suggests several approaches for future research. First, team competence not only seems to be an important input variable but also a promising process or output variable that can be developed (cf. Kozlowski *et al.*, 1999; McIntyre & Salas, 1995). This view decisively shifts the aim of participative management away from vague entities such as satisfaction towards concrete entities such as competence (cf. Heller, 2003). Second, the study aims to encourage the use of process-analytic instruments instead of self-report measures. In addition to optimization tasks, future research should examine other situations in which team competence appears. Third, whereas professional and methodological competence can be realized easily by recent approaches to self-directed group work, especially by participation, it is essential to develop new ideas to improve social competence. Although training in general has been intensely studied, few investigations have dealt with its role in work groups (cf. Sundstrom *et al.*, 2000). Fourth, other potentially important design characteristics could be examined in future research. For example, leadership has been shown to be highly influential in other areas of personnel research and very probably plays a role in determining group competence. Fifth, it seems to be important to investigate

the consequences of team competence further; that is, to examine the second part of the HRM that was neglected in the present study. How important is competence for the group's effectiveness? More precisely, which aspects of team competence are important for which aspects of group effectiveness? Future research might combine and test the themes in an integrated input–process–output model. Finally, I hope that the research paradigm and results described here will facilitate further development of an important but hitherto neglected area of understanding: team competence.

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## References

Argote, L., & McGrath, J. E. (1993). Group process in organizations. In C. L. Cooper & I. T. Robertson (Eds.), *International review of organizational psychology* (pp. 333–389). Chichester, UK: Wiley.

Baitsch, C., & Frei, F. (1980). *Qualifizierung in der Arbeitstätigkeit* [Qualification at working]. Bern: Huber.

Bales, R. F. (1950). *Interaction process analysis: A method for the study of small groups*. Cambridge: Addison-Wesley.

Bales, R. F. (1970). *Personality and interpersonal behavior*. New York: Holt.

Bergius, R. (1976). *Social psychology* [Sozialpsychologie]. Hamburg: Hofmann and Campe.

Bergmann, B. (2000). Arbeitsimmanente Kompetenzentwicklung [Work instrinsic development of competence]. In Arbeitsgemeinschaft Qualifikations-Entwicklungs-Management (Eds.), *Kompetenzentwicklung und Berufsarbeit* (pp. 11–40). Münster: Waxmann.

Bernard, H. (2000). *Unternehmensflexibilität. Analyse und Bewertung in der Betrieblichen Praxis* [Company flexibility. Analysis and appraisal in operationally practice]. Wiesbaden: Gabler.

Campbell, J. P., Glasser, M., & Oswald, F. (1996). The substantive nature of job performance variability. In K. Murphy (Ed.), *Individual differences and behavior in organizations*. Hillsdale, NJ: Erlbaum.

Campion, M. A., Medsker, J. J., & Higgs, A. C. (1993). Relations between work group characteristics and effectiveness: Implications for designing effective work groups. *Personnel Psychology*, *46*(4), 823–850.

Cannon-Bowers, J. A., Tannenbaum, S. I., Salas, E., & Volpe, C. E. (1995). Defining team competencies and establishing team training requirements. In R. Guzzo & E. Salas (Eds.), *Team effectiveness and decision making in organizations* (pp. 333–380). San Francisco, CA: Jossey-Bass.

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, *20*, 37–46.

Cohen, S. G., & Bailey, D. E. (1997). What makes team work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management*, *23*, 239–290.

Cohen, S. G., Ledford, G. E., Jr., & Spreitzer, G. M. (1996). A predictive model of self-managing work team effectiveness. *Human Relations*, *49*(5), 643–676.

Cooke, R. A., & Szmal, J. L. (1994). The impact of group interaction styles on problem-solving effectiveness. *Journal of Applied Behavioral Science*, *30*(4), 415–437.

Cordery, J. L., Mueller, W. S., & Smith, L. M. (1991). Attitudinal and behavioral effects of autonomous group working: A longitudinal field study. *Academy of Management Journal*, *34*, 464–476.

Cotton, J. L. (1993). *Employee involvement: Methods for improving performance and work attitudes*. London: Sage.

