

# The Dimensionality of Management Team Effectiveness

*A psychometric analysis of the team  
inventory “effect”*

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# Abstract

In 2012, Bang and Midelfart suggested a management team effectiveness model based on an extensive review of available research. This framework was specifically created for the understanding of management team functioning. Based on this model, the questionnaire “*effect*” was created. This is a survey instrument, developed to measure MT effectiveness as defined by Bang and Midelfart’s model. The purpose of the present study was dual-headed. The first aim was directed towards assessing the instrument. Firstly, the viability of 24 of the scales measured by the instrument was examined. Following this, the existence of a simpler component structure than the one originally measured by “*effect*” was investigated. A Procrustes analysis provided support for structuring “*effect*” into 24 different scales. Further analysis of the dimensionality of the predictor dimensions led to the establishment of two main groups of predictor components, named internal and external conditions. The internal conditions clustered around two components – task and relationship – while the external conditions clustered into one component. The criteria dimensions could be understood as one component, named outcomes. The second aim of the study was directed towards examining the association between the components established in part one. A positive relationship was found between all of the predictors and the outcome component. Structural equation modeling revealed that the effect ( $\beta=.73$ ) of the external predictor component on the outcomes was largely mediated through the two internal predictor components. Together, the model presented explained 84% of the variation in outcomes of management team effectiveness.

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# 1 Introduction

Modern organizations commonly have more than one manager. When a company reaches a certain size and complexity, a need for specialized managers that have both a shared and individual area of responsibility in managing the organization arises. To communicate and coordinate the path the organization takes, these leaders are often part of teams, which are called management teams (MTs).

A MT has been defined as “a group of individuals, each of whom has a personal responsibility for leading some part of an organization, [and] who are interdependent for the purpose of providing overall leadership for a larger enterprise” (Wageman & Hackman, 2010, p. 477). A MT generally consists of a senior manager and the managers that report directly to him or her.

An example of a well-known organization that has MTs integrated in its organizational hierarchy is the Central Bank of Norway. The Central Bank has a governor at the top, with two deputy governors directly beneath him. Together, the three governors form a top management team (TMT) (Hambrick & Mason, 1984). However, the governor is also a part of another TMT, together with the heads of the five departments that make up the operational unit of the Central Bank.

There are several advantages that lead organizations like the Central Bank of Norway to reserve their manager’s valuable time to spend in meetings with other managers. The main goal of these meetings is to coordinate operations across the organization, solve organizational-wide issues, and provide strategic, operational, and institutional leadership for the organizational unit which it heads (Wageman, Nunes, Burruss, & Hackman, 2008).

Further, studies indicate that there is a positive relationship between MTs and the organization’s outcome (Hambrick, 2007; Hambrick & Mason, 1984; Norburn & Birley, 1988). Thus, if an organization has one or more MTs, it is in its best interest that they are high performing, or effective. Yet, a study of 120 TMTs found that 42% of the teams were performing at a level designated as “poor” (Wageman, Nunes, Burruss, & Hackman, 2008). Further, 37% had a «mediocre» performance, and only 21% were categorized as «outstanding». Seeing as there is a 79% chance of a MT being mediocre or worse, there obviously is a need to develop a greater understanding towards understanding MT functioning.

In the last 40 years of team research, there are a number of studies offering scientific insight into teams and work groups in general, what dimensions define performance, and what

dimensions that have an effect on it (Bettenhausen, 1991; Hackman, 1990; Mathieu, Maynard, Rapp, & Gilson, 2008; Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000; Salas, Dickinson, Converse, & Tannenbaum, 1992). The interest in teams and work teams led to the subsequent research on MTs and dimensions predicting and defining MT performance (Boone, Van Olffen, Van Witteloostuijn, & De Brabander, 2004; McIntyre, 1998; Nelson, 1996; Srivastava, Bartol, & Locke, 2006).

Despite this growing abundance of research on MT effectiveness, the field has suffered from the lack of integration of the subsequent findings. Until lately, no MT-specific framework taking into account the budding plethora of research on dimensions of MT effectiveness existed. In 2008, Wageman et al. expanded Hackman (2002)'s team effectiveness theory into the MT realm. Although a step in the right direction, this was a theory based on Hackman's generic model of team research, not MTs specifically. Thus, the field of MT effectiveness research was still lacking an updated and assimilated model based on research on MTs.

To offer a solution, Bang and Midelfart (2012) performed a merger of the chief existing research from MT studies and team studies, postulating a unified suggestion of what MT performance is, and what influences it. Through an extensive evaluation and review of the central research on the domain of MT and team performance, they created a model describing MT effectiveness (Bang & Midelfart, 2012).

Bang and Midelfart's model permitted the creation of "*effect*", a research-based survey instrument, developed to measure MT effectiveness as defined by their model. This study aims to use empirical data obtained from "*effect*" to gain insight towards the dimensionality of MT effectiveness. To do this, the paper will first introduce what MTs are and what makes them unique from other work teams, before reviewing the criteria and predictor dimensions that are relevant in the context of MT effectiveness. Following this, the instrument "*effect*" and the scales it consist of will be presented, before, finally, the aims and tentative assumptions of the study is staked out.



# 2 Management Teams

## 2.1 The Purpose of MTs

Modern organizations are structured around employees working with other people, often arranged into teams, sections, and departments. Use of work teams, like MTs, have been argued to lead to substantial organizational success (see Furnham, 2005 for an overview).

Several million dollars saved, increases in productivity, upped quality of production, increases in innovation and learning, and reduced costs of production are among some of the benefits of using work teams (Blanchard et al., 2001; Redding, 2000), but also the fulfilment of individual social and psychological needs (Likert, 1961). According to Likert (1961), to harvest these benefits, it is vital to identify what factors determine team effectiveness, and then create an organizational structure that supports the findings.

In the passing of the last 30 years, MTs have become a common occurrence in the way businesses structure their organizations (Nadler & Spencer, 1998). Research shows that, like other work teams, a MT also has a potential to greatly influence both individual and organizational success and growth (Flood, McCurtain, & West, 2001).

That organizations will benefit from successful MTs is not surprising, if one views MTs in light of their definition and purpose. Expanding on the definition provided by Wageman and Hackman (2010) above, a MT is a group of leaders who make and enforce decisions, which has ramifications spanning the entire organization (Dainty & Kakabadse, 1992). Be it a top management team (TMT) (Hambrick & Mason, 1984), or a medium- or lower-level team, members in the MT function to laterally coordinate the organization's subunits. By effect, the individual leader's expertise is combined and integrated, and may due to this lead to a competitive edge for the company (Mankin, Cohen, & Bikson, 1996).

The purpose of a MT has been outlined as exchanging information, discussing and deciding upon tasks, monitor and follow up on the decisions made, and to support and motivate each other (Bang & Midelfart, 2012). This has led MTs to be classified as decision-making and problem solving groups (Bowers, Pharmer, & Salas, 2000).

Thus, with MTs there exist arenas where the formally powerful individuals within an organization meet to exchange ideas, share knowledge, make decisions, provide advice, and coordinate the organization's goals across their respective subunits (Bang & Midelfart 2012).

Consequently, if executed successfully, these processes benefit both the organization as a whole and the individual member.

## 2.2 Uniqueness of MTs

Having outlined the essence of a MT and its purpose, I will now examine what makes MTs unique from other teams. This is important, as this paper builds its argument on MTs being dissimilar from other work teams, and thus requires its own framework to be understood by. There are several key points where MTs differ from other teams, and this paper will include a few of the most salient ones: member composition, identification, reason for existing, and complexity of tasks.

**Member composition.** Being a member of the MT is chiefly a byproduct from leading a subunit in an organization. The primary job of the individual member of the MT is to be responsible for and manage their own distinct subunits (Wageman & Hackman, 2010), not being a member of the MT. In regards to member composition, this has implications for the MTs, as a member may not easily be removed or replaced, unless he or she at the same time is removed from their managerial position.

Further, there is no selection based on the members possessing the skills or abilities needed to interact successfully with the other pieces of the MT-puzzle (Bang & Midelfart, 2012). Comparatively, other work teams which set out to solve similar cognitive tasks as a MT, are usually designed by carefully selecting members to cover what is needed of skills, knowledge, motivation and ability to solve the problems at hand (Bang & Midelfart, 2012).

**Identification.** Because members view themselves as primarily belonging elsewhere, a member may not be motivated for top contribution or identify particularly with their management team. Consequently, the top-down configuration that exists when building MTs may lead to differing goals and interests (Hambrick & Mason, 1984), power play and strategic positioning between the members (Bang & Midelfart, 2012), which in turn may affect group dynamic and performance.

**Reason for existing.** Additionally, more often than not, MTs suffer from a lack of a clear mandate as to why the group exists, and what the group should produce (Bang & Midelfart, 2012). This is often not the case with other teams that are decision-making and problem solving by nature. In comparison, the reason for existing and what is defined as a job well done by a work team like an airline crew is rather straightforward.

**Complexity of tasks.** Lastly, as a result of spanning the breadth of an organization both in members' affiliation and in purpose, the tasks to be solved by a MT may range in complexity from simple to very complex (Bang & Midelfart, 2012). One meeting may concern how to best implement the newly decided upon direction of the company, another meeting may demand for personnel benefits being coordinated across subunits. This differs from most other decision-making and problem solving teams, which imaginably, have a niche where they are expected to examine.

In sum, MTs are distinct from other teams. To harvest the benefits outlined above, overcome MT-specific challenges, and avoid process loss by the use of teams (Steiner, 1972), it is imperative for an organization to develop well-functioning and effective MTs. In order to do this, it is necessary to identify which variables MT effectiveness can be described by, and which variables that determine it. This paper will now consider the central theories regarding criteria and predictor dimensions of MT effectiveness.

# 3 Outcomes of Management Team Effectiveness

## 3.1 Defining Team Effectiveness

One definition of team effectiveness is “the capacity a team has to accomplish the goals or objectives administered by authorized personnel or the organization” (Aubé & Rousseau, 2011). This means that it is necessary to define what are the goals and objectives of a MT is, and then estimate success according to the team’s score on these dimensions (Mahoney, 1988).

Therefore, many studies have established effectiveness outcome criteria, so that if a MT reaches its goal according to these, it will be deemed as effective. This paper will now review central criteria dimensions are relevant in the context of MT effectiveness.

## 3.2 MT Effectiveness Criteria Dimensions

In comparison to the predictor dimensions, which are presented later, there is not much disparity between models when it comes to criteria dimensions of team effectiveness.

Hackman (1990, 2002; 1975) has become the central face of team effectiveness, and is the main inspiration to core team-effectiveness models. Hackman (2002) uses three criteria to understand team performance. According to him, team effectiveness can be observed through the team output, team viability, and individual well-being and growth (Hackman, 2002).

In his definition, team output refers to the team reaching or exceeding requirements expected from them by the organization. Team viability holds that the team should both interact and cooperate just as well in the future, or better. Well-being and growth entails that the individual member should experience a positive development, rather than negative, as a result of being a part of the team (Hackman, 2002).

There are other theories which present other criteria of team effectiveness, like the criteria postulated by Katzenbach and Smith (1993). In their definition of team effectiveness, they argued that a team might deliver collective work products, performance results, and personal growth. There are similarities between this and Hackman’s (2002) model, especially in that personal growth/individual learning, and team output/collective work products are in congruence with each other.

Since Hackman's (1990, 2002) criteria for outcomes of effectiveness is identical in the two most central MT effectiveness models (Bang & Midelfart, 2012; Wageman et al., 2008), his dimensions will be used when assessing MT effectiveness dimensions in this paper. In regards to the present study there are thus three specific criteria that the effectiveness of a MT may be assessed towards: added value for the organization, added value for the individual member, and added value for the team, (Bang & Midelfart, 2012; Wageman et al., 2008).

**Added value for the organization.** The first criterion, added value for the organization, stems from the team output, is defined as when the team's outcome meets or surpasses expectations from those who make use of the outcomes (i.e. decisions), and influences the organization's performance (Bang & Midelfart, 2012; Wageman et al., 2008). Added value for the organization is split into three sub-dimensions, namely task results, decision quality, and decision implementation (Bang & Midelfart, 2012).

**Added value for the individual.** The second criterion, added value for the individual member, is concerned with the individual's well-being and growth (Bang & Midelfart, 2012; Wageman et al., 2008). In short, if team members are happy, motivated, experiences growth, and gains knowledge as a result of being a part of the team, this can according to several MT studies be considered a measure of MT effectiveness (Bang & Midelfart, 2012; Wageman, Hackman, & Lehman, 2005). Thus, to determine whether a MT is effective or not, it is important to establish what benefits being in a MT serves the individual member.

**Added value for the team.** The third criterion, added value for the team, describes team viability, which can be seen through team members experiencing improved levels of cooperation. This is traditionally viewed as an outcome criteria alongside with the two dimensions previously presented (Bang & Midelfart, 2012; Hackman, 2002; Wageman et al., 2008). However, in this paper, added value for the team will be regarded as an aspect that influences team performance, thus, a predictor dimension. The reasoning behind this will be argued below.

Bang and Midelfart (2012) suggest that team viability consists of the sub-dimensions team psychological safety, team spirit (also known as team cohesion), functional team culture, and team efficacy (table 1). It can be argued that these features appear as a by-product of, and are influenced by, MT member's interaction during its teamwork. Team spirit, functional team culture, team psychological safety, and team efficacy are not phenomena that are present with a group in its initial phases. Rather, these sub-dimensions are all dynamical states that can be seen as emerging as a consequence of team interaction.

In accordance with Marks, Mathieu, and Zaccaro (2001), this paper argues that the sub-dimensions of team viability can be viewed as *emergent states*, instead of a set of outcome criteria. Emergent states are a more complex feature within a traditional input-process-output-model (IPO-models) (Marks, Mathieu, and Zaccaro (2001). An emergent state, according to Marks, DeChurch, Mathieu, Panzer, and Alonso (2005), is an aspect of a team that comes into existence as a consequence of, and evolves during, team interaction. Emergent states are a property that can provide the team with structure (Morgeson & Hofmann, 1999), and with dynamic characteristics that change depending on members' activities (Marks, Mathieu, and Zaccaro, 2001).

As these states emerge from continued team cooperation, they can be thought to influence the outcome dimensions directly. Thus, the aspect of team viability, will be treated as an emergent state in this paper, and as an aspect predicting effectiveness in the subsequent statistical analysis.

## 4 Predictors of Team Effectiveness

There are bundles of team effectiveness research based on predictors of team performance. However, in this area, there exist more conflict as to how many, and which, variables are most important.

It is impossible to discuss MT-effectiveness models without referring to generic team effectiveness models, as the few MT-effectiveness models that exist are largely based directly on generic team effectiveness models and research. This section will introduce different frameworks of predictor variables suggested to influence team effectiveness, and then compare them to highlight where they have converging and diverging inclinations. There are additional models relevant than those presented here (Cohen & Bailey, 1997; Gladstein, 1984), but due to the scope of this paper, they will not be included.

The aim of this section is to provide an overview of suggested predictor variables in team effectiveness research. Building upon this understanding, the next section will then discuss MT-specific predictor dimensions.

### 4.1 Team Effectiveness Models

**GRPI-model.** One of the earliest theories of team effectiveness was introduced by Plovnick, Fry, and Rubin (1977). Their four-step pyramidal model starts with “interpersonal relationships” at the bottom, with “procedures” as the next dimension on top of it, following with “roles”, and lastly “goals”. The model is called the GRPI-model, indicating the direction and importance of the elements – first establish a **g**oal, then **r**oles of the members, then **p**rocesses like methods for decision-making and work flow, before lastly encouraging an **i**nterpersonal environment characterized by trust (Plovnick et al., 1977).

The GRPI-model has much in common with other central team effective theories, but it differs from them mainly on putting the second highest emphasis on roles. This is either a sub-dimension in other theories (e.g. (Sundstrom, De Meuse, & Futrell, 1990), or not present at all (Hackman, 2002; Katzenbach & Smith, 1993; LaFasto & Larson, 2001; Lombardo & Eichinger, 1995). Further, the main dimensions have a designated temporal order affiliated with them, as is dictated by the G, then P, then R, and then I-order. This determined directionality can be seen in some team effectiveness models that predict an input-process-output relationship-model (e.g. Hackman, 2002; Hackman & Wageman, 2008; Bang &

Midelfart, 2012). Thematically, and which can be seen as a trend in the later arising theories as well, is the focus on goals, processes, and interpersonal relationships.