Cranach, M. von. (1996). Toward a theory of the acting group. In E. Witte & J. Davis (Eds.), *Understanding group behavior: Small group processes and interpersonal relations* (pp. 147–187). Mahwah, NJ: Erlbaum.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Press.

Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and the control of behaviour. *Journal of Personality and Social Psychology*, *53*, 1024–1037.

Deutsch, M. (1949). An experimental study of the effects of cooperation and competition upon group process. *Human Relations*, *2*, 199–231.

Druskat, V. U., & Kayes, C. (1999). The antecedents of team competence: Toward a fine-grained model of self-managing team effectiveness. *Research on Managing Groups and Teams*, *2*, 201–231.

Fischer, K. W., Bullock, D., Rotenberg, E. J., & Raya, P. (1993). The dynamics of competence: How context contributes directly to skill. In R. Wozniak & K. W. Fischer (Eds.), *Development in context: Acting and thinking in specific environments* (pp. 113–125). Hillsdale, NJ: Erlbaum.

Frieling, E., Freiboth, M., Henniges, D., & Saager, C. (1997). Effects of team work on the working conditions of short cycled track work: A case study from the European automobile industry. *International Journal of Industrial Economics*, *20*, 371–388.

Frieling, E., & Sonntag, K. (1999). Lehrbuch Arbeitspsychologie (2 Aufl.). *Textbook of industrial psychology* (2nd ed.). Bern: Huber.

Fröhlich, D., & Pekruhl, U. (1996). *Direct participation and organisational change: Fashionable but misunderstood?* Luxembourg: Office for Official Publications of the European Communities.

Gladstein, D. L. (1984). Groups in context: A model of task group effectiveness. *Administrative Science Quarterly*, *29*(1), 499–517.

Glasl, F. (1994). *Konfliktmanagement: ein Handbuch zur Diagnose und Behandlung von Konflikten für Organisationen und Berater* [Conflict management: Textbook for diagnosis and treatment of conflicts for organisations and advisers]. Bern: Haupt.

Guzzo, R. A., & Dickson, M. W. (1996). Teams in organizations: Recent research on performance and effectiveness. *Annual Review of Psychology*, *47*, 307–420.

Guzzo, R. A., Yost, P. R., Campbell, R. J., & Shea, G. P. (1993). Potency in groups: Articulating a construct. *British Journal of Social Psychology*, *32*, 87–106.

Hacker, W. (1978). *Allgemeine Arbeits- und Ingenieurspsychologie* [General work and industrial engineering psychology]. Bonn: Deutscher Verlag der Wissenschaften.

Hacker, W. (1985). Activity – A fruitful concept in industrial psychology. In M. Frese & J. Sabini (Eds.), *Goal directed behaviour: The concept of action in psychology* (pp. 262–284). Hillsdale, NJ: Erlbaum.

Hackman, J. R. (1987). The design of work teams. In J. W. Lorsch (Ed.), *Handbook of organizational behaviour* (pp. 315–342). Englewood Cliffs, NJ: Prentice-Hall.

Hackman, J. R., & Morris, C. G. (1975). Group tasks, group interaction process and group performance effectiveness: A review and proposed integration. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 8, pp. 45–99). New York: Academic Press.

Heller, F. (2003). Participation and power: A critical assessment. *Applied Psychology*, *52*, 144–163.

Hirokawa, R. Y. (1983). Group communication and problem-solving effectiveness: An investigation of group phases. *Human Communication Research*, *9*, 291–305.

Holm, S. (1979). A simple sequentially rejection multiple test procedure. *Scandinavian Journal of Statistics*, *6*, 65–70.

Imai, M. (1992). *Kaizen. Der Schlüssel zum Erfolg der Japaner im Wettbewerb* [Kaizen. The Japanese key to success at competition]. München: Langer/Müller.

Karasek, R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, *24*, 285–307.

Kauffeld, S. (2006). *Kompetenzen messen, bewerten, entwickeln.* Ein prozessanalytischer Ansatz für Gruppen [Measuring, evaluating, and developing competences. A process analytical approach for groups]. Stuttgart: Schäffer-Poeschel.