**Katzenbach and Smith's team effectiveness-model.** A second theory of team effectiveness that came into life in 1993, claims there are three main dimensions (Katzenbach and Smith, 1993). According to this model, skills, commitment, and accountability are the main input dimensions influencing results. Conversely to the pyramidal structure of the GRPI (Plovnick et al., 1977), they introduce their dimensions in a triangular diagram scheme, where the three dimensions are equally emphasized and important in the process towards team effectiveness.

This model has key dimensions that are not as intuitively comparable with key dimensions presented by others, but looking at the sub-dimensions, there are several which find resemblance in various models. E.g., commitment has "specific goals" (Plovnick et al., 1997; Lombardo & Eichinger, 1995; Hackman, 2002). Moreover, the dimension "skills" has the sub-dimension "interpersonal", which also finds twins in several models (Hackman, 2002; LaFasto & Larson, 2001; Lombardo & Eichinger, 1995; Plovnick et al., 1977)

**T7-model of team effectiveness.** The third model to be presented here is the "T7-model of Team Effectiveness" (Lombardo & Eichinger, 1995). Identifying seven variables, all starting with the letter T, Lombardo and Eichinger (1995) introduced the first split into external and internal conditions that can be seen in team effectiveness predictors. The internal predictors were named thrust (goal and common purpose), trust, talent (collective skills), teaming skills (operate effectively), and task (execute successfully). The two external predictors were called team leader fit, and team support from the organization (Lombardo & Eichinger, 1995).

Again, we see similarities between the variables from models presented and the internal team predictors. What is new with this model, is the introduction of external predictors. According to Lombardo and Eichinger (1995), all seven dimensions must be present for the team to be effective, including the external predictors. They postulate, that regardless of the completeness of the team's internal predictors, if the external predictors are lacking, the effectiveness will suffer.

**The Five Dynamics of Team Work:** The T7 model has several similarities by the fourth theory, named "The Five Dynamics of Team Work" (LaFasto & Larson, 2001). Based on examination of more than 600 teams, they revised the model from its original four-dimension structure (Larson & LaFasto, 1989), now claiming a five-dimension model. This



model holds that team effectiveness is dependent on team members, relationships, problem solving, leadership, and organizational environment. The latter two are the same as can be observed as external predictors in T7, and the former three have similarities with skills, interpersonal relationships, goals, and processes that are repeating key dimensions (Hackman, 2002; Lombardo & Eichinger, 1995; Plovnick et al., 1977).

**Hackman's team effectiveness-model.** Lastly, Hackman (2002) claims that team effectiveness is more likely to occur if five basic conditions are put in place and fostered. In this conceptual model, the dimensions are also split into internal and external. According to Hackman (2002), the five basic conditions are: having a real team, a compelling direction, an enabling team structure, a supportive organizational context, and available expert coaching.

The three first dimensions are internal, and are positioned in a triangle, like Katzenbach and Smith (1993) and the T7-model (Lombardo & Eichinger, 1995). A real team consists of a team that share tasks, have clear team affiliation boundaries, and where the number of members is stable over a reasonable period of time. Having a compelling direction through well-defined and challenging goals also leads to increased effectiveness. Enabling structure refers to the context in which the team exists in, some are under the team's control, and some are not. There are three sub-dimensions of enabling structure: 1) task design, 2) team composition – team size, skills and talents, and good diversity, and 3) norms of conduct (Hackman, 2002).

Further, in the same vein as Lombardo and Eichinger (1995), the latter two dimensions are external to the team (Hackman, 2002). A supportive context consists of rewards provided the team, room for development through an educational system, and information available (resources). And, lastly, to be effective, teams needs to be able to draw upon guidance from an external coach or mentor if help is needed (Hackman & Wageman, 2004). The first dimension of external organizational support finds matches in previous models (Lombardo & Eichinger, 1995), but expert guidance is new. The latter is an extension of the two previous models with external dimensions, which had team leadership as the second dimension. Here, though, this leader is transformed into an external resource separate from the team leader.

Together these five basic conditions, according to Hackman (2002), successively work to influence the process variables team effort, performance strategy, and use of talent. As can be observed in linear IPO-models like this, the process dimensions then influence the team effectiveness criteria.

## 4.2 Management Team Effectiveness Models

Having drawn lines through the central team research and established the fundamental theories and models that exist regarding predictor dimensions, the focus now advance towards the terrain of MT effectiveness. There are two main attempts to describe what influences MT performance, the first by Wageman et al. (2008), and the second by Bang and Midelfart (2012).

**Senior leadership teams.** In 2008, Wageman et al. attempted to describe MT functioning, they did a study on 120 senior leadership teams based on Hackman's (1990, 2002) team effectiveness model. To do this, they used an instrument based on Hackman's model called "*Team Diagnostic Survey*" (Wageman et al., 2005), or, TDS.

Wageman et al. (2008) further examined what separated teams that were high-performing from the low-performing, by applying Hackman's (1990, 2002) generic team effectiveness framework. Therefore, according to Wageman et al. (2008), MT effectiveness can also be understood as consisting of two main conditions: essential conditions and enabling conditions. Further, Wageman et al. (2008), variables underlying essential conditions in MTs are: 1) real team, 2) right people, 3) compelling direction. The variables underlying enabling conditions are: 1) sound structure, 2) supportive context, and 3) team coaching.

This research shows that the predicting variables together explained more than 50% of the variance on Hackman's (2002) three previously introduced effectiveness dimensions. This study is interesting, as it provides the field of MT effectiveness with a statistically sound evidence-based framework, and led to a validation of the TDS instrument for assessing MT effectiveness (Wageman et al., 2005). This instrument permits diagnosis of areas where individual MT are ineffective according to Hackman (2002)'s model, and the subsequent coaching of MTs towards higher performance.

Still, there is an aspect of this model that gives room for reflection. As we have established in previous sections of this paper, MTs are both similar and different from other teams. MTs are distinct from other work teams in being concerned with decision-making and problem-solving (Bowers, Pharmer, & Salas, 2000). Further, MTs can also be considered unique from other decision-making and problem solving teams as well (McIntyre, 1998). MTs are different, in both team and work team context. Therefore, frameworks built and conclusions drawn about MTs should include results and research performed on MTs. Thus, the validity of a MT model based purely on general teams can be questioned.

**Effective management teams.** To my knowledge, only one effectiveness model is created specifically for MTs. In 2012, Bang and Midelfart united theory and empirical studies available from research on teams, work groups, TMTs, and MTs. This comprehensive framework aimed to describe the variables influencing MT effectiveness.

Bang and Midelfart’s (2012) model, described in their book “Effective management teams”, is based “partly on research on MTs, partly on research on teams and work groups with similar challenges as MTs (e.g. decision-making and problem-solving groups), while simultaneously drawing from the general studies on teams we found relevant for MTs” (Bang & Midelfart, 2012, p.49, my translation).

Bang and Midelfart’s (2012) model is a basic IPO-model, with together 19 variables that they deem significant to MT effectiveness (see table 1). In short, these predictor variables are separated into input and processes, where the inputs (basic conditions) are assumed to affect the processes (table 1), which then successively influence the previously discussed results (added values) (Bang & Midelfart, 2012).

As is quickly ascertained from the list in table 1, several of the variables in Bang and Midelfart’s model are very similar to those from team- and MT-research. Perhaps the greatest difference in Bang and Midelfart (2012)’s model from others presented in this paper, is the large number of variables. Whereas the previous models had predictors primarily consisting of single digits, this is not the case in Bang and Midelfart’s (2012) model, with 19 predicting dimensions.

**Table 1.** List over the input/process dimensions from Bang and Midelfart (2012)’s MT effectiveness model

<b>Input dimensions</b>	<b>Process dimensions</b>
Clear purpose	Pre-meeting preparations
Appropriate tasks	Clear meeting goals
Appropriate size	Focused communication
Appropriate competencies	Task conflict
Balanced diversity	Absence of relationship conflict
Team reinforcing reward systems	Absence of politics
Adequate information systems	Dialogue
Adequate educational systems	Active external relationships
	Continous team learning
	Effective team leadership
	Behavioral integration

The large number of variables may be a result from the selection method. Bang and Midelfart (2012) created and established the 19 dimensions that they suggest determine MT effectiveness without performing a quantitative or qualitative selection method guiding the structure formation. Rather, the model is based on an extensive review of the literature on the field of what influences MT performance. This means that the variables are not selected based on statistical independence, although each individual underlying variable is theoretically sound and supported (Bang & Midelfart, 2012).

What can be concluded is that the model consists of a very large amount of dimensions (27 with criteria and predictor variables together). Further, the input and process dimensions were selected based on the criteria of previous research showing them to predict the outcome of MT effectiveness. However, to the extent of my knowledge, this is the only model describing MT effectiveness created specifically for MTs. This makes it valuable in the quest to explore the dimensionality of MT effectiveness further.

Based on Bang and Midelfart's model, the questionnaire "*effect*" was created, which is the focal point of the remainder of this paper.

# 5 The Measurement Instrument

## “effect”

“effect” is a survey instrument constructed from Bang and Midelfart’s (2012) model of effective MTs. As the aim of this study is to investigate the dimensionality of MT effectiveness, data obtained by use of this instrument can therefore be utilized in this regard.

“effect” was developed in order to assess and coach MTs on basis of their scores, much like the previously mentioned TDS (Wageman et al., 2005). It is based on self-report from individual members of the MT, who answer questions regarding their team’s functioning. The replies obtained are then aggregated and a feedback-report based on collective scores on the different dimensions are provided to the team (Bang, 2017).

**Table 2.** List over the predictor and criteria dimensions measured by the survey-instrument “effect”

Predictor dimensions		Criteria dimensions	
1	Clear purpose	1	Task results
2	Appropriate tasks	2	Decision quality
3	Appropriate size	3	Decision implementation
4	Appropriate competencies	4	Individual well-being and growth
5	Balanced diversity		
6	Team reinforcing reward systems		
7	Adequate information systems		
8	Adequate educational systems		
9	Pre-meeting preparations		
10	Clear meeting goals		
11	Focused communication		
12	Task conflict		
13	Absence of relationship conflict		
14	Absence of politics		
15	Dialogue		
16	Active external relationships		
17	Continous team learning		
18	Effective team leadership		
19	Behavioral integration		
20	Team psychological safety		
21	Team spirit		
22	Functional team culture		
23	Team efficacy		

The instrument has 124 items and 27 scales, in thematic and theoretical congruence with Bang and Midelfart (2012)'s model (see appendix 1 and 2 for a more detailed description). "*effect*" has 23 scales that through underlying items measure predictor dimensions. The criteria dimensions are measured through four scales with three to five underlying items for each scale.

See table 2 for a complete overview of the predictor and criteria dimensions as measured by the scales in "*effect*". Mark that in table 2, team viability (dimension 20-23) is here positioned under predictors, as these dimensions are treated as emergent states, influencing task performance and individual well-being and growth (outcomes) of management teams (Marks et al., 2001).

As presented above, the dimensions from Bang and Midelfart's (2012) model that the scales in "*effect*" are based on are created from an extensive review and subsequent aggregation of central research. However, although it is constructed from empirical data, the independence of the scales measuring MT effectiveness by the instrument lacks being subjected to statistical validation. To be able to draw conclusions based on findings from the questionnaire, it is necessary to assess the validity of the scales.

## 6 Present Study

This paper has three main aims, the last which is based on the results that will be found through assessing the two first aims. As the assumptions made in the second part are based on the results obtained from the preceding part of the paper, I cannot make predictions, present results, or discuss the outcome of part two before I have first performed the necessary analysis and evaluation of the results from part one.

Aims and tentative assumptions will therefore be separate. Further, as part two is directly based on the findings of part two, the tentative assumptions concerning the results from these analyses, will be less extensive.

The methods are common for both part one and two. The remainder of the study splits into two individual parts, including statistical analyses, results, and discussions. A final general discussion will be made at the end.

### 6.1 Aim of Part One

When creating the "*effect*" instrument, a fundamental assumption was that the items measured a smaller number of separate, but probably intercorrelated, dimensions. By using available data, the validity of this assumption is investigated in part one of this study.

Following this, exploratory factor analysis is applied to investigate alternative, and possibly simpler, interpretations of the dimensionality.

### 6.2 Aim of Part Two

After examining dimensionality and properties of scales in "*effect*", the paper seeks to investigate if the predictor components correlate with the output components, and if so, how.

### 6.3 Tentative Assumptions, Part One

As the items measuring the scales of team functioning in "*effect*" were selected by Bang and Midelfart (2012) by a procedure involving stratified sampling from a domain defined by theory and empirical findings from a number of empirical studies, the paper will first examine to what extent we can find support for an underlying component structure *that reflects the dimensions supposed to be measured in "effect"*.

Then, regarding the second aim of part one, based on previously presented theory, I will separate the predictors into two groups before performing a principal component

analysis: one group with external conditions and the second with internal conditions. This duality is a tendency which appears to be strong in both team- and MT-effectiveness models (Hackman, 2002; Wageman et al., 2008). I will therefore separate the external condition scales from those scales measuring internal predictors of MT effectiveness.

An examination of the underlying components of these two groups will then be performed, assessing whether there is another, simpler way, to understand predictors of MT effectiveness. As the variables were inherently chosen based on research stating what predicts MT effectiveness, I find it reasonable to expect that these predictor variables will cluster together in fewer components.

## **6.4 Tentative Assumptions, Part Two**

I expect that the predictor components will correlate with the output components. This is theoretically reasonable, as the variables chosen by Bang and Midelfart (2012) are selected based on studies showing these predictors to influence team effectiveness outcome criteria. I also expect that the predictor components from part one will correlate positively with the outcome components.



# 7 Methods

## 7.1 Design and Procedure

The present study is based on responses on the questionnaire «*effect*» from 215 MTs, comprising 1332 individuals. Individual team members rated their MT on several dimensions related to effectiveness. The data gathering took place between 01.01.2012 and 30.12.2014, as part of the research project “Effective management teams” at the Department of Psychology, University of Oslo, led by associate professor Henning Bang. Participants received an e-mail with a link to the questionnaire. They had a seven-day deadline, and non-responders were sent one reminder.

Subsequent to finishing the questionnaire, the respondents received a feedback-report and scores of the management team to which they belonged. Mean response rate of the management teams was 96.9%.

## 7.2 Sample

Before selecting participating teams, a MT was defined as a team consisting of leaders who report to a superior, see themselves as belonging to the MT, and have regular meetings (Bang & Midelfart, 2010; McIntyre, 1998). MTs included in the study were not subject to a systematic selection method, but rather selected on basis of convenience sampling. 40% of the invited teams participated as a part of different MT development programs, and the remaining 60% responded as a part of the research project.

The final sample comprised teams originating from both public (50.2%) and private sector (49.8%). The teams came from a variety of backgrounds, including consulting firms, health care, entertainment, public administration, transportation, culture, education, and economy and finance. Of the 215 teams, 80 MTs were Danish and 135 were Norwegian.

Overall, 1332 leaders (54.1% male, 45.9% female) on different organizational echelons assessed their respective teams. In this study, 50 of the MTs were TMTs (level 1), 71 were middle-level (level 2), and 94 were lower-level (level 3 or lower), in their respective organizations.

Team size ranged from 23 leaders to three leaders, with an average size of 7.37 individuals (standard deviation 3.38). Most teams had four or six members (14.4% of the

teams). 87.4% of the teams had 10 members or less. Age was missing in just below half (45.3 %) of the replies, so this variable will not be described further.

Tenure distribution was evenly dispersed on >1 year (19.1%), 1-2 years (18.3%), 2-4 years (20.6%), and with 5.7% who had been part of the management team for more than 6 years. 16.4% did not answer on which tenure category they belonged to.

## 7.3 Instrument and Measures

The statistical analyses in this master's thesis were performed on the scales in "*effect*" that measure aspects which, according to Bang and Midelfart (2012), predict MT performance and the outcomes of performance. The measures and underlying items are described in appendix 1 and 2. The psychometric qualities of "*effect*" are described in Bang (2017).