Klein, K. H., Dansereau, F., & Hall, R. J. (1994). Levels issues in theory development, data collection and analysis. *Academy of Management Review*, *18*, 195–229.

Kozlowski, S. W. J., Gully, S. M., Nason, E., & Smith, E. M. (1999). Developing adaptive teams. A theory of compilation and performance across levels and time. In D. R. Ilgen & E. D. Pulakos (Eds.), *The changing nature of performance: Implications for staffing, motivation and development* (pp. 240–292). San Francisco, CA: Jossey-Bass.

Kraiger, K., Ford, J. K., & Salas, E. (1993). Application of cognitive, skill-based, and affective theories of learning outcomes to new methods of training evaluation. *Journal of Applied Psychology*, *78*(2), 311–328.

Langfred, C. W. (2000). The paradox of self-management: Individual and group autonomy in work groups. *Journal of Organizational Behavior*, *21*, 563–585.

Leavitt, H. J. (1951). Some effects of certain communication patterns on group performance. *Journal of Abnormal and Social Psychology*, *46*, 38–50.

Levine, D. I., & Tyson, L. (1990). Participation, productivity, and the firm's environment. In A. S. Blinder (Ed.), *Paying for productivity* (pp. 183–243). Washington, DC: Brookings Institution.

Locke, E. A., & Wagner, J. A. (1997). Participation in decision making: An information exchange perspective. In G. R. Ferris (Ed.), *Research in personnel and human resource management* (pp. 293–331). Greenwich, CT: JAI Press.

Macy, B. A., & Izumi, H. (1993). Organizational change, design, and work innovation: A meta-analysis of 131 North American field studies 1961–1991. *Research in Organizational Change and Development*, *7*, 235–313.

McIntyre, R. M., & Salas, E. (1995). Measuring and managing for team performance: Emerging principles form complex environments. In R. A. Guzzo & E. Salas (Eds.), *Team effectiveness and decision making in organizations* (pp. 9–45). San Francisco, CA: Jossey-Bass.

Miles, R. E. (1965). Human relations or human resources? *Harvard Business Review*, *43*, 148–163.

Minssen, H. (1994). Risks of group work in manufacturing [Risiken von Gruppenarbeit in der Fertigung]. *Angewandte Arbeitswissenschaft*, *142*, 31–53.

Pearce, J. A., II, & Ravlin, E. (1987). The design and activation of self-regulating work groups. *Human Relations*, *40*(11), 751–782.

Pearson, C. A. L. (1992). Autonomous workgroups: An evaluation at an industrial site. *Human Relations*, *45*(9), 905–936.

Seers, A., Petty, M. M., & Cashmann, J. F. (1995). Team-member exchange under team and traditional management: A naturally occurring quasi-experiment. *Group and Organization Management*, *20*(1), 18–38.

Shea, G. P., & Guzzo, R. A. (1987). Groups as human resources. *Research in Personnel and Human Resources Management*, *5*, 323–356.

Smith-Jentsch, K. A., Zeisig, R. L., Acton, B., & McPherson, J. A. (1998). Team dimensional training: A strategy for guided team self-correction. In J. A. Cannon-Bowers & E. Salas (Eds.), *Making decisions under stress: Implications for individual and team training*. Washington, DC: APA Press.

Sonntag, K.-H., & Schaper, N. (1992). Förderung beruflicher Handlungskompetenz [Developing professional action competence]. In K.-H. Sonntag (Ed.), *Personalentwicklung in organisationen*. (pp. 187–210). Göttingen: Hogrefe.

Steiner, I. D. (1972). *Group process and productivity.* New York: Academic Press.

Sundstrom, E., McIntyre, M., Halfhill, T., & Richards, H. (2000). Work groups: From the Howthorne studies to work teams of the 1990s and beyond. *Group Dynamics: Theory, Research, and Practice*, *4*(1), 44–67.

Volpert, W. (1990). Welche Arbeit ist gut für den Menschen. Notizen zum Thema Menschenbild und Arbeitsgestaltung [Which work is good for mankind. Notes concerning attitudes towards human beings and work organization]. In F. Frei & I. Udris (Eds.), *Das Bild der Arbeit*. (pp. 23–40). Bern: Huber.