These measures consist of 2-8 items rated on 7-point Likert-scales, where 7 indicates "totally agree", 4 equals "neither disagree or agree", and 1 indicates "totally disagree". These statements make up the individual items underlying the scales.

**Missing.** The instrument originally has 27 scales (see table 2, appendix 1). Two predictors, political behavior and behavioral integration, were added to the instrument later than the rest of the variables. Political behavior had 897 responses, whereas behavioral integration had only 354 responses. These two dimensions were therefore not included in the data analysis. Lastly, appropriate size was also removed, as it comprises only one item. Hence, 20 predictor scales and four criteria scales were examined by further analysis. The remaining number of items were 113.

In other cases of missing responses, pairwise deletion (available-case analysis) was used. This handling method can be used when the responses can be assumed to be missing at random (Peugh & Enders, 2004). Compared to list wise deletion techniques, this method increases the power in the analysis, and is therefore preferred.

## 7.4 Concept Clarification

All quantitative analyses are analyses of relationships between variables. The variables may be items, dimensions or components, depending on the research question. Throughout this paper, data are analyzed at different levels, and to avoid possible confusion the following terminology is used:

**Items:** Single questions measuring perceptions of team behavior and effectiveness. These items were intended to be indicators of dimensions of team functioning.

**Scales:** Scales are measures of dimensions in “*effect*”, and comprise a number of items.

**Dimensions:** Dimensions are measured by simple additive scales formed by items. These dimensions are derived from theories and empirical studies of team effectiveness.

**Components:** A possible higher order description of dimensions based on their between dimension correlations. In the literature the concepts of "factors" and "components" are often used interchangeably. As analyses in the present context had only descriptive and exploratory purposes, and principal components analyses were performed, I have chosen the concept "components".

## 8 Statistical Analyses, Part One

**Procrustes analysis.** Procrustes analysis (principal component analysis with target rotation) was applied to examine if the dimensions said to be measured by “*effect*” would find empirical support from the dataset. Analyses were performed separately for predictor and outcome scales. Procrustes analysis was performed by Eilertsen's (1989) orthogonal matching program applying an algorithm suggested by Norman Cliff (Cliff, 1966).

**Principal component analysis.** Principal component analysis (PCA) was applied to the data set in order to account for the common variance among the items (Tabachnick & Fidell, 2007), i.e. establishing the dimensionality of MT effectiveness measured by “*effect*”.

When assessing the component structure, the dimensions were split into three separate PC analyses, based on the theory presented earlier in this paper. The first group comprised the four criterion scales (task results, decision quality, decision implementation, and individual well-being and growth). The second group comprised three external predictor scales (team reinforcing reward systems, adequate information systems, and adequate educational systems). These scales measure external resources available to the group from the surrounding organizational environment, and are therefore deemed as separate from the rest of the predictors. This group is referred to as “external conditions” in further analysis.

The third group comprised the remainder of the predictor scales, thought to measure internal characteristics of the team (clear purpose, appropriate tasks, appropriate competencies, balanced diversity, pre-meeting preparation, clear meeting goals, focused communication, task conflict, absence of relationship conflict, dialogue, active external relationships, continuous team learning, team leadership, team psychological safety, team spirit, functional team culture, and team efficacy). This last group of predictor scales will be referred to as “internal predictors” in further analyses.

Except from the Procrustes analysis, all analyses were performed in SPSS 22.

## 9 Results, Part One

The 24 scales which are measured by “*effect*” are expected to be partly overlapping and correlated, both by measuring similar phenomena, and by phenomena being causally related, and may not be regarded as underlying "components" in any sense. To justify the measurement of the 24 scales with the 113 items (95 predictors, 18 criteria), I did however expect two criteria to be satisfied:

1. Correlations between items measuring the same dimension should be higher than correlations between these items and items measuring other dimensions.
2. Correlations between items measuring the same dimension should be so high that, when creating an additive scale based on these items, the estimated reliability of the scale should be acceptable.

When doing the Procrustes analysis, I split the 24 scales into two groups: the predictor scales (20 scales) and the outcome scales (four scales). To examine the first criterion, the 95 items measuring the possible predictors of effective team functioning were analyzed by a principal component analysis (PCA), extracting all possible components. These components were rotated into a space of lower dimensionality of 20 theoretically defined components ("Procrustes rotation") by employing a procedure suggested by Cliff (1966). Visual inspection of the structure of the rotated 95 by 20 component matrix showed clear indications that criteria 1 above was satisfied (appendix 3a and 3b). The same analysis was performed for the 18 items measuring four outcome dimensions (appendix 4).

To achieve a more objective measure of fit of the empirical matrix to the theoretical, we computed Tucker's coefficient of congruence (presented in table 3). This is a commonly used measure for comparison of component/factor loadings from different samples (Lorenzo-Seva & Ten Berge, 2006). Tucker originally proposed the following rules of thumb for evaluating this index when examining interpretability of factor loadings: .98 to 1.00=excellent, .92 to .98=good, .82 to .92=borderline, .68 to .82=poor, and below .68=terrible.

**Table 3.***Descriptive statistics, congruence coefficients, agreement, and estimated reliability for all scales.*

		n	mean	sd	Congruence	Mean IIC	Mean RWG	ICC <sub>2</sub>	Alpha
<i>Internal Predictor Variables</i>									
IP1	CLEAR PURPOSE	1327	5.08	1.31	0.80	0.56	0.62	0.71	0.83
IP2	APPROPRIATE TASKS	1326	4.73	1.15	0.73	0.45	0.70	0.74	0.86
IP3	APPROPRIATE COMPETENCIES	1329	5.46	1.28	0.82	0.50	0.65	0.71	0.80
IP4	BALANCED DIVERSITY	1324	5.47	1.21	0.77	0.58	0.67	0.72	0.85
IP5	PRE-MEETING PREPARATIONS	1322	4.57	1.24	0.85	0.47	0.62	0.69	0.81
IP6	CLEAR MEETING GOALS	1324	4.87	1.29	0.81	0.46	0.58	0.61	0.77
IP7	FOCUSED COMMUNICATION	1326	4.66	1.23	0.80	0.44	0.64	0.68	0.79
IP8	TASK CONFLICT	1324	4.74	1.21	0.95	0.41	0.62	0.57	0.73
IP9	ABSENCE OF RELATIONSHIP CONFLICT	1313	5.31	1.58	0.83	0.69	0.57	0.81	0.90
IP10	DIALOGUE	1328	5.01	1.16	0.70	0.52	0.68	0.70	0.88
IP11	ACTIVE EXTERNAL RELATIONSHIPS	1324	5.08	1.11	0.83	0.43	0.67	0.56	0.77
IP12	CONTINUOUS TEAM LEARNING	1308	4.31	1.43	0.87	0.52	0.51	0.60	0.81
IP13	EFFECTIVE TEAM LEADERSHIP	1258	5.34	1.28	0.79	0.71	0.64	0.64	0.93
IP14	TEAM PSYCHOLOGICAL SAFETY	1325	5.70	1.14	0.77	0.54	0.69	0.60	0.89
IP15	TEAM SPIRIT	1325	5.19	1.26	0.70	0.55	0.65	0.71	0.88
IP16	FUNCTIONAL TEAM CULTURE	1322	4.59	1.18	0.74	0.36	0.66	0.65	0.72
IP17	TEAM EFFICACY	1318	5.39	1.17	0.76	0.57	0.69	0.66	0.87
<i>External Predictor Variables</i>									
EP1	TEAM REINFORCING REWARD SYSTEMS	1312	4.08	1.32	0.89	0.41	0.55	0.58	0.74
EP2	ADEQUATE INFORMATION SYSTEMS	1326	5.35	1.26	0.91	0.68	0.54	0.43	0.81
EP3	ADEQUATE EDUCATIONAL SYSTEMS	1326	4.91	1.39	0.92	0.55	0.57	0.70	0.78
<i>Dependent Variables</i>									
D1	TASK RESULTS	1322	5.11	1.15	0.83	0.54	0.69	0.69	0.85
D2	DECISION QUALITY	1313	5.20	1.02	0.87	0.66	0.74	0.59	0.85
D3	DECISION IMPLEMENTATION	1320	4.90	1.32	0.90	0.54	0.67	0.80	0.85
D4	INDIVIDUAL WELL-BEING AND GROWTH	1324	5.37	1.27	0.88	0.58	0.62	0.58	0.86
<i>Congruence: Tucker's Congruence Coefficient</i>									
<i>Mean IIC: Mean Inter-Item Correlations</i>									
<i>Mean RWG: Mean RWG across 215 teams</i>									
<i>ICC2: Intra-Class Correlation</i>									
<i>Alpha: Cronbach's Alpha</i>									

Table 3 provides descriptive statistics for all scales. As can be observed in table 3, mean scores were all above mid-points of the 1-7 point scale used, suggesting somewhat skewed distributions. All scales did however show sufficient variability (standard deviations), and thereby no indications of ceiling effects.

Mean inter-item correlations (IIC) are the mean correlation among items measuring the same dimension. They ranged from .36 to .71. Except from being crucial for the reliability of a scale and giving an impression of the "homogeneity" of the items, these have no obvious interpretation. I did however expect them to be higher than the mean correlation between those items and items measuring other dimensions. Showing this would however require presentation of the full 113x113-correlation matrix.

For illustrative purposes I computed the mean "off-dimension correlation" for the scale with the lowest mean inter-item correlation ("Functional Team Culture" with IIC=.36). The mean "off-dimension correlation" was .33. So even for the least "distinct" scale, this simple criterion seems to be satisfied.

A more comprehensive analysis of this criterion was performed by Procrustes rotation. Results are presented in appendix 3 and appendix 4. Tucker's congruence coefficients after Procrustes rotation are presented in table 3. They ranged from .70 to .95. Applying Tucker's original criteria, at least 8 of the coefficients must be considered representing "poor fit".

However, these are "rules of thumb" for justifying similar interpretations of factors. When inspecting the observed correlation matrix, even for scales with coefficients as low as .70, all within scale correlations were higher than the between dimension correlations. And for the scale measuring "Team spirit" the congruence coefficient was .70. Inspection of the target rotated PC loadings for this scale (column 18 in appendix 3a and 3b) shows that the on-target (criteria) loadings ranged from .53 to .64 with mean=.58, and the off-target loadings ranged from -.03 to .35 with mean=.14. So even for this scale no alternative interpretation was obvious. For the present purpose of using PC analysis to sort the elements of the 95x95 and 18x18-correlation matrices rather than establishing similar interpretations of factors, even congruence coefficient as low as .70 seemed to support interpretations of scales as suggested in "*effect*".

I thus concluded that criteria one above, was at least partly satisfied for all scales - although some of the dimensions measured must be considered highly correlated. Estimated reliabilities by Cronbach alpha's showed criteria two above to be satisfied for all 24 measures included in the present study - with reliability estimates ranging from  $\alpha$ =.72 to .93.

Correlations within measures of external predictor scales and within measures of outcome scales are presented in table 4 and 5. Correlations between the external predictor scales were positive, with a range of .31 to .36. The four outcome scales were also positively correlated, with correlations ranging from .65 to .69. Separate principal components analyses of the three external predictor scales and the four outcome scales supported a one-dimensional interpretation of both, with one component explaining 56% and 69% of the variance respectively.

**Table 4.** *Correlations between external predictor scales.*

	1	2	3
1 TEAM REINFORCING REWARD SYSTEMS	1.00	0.33	0.36
2 ADEQUATE INFORMATION SYSTEMS	0.33	1.00	0.31
3 ADEQUATE EDUCATIONAL SYSTEMS	0.36	0.31	1.00

**Table 5.** *Correlations between outcome scales.*

	1	2	3	4
1 TASK RESULTS	1.00	0.65	0.67	0.69
2 DECISION QUALITY	0.65	1.00	0.62	0.56
3 DECISION IMPLEMENTATION	0.67	0.62	1.00	0.65
4 INDIVIDUAL WELL-BEING AND GROWTH	0.69	0.56	0.65	1.00

As both criteria presented above were found satisfied, the study continued to the assessment of component structure of the internal predictor scales. After applying PCA to the 17\*17 correlation matrix, the most appropriate dimensionality was suggested by the use of Horn's parallel analysis. The parallel analysis was done by generating 1000 random samples of size 1300 from a population comprising 17 uncorrelated variables and extracting 17 eigenvalues from each sample (table 6). Using the commonly applied criteria of retaining components with empirical eigenvalues larger than the 95th percentile of random eigenvalues, this procedure would in this case imply retention of two components explaining 58% of the variance.

**Table 6.** *Eigenvalues from principal components analysis of the 17 internal predictor scales.*

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	8.459	49.760	49.760
2	1.470	8.645	58.404
3	1.131	6.652	65.056
4	0.767	4.515	69.571
5	0.638	3.751	73.322
6	0.564	3.319	76.641
7	0.502	2.954	79.595
8	0.470	2.765	82.360
9	0.459	2.699	85.059
10	0.397	2.337	87.395
11	0.365	2.146	89.542
12	0.351	2.064	91.605
13	0.336	1.977	93.582
14	0.304	1.786	95.368
15	0.289	1.698	97.066
16	0.269	1.580	98.646
17	0.230	1.354	100.000



Following extraction, varimax rotation was performed on the solution to obtain a simpler interpretation of the dimensions. The most salient loadings on each of the dimensions are marked in bold (table 7). To aid interpretation component loadings are also plotted in figure 1.

**Table 7.** *Varimax rotated component loadings for the 17 internal predictor dimensions.*

	Component	
	1	2
CLEAR PURPOSE	<b>0.66</b>	0.40
APPROPRIATE TASKS	<b>0.75</b>	0.34
APPROPRIATE COMPETENCIES	0.12	<b>0.83</b>
BALANCED DIVERSITY	0.24	<b>0.82</b>
PRE-MEETING PREPARATIONS	<b>0.70</b>	0.14
CLEAR MEETING GOALS	<b>0.72</b>	0.25
FOCUSED COMMUNICATION	0.54	0.47
TASK CONFLICT	0.36	-0.13
ABSENCE OF RELATIONSHIP CONFLICT	0.05	<b>0.84</b>
DIALOGUE	0.49	<b>0.67</b>
ACTIVE EXTERNAL RELATIONSHIPS	0.59	0.38
CONTINUOUS TEAM LEARNING	<b>0.61</b>	0.22
EFFECTIVE TEAM LEADERSHIP	0.60	0.48
TEAM PSYCHOLOGICAL SAFETY	0.36	<b>0.69</b>
TEAM SPIRIT	0.47	<b>0.71</b>
FUNCTIONAL TEAM CULTURE	0.65	0.46
TEAM EFFICACY	0.62	0.47

*The most "salient" loading for each component in bold.*

As can be seen in fig. 1, where the dimensions can be observed in a 2-dimensional room, nearly all of the dimensions are correlated to some extent with both the x and y-axis. The dimensions included in each component are those who are most salient to each axis, and which do not crossload highly on both.

Clear purpose, appropriate tasks, pre-meeting preparations, clear meeting goals, and continuous team learning had the most salient loadings on component 1. Appropriate competencies, balanced diversity, absence of relationship conflict, dialogue, team psychological safety, and team spirit, showed the most salient loadings on component 2.