Wall, T. D., Kemp, N. J., Jackson, P. R., & Clegg, C. W. (1986). Outcomes of autonomous work groups: A long-term field experiment. *Academy of Management Journal*, *29*(2), 280–304.

Wegge, J. (2000). Participation in group goal setting: Some novel findings and a comprehensive model as a new ending to an old story. *Applied Psychology*, *49*, 498–516.

Weinert, F. (2001). Concept of competence: A conceptual clarification. In D. S. Rychen & L. H. Salganik (Eds.), *Defining and selecting key competencies* (pp. 45–65). Kirkland, WA: Hogrefe and Huber.

West, M. (1996). *Handbook of work group psychology*. Chichester, UK: Wiley.

Yammarino, F. J., & Naughton, T. J. (1992). Individualized and group-based views of participation in decision making. *Group and Organization Management*, *17*, 398–413.

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## Appendix: Cassel Competence Grid (CCG)

| Professional competence | Methodological competence | Social competence | Self-competence |
|---|---|---|---|
| Differentiation problem | Positive remarks concerning the structuring of the discussion | Positive socio-emotional remarks | Positive remarks concerning participation |
| ***Problem*** identifying a (partial) problem<br>***Describing a problem*** illustrating problems | ***Clarifying/concretization*** ensuring contributions are to the point, clarifying<br>***Procedural suggestion*** suggestions for further procedure<br>***Procedural question*** questions about further procedure<br>***Prioritising*** stressing main topics<br>***Time management*** reference to time<br>***Task distribution*** delegating tasks during the discussion<br>***Visualization*** using flip chart and similar tools<br>***Weighing up costs/benefits*** economical thinking<br>***Summary*** summarizing results | ***Addressing someone in an encouraging way*** e.g. addressing the quiet participants<br>***Support*** agreeing to suggestions, ideas etc.<br>***Active listening*** signalling interest („mmh", „yes")<br>***Refusal*** contradiction based on facts<br>***Feedback*** e.g. signalling whether something is new or already known<br>***Lightening the atmosphere*** e.g. jokes<br>***Differentiation between opinions and facts*** marking one's own opinion as an opinion not as a fact<br>***Feelings*** mentioning feelings like anger or joy<br>***Praise*** e.g. positive remarks about other people | ***Interest in change*** signalling interest<br>***Personal responsibility*** taking on responsibility<br>***Planning of measures*** agreeing upon tasks to carried out |
| Cross-linkage problem<br>***Connections with problems*** e.g. naming causes and effects | | | |
| Differentiation solution<br>***Defining target*** vision, description of requirements<br>***solution*** identifying (partial) solutions<br>***Description of a solution*** illustrating solutions | | | Negative remarks concerning participation<br>***No interest in change*** e.g. denial of optimization opportunities<br>***Moaning*** emphasis on the negative status quo, pessimism, killer phrases<br>***Platitude*** empty talk<br>***Seeking someone to blame*** personalizing problems<br>***Emphasizing authoritarian elements*** pointing out hierarchies and competencies<br>***Terminating discussion*** ending or trying to end the discussion early |
| Cross-linkage solutions<br>***Problem with a solution*** objection to a solution<br>***Connections with solutions*** e.g. naming advantages of solutions | | | |
| Remarks about the organization<br>***Organizational knowledge*** knowledge about organization and process | Negative remarks concerning the structuring of the discussion | Negative socio-emotional remarks | |
| Remarks about knowledge management<br>***Knowing who*** reference to specialists<br>***Question*** questions about opinions, content, experience | ***Losing the train of thought in details and examples*** examples which are not relevant to the goal, monologues | ***Criticism /running someone down*** making disparaging comments about others<br>***Interruption*** cutting someone off while speaking<br>***Lateral talk*** starting or getting involved in lateral talk<br>***Reputation*** pointing out work experience, duration of employment at this company etc. | |

*Note:* The term 'facet' refers to the highest level of abstraction (e.g. professional competence). The second highest level of abstraction is termed 'aspect' (marked grey; e.g. differentiation problem). The third level is termed 'criteria' (marked bold and italic; e.g. problem). Finally, the criteria are explained (e.g., identifying a problem).