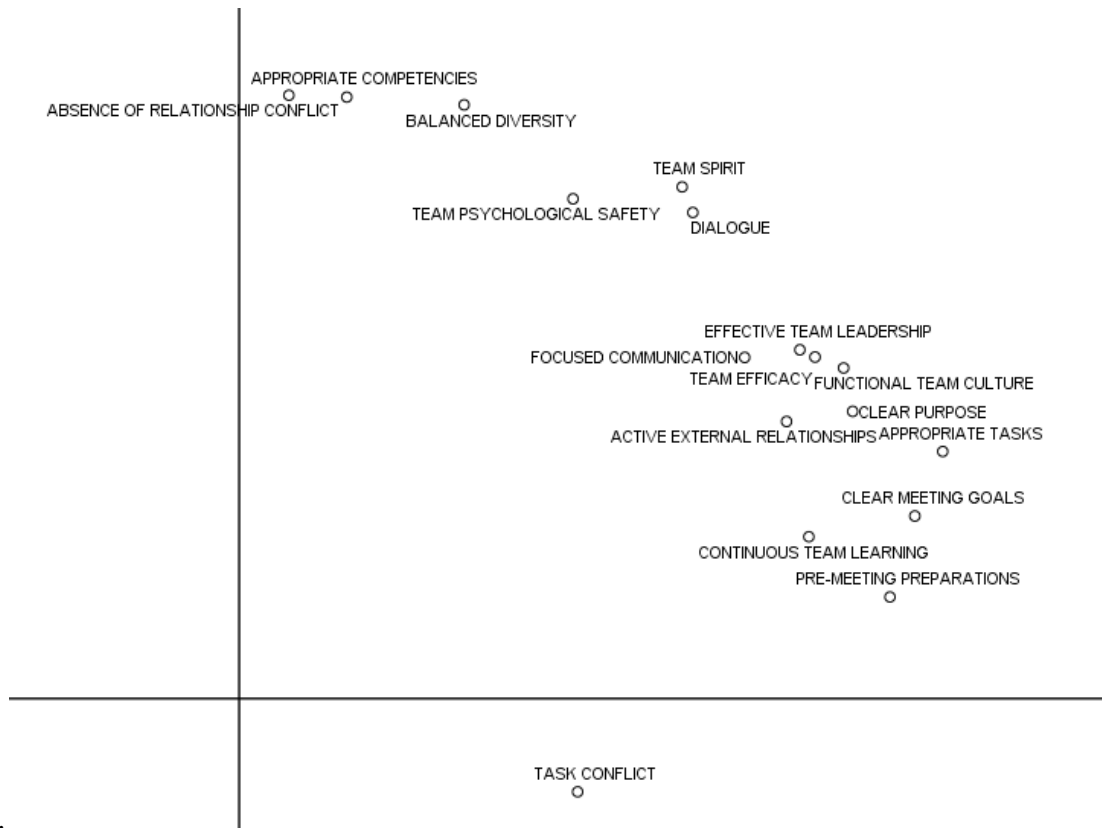


Figure 1.  
Two dimensional plot of varimax rotated component loadings for the 17 internal predictor variables.

Lastly, the components extracted must also fill a criterion of being theoretically meaningful. This is based on which scales load on the components. The theoretical meaningfulness of the resulting components will be argued for in the following part one-discussion.

# 10 Discussion, Part One

## 10.1 Summary of Results

The first purpose of part one of this study was to examine if the scales as they are measured in “*effect*” could be supported empirically. Conclusions regarding this was based on whether the scales would satisfy the statistical demands of criteria 1) distinctness, and 2) reliability. After analyzing the results, distinctness is considered acceptable, as the intra-scale correlations were substantially higher than inter-scale correlations, PC loadings after target rotation showed the expected pattern (appendix 3a and 3b), and congruence coefficients from target rotation were at acceptable levels.

In regards to reliability, the alpha levels of the scales were shown to be of acceptable levels as they were all above the given cut-off of .70 ( $\alpha=.72-.93$ ), and this criteria is therefore considered to be fulfilled as well.

According to the first aim of part one, in regards to the dimensionality suggested by “*effect*”, I find empirical support for the 24 scales being treated as measuring distinct but correlated phenomena, and that they may be measured by their designated items.

The second purpose was to examine the underlying dimensionality of the 24 scales as measured by “*effect*”. The next analysis examined if the 24 scales measured by the instrument could be understood by a simpler component solution. To examine this, I applied PCA on the three groups of scales. Following the application of statistical extraction criteria, the resulting solution was rotated. Based on the results, this study finds that MT effectiveness as measured by “*effect*” can be comprehensible described by four components (three predictors, one criterion).

Thus, I find support for the second tentative assumption, that the 24 scales measured by the instrument “*effect*”, can be reduced to a set of fewer components.

## 10.2 Component Dimensionality

**Outcome scales.** The results from the PCA showed that the four criterion scales could be understood as reflecting a simpler, unidimensional structure. The four scales reduced in this regard were task results, decision quality, decision implementation, and individual well-being and growth. This component is called “outcome”.

**External predictor scales.** The three scales relating to conditions in the team’s external environment (team reinforcing reward systems, adequate information systems, and adequate educational systems) were following PCA reduced to one component. This component is subsequently dubbed “external conditions” (i.e. external conditions like resources and organizational framework available to the team).

**Internal predictor scales.** The 17 internal scales can be understood as reflecting two components. These two components are categorized as both belonging to internal conditions (i.e. conditions that arise as a product of internal team processes and interactions). Most of the scales in this analysis were shown related to both components, but in varying degrees, and the name of each component is created from the meaning of the scales loading highest on it. On the background of the scales clustering closest to the two individual axes, the first component was interpreted as “relationship-oriented” and the second as “task-oriented”. In both cases, the variables strongly associated with one axis, were weakly associated with the other axis. This pattern also guided the interpretation.

The task-oriented component had five scales that loaded highly on it and low on the other component: Clear purpose, appropriate tasks, pre-meeting preparations, clear meeting goals, and continuous team learning. Meanwhile, the relationship-oriented component consisted of these six variables (loading high on the relationship-oriented component and low on the task-oriented): Appropriate competencies, balanced diversity, absence of relationship conflict, dialogue, team psychological safety, and team spirit.

### 10.3 Interpretation of Component Dimensionality

The four interpretable components yielded from the PCA, differing from the original model with 24 scales, will now be discussed further. Neither of the components showed to correspond considerably with those suggested by the original model, although having some similarities, the four components came out with the need for a new theoretical interpretation.

**Outcomes.** The four criterion scales (task results, decision quality, decision implementation, and individual well-being and growth) in “*effect*” have been suggested to measure two separate components (task performance and individual satisfaction) (Bang & Midelfart, 2012). In the present study, these four scales were highly correlated and could be described by one component.

This is a novel finding, as no work team or MT studies have found similar unidimensional structure of outcomes previously. Short of theory to compare this finding to, it

is difficult to imagine how individual well-being and growth can be perceived by team members as closely related to task results, decision quality, and decision implementation. One possible reasoning to explain this can be that when evaluating their MT, an underlying g-factor of contentment may work to influence the satisfaction felt concerning the results created, regardless of the items measuring task- or relationship-related dimensions. This may color the answers, causing a higher correlation, and finally lead to the dimensions all loading on one common component.

Another explanation is that it may be caused by a weakness of the instrument. It may also be due to common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), which will be addressed further in the general discussion.

**External conditions.** The scales measuring external conditions were highly correlated and could be described by one component. It was natural to separate these variables from the others, based on theory and previous studies of external dimensions (Hackman, 2002; LaFasto & Larson, 2001; Lombardo & Eichinger, 1995; Wageman et al., 2008). Although external conditions is suggested as part of the picture by several team and MT effectiveness models (Bang & Midelfart, 2012; Hackman, 2002; LaFasto & Larson, 2001; Lombardo & Eichinger, 1995; Wageman et al., 2008), the findings in this study indicate a novel interpretation.

A possible explanation for this is that MTs existing in a supportive organizational environment, overall receive more resources needed than those existing in less supportive organizations will do. This component may therefore reflect the experienced organizational support, not the individual available resources themselves. This will be discussed further in the section concerning future studies.

**Internal conditions.** Internal conditions were shown to split into two main components. Based on the scales loading on the two components, one was termed relationship-oriented and the other one task-oriented (see table 7). This emotional/instrumental dyadic model is not uncommon in the organizational psychology field. Rather, it was coined as the “popular hypothesis” (Kavanagh, 1975), and considered the dominant hypothesis in regards to leadership effectiveness before the introduction of transformation/transaction leadership styles (Judge, Piccolo, & Ilies, 2004).

The dual component structure in classic leadership theories can, according to Bowers and Seashore (1966), be applied to groups as well as leadership. Moreover, these components are suggested to influence effectiveness of groups and teams, as in our study. The difference is that in these studies, it is the leadership style that leads to this effectiveness, not the MT

functioning. Although not fully comparable or investigated in regards to MTs, it is interesting to see such a conventional tendency appear in our data as well.

The central Ohio-state leadership style studies, taking place in the 1940s-1950s (see Stogdill, 1950), aimed to understand what predicted effective leadership. They found that high group performance and satisfaction could be predicted from an instrumental/emotional dyadic conceptualization, in line with our findings in the present study.

The Ohio-state studies components were named “consideration” and “initiating structure”, and the theory has found overwhelming support in later studies (Fleishman, 1953; Fleishman, Harris, & Burt, 1955; Stogdill & Coons, 1957). Several studies confirmed the relationship between consideration and initiating structure factors and high satisfaction and performance (e.g. Fleishman & Simmons, 1970), in line with findings in this present study. In effect, according to Fleishman (in Dansereau & Yammarino, 1998), “Consideration and Initiating Structure has proven to be among the most robust of leadership concepts”.

The Ohio-state studies, dominating leadership effectiveness in 1940s-1970s, inspired research like Katz, Maccoby, and Morse (1950), who found that leadership style could be conceptualized dyadically. In their study, they named the two components as “employee orientation” and “production orientation” (Cartwright & Zander, 1960), again finding support for interpersonal and task-oriented aspects influencing effectiveness in groups. Concurrently, Cartwright and Zander (1960), also split leadership into two group aspects: group maintenance and group achievement, supporting the same dual structure of effectiveness.

As the 1980s approached, the leadership styles turned towards transformational/transactional leadership styles (Bass, 1985; Burns, 1978). These are higher-order implicit leadership styles theories, but they are thematically split into emotional/instrumental tendency, in line with the resulting dimensionality found here.

Having established the underlying component structure of the scales measured by “*effect*”, the next step in my study is to examine the relationship between the four components that emerged from the initial analysis.

# 11 Statistical Analyses, Part Two

**Data Analyses.** To perform the structural equation model analysis, the computer program Amos from SPSS was used.

**Aggregation.** As MT effectiveness is a team phenomenon, it is conceptually meaningful to examine the variables aggregated to team level. Items, dimensions, and components in this study are all measured independently (the respondents have not collaborated in forming a response) at an individual level. The responses are however not intended to measure characteristics of individuals, but properties of teams.

This is methodically facilitated by the questionnaire asking questions about how the *team* functions, and not about the individual team members. When examining the relationship between predictor and criterion components of management team effectiveness, the unit of analysis therefore was at the level of the team, not the individual.

The responses in this study are individual members' self-reports on team performance, and to justify the aggregation of these, two measures were assessed (table 3). First, level of inter-rater agreement was assessed by computing rwg for each scale within all teams. As a summary measure of agreement, mean rwgs across all teams are reported in table 3.

The rwg coefficient have been discussed both as an estimate of the reliability of aggregated scores, and as a pure index of inter-rater agreement (Biemann, Cole, & Voelpel, 2012; James, Demaree, & Wolf, 1984). In the present context, the latter interpretation is preferred. The rwg coefficient compares the observed within-group variance in a sample to the variance expected when there is a complete lack of agreement among the judges - and varies from 0 (no actual agreement) to 1 (complete agreement).

While some authors views values above .70 as satisfactory inter-rater agreement (George, 1990), others argue that .50 may be sufficient (Guzzo & Shea, 1992). The .70 cut-off has been disputed as lacking statistically valid arguments (LeBreton, Burgess, Kaiser, Atchley, & James, 2003). Biemann et al. (2012) suggests that rwg-values can be ordered into a level of agreement-scale, where the purpose dictates the cut-off. Moderate levels of agreement (.50) are suggested to be sufficient in the study of general trends in teams. As can be observed in table 3, which presents values from inter-rater agreement calculations, all scores were above the recommended cut-off of .50.

Second, reliability of aggregated scores were estimated by intra-class coefficients ICC(2) - also reported in table 3.

ICC(2) is a reliability estimate, where response variation is compared among the members of the team. ICC(2) describes how strongly the judgments of each member of the team resembles the judgments of other team members. This permits the assessment of consistency of judgments within a group when judging the group on the scales in “*effect*”. Cicchetti (1994) suggested the following agreement-levels:  $<.40$  = poor,  $.40-.59$  = fair,  $.60-.74$  = good, and  $.75-1.0$  = excellent. Using this as a guideline, 18 of the scales showed estimated reliabilities characterized as "good", while six scales only satisfied the "fair" criterion.

However, for most of the subsequent analyses, only components and not individual scales were aggregated to team level. ICC coefficients for components were .82 for relationship-oriented, .65 for task-oriented, .61 for external conditions, and .74 for outcomes.

Based on the two criteria described above, aggregation of individual judgments to team-level was considered justified.

**Structural equation modeling (SEM).** SEM is an approach that includes a group of different models and methods (Kaplan, 2009), like confirmatory factor analysis, path analyses of relationships among observed and/or latent variables, partial least squares path modeling, and latent growth modeling (Kline, 2011). SEM can be used to assess latent variables through observable variables, creating a structural model outlining the correlation between the underlying variables (Kaplan, 2009). In the present study, this approach was used only as a convenient way of estimating direct and indirect effects among a small number of observed variables.



# 12 Results, Part Two

First, predictor variables and outcome variables were aggregated to team level. For overall analyses of these relationships, two exact component scores were computed from the PCA described in results part one. In addition, simple additive scales were constructed for the external predictors and outcomes.

Table 8 shows the relationships between the different components created in part one, at team level. As can be seen, all components were positively correlated with each other, with exception of task and relationship being uncorrelated also at team-level ( $r=.03$ ).

The correlation between the outcome and the internal and external components were  $r=.73$  for the external conditions, and  $r=.64$  and  $r=.67$  for task and relationship, respectively. External conditions was also related positively with both internal conditions (task  $r=.62$ , and relationship  $r=.43$ ).

**Table 8.** *Correlations between components at team level (n=215).*

	External Conditions	Task	Relationship	Outcome
External Conditions	1.00	0.62	0.43	0.73
Task	0.62	1.00	0.03	0.64
Relationship	0.43	0.03	1.00	0.67
Outcome	0.73	0.64	0.67	1.00

As the purpose of part 2 was to assess the constructs relationship with the outcome construct, table 9 provides an overview of each underlying predictor dimension's correlation with each criteria dimension.

Table 9 shows that all dimensions making up the internal and external conditions, were individually positively correlated with all of the individual outcome dimensions. The only exception is task conflict, which did not show a relationship with any of the outcome dimensions.

**Table 9.** Correlations between all predictor dimensions and criteria dimensions at team level (n=215).

	TASK RESULTS				
		DECISION QUALITY		INDIVIDUAL WELL-BEING AND GROWTH	
			DECISION IMPLEMENTATION		
CLEAR PURPOSE	0.73	0.66	0.64	0.55	
APPROPRIATE TASKS	0.75	0.71	0.67	0.62	
APPROPRIATE COMPETENCIES	0.63	0.49	0.60	0.58	
BALANCED DIVERSITY	0.73	0.58	0.62	0.72	
PRE-MEETING PREPARATIONS	0.49	0.57	0.50	0.42	
CLEAR MEETING GOALS	0.63	0.66	0.63	0.54	
FOCUSED COMMUNICATION	0.60	0.62	0.71	0.52	
TASK CONFLICT	0.06	0.07	-0.02	0.12	
ABSENCE OF RELATIONSHIP CONFLICT	0.58	0.41	0.56	0.61	
DIALOGUE	0.79	0.68	0.69	0.75	
ACTIVE EXTERNAL RELATIONSHIPS	0.69	0.64	0.65	0.56	
CONTINUOUS TEAM LEARNING	0.54	0.43	0.30	0.48	
EFFECTIVE TEAM LEADERSHIP	0.70	0.66	0.62	0.68	
TEAM PSYCHOLOGICAL SAFETY	0.74	0.60	0.62	0.71	
TEAM SPIRIT	0.82	0.64	0.60	0.80	
FUNCTIONAL TEAM CULTURE	0.77	0.68	0.65	0.67	
TEAM EFFICACY	0.78	0.74	0.60	0.75	
TEAM REINFORCING REWARD SYSTEMS	0.54	0.50	0.44	0.49	
ADEQUATE INFORMATION SYSTEMS	0.55	0.55	0.50	0.48	
ADEQUATE EDUCATIONAL SYSTEMS	0.48	0.39	0.45	0.49	

All reported correlations were statistically significant at  $p < .01$ .

To further investigate the relationship between the components, SEM analysis was used. The components modeled were relationship, task, external conditions, and outcome (figure 2). The components are showed as rectangles, with the paths represented by standardized regression coefficients ( $\beta$ ).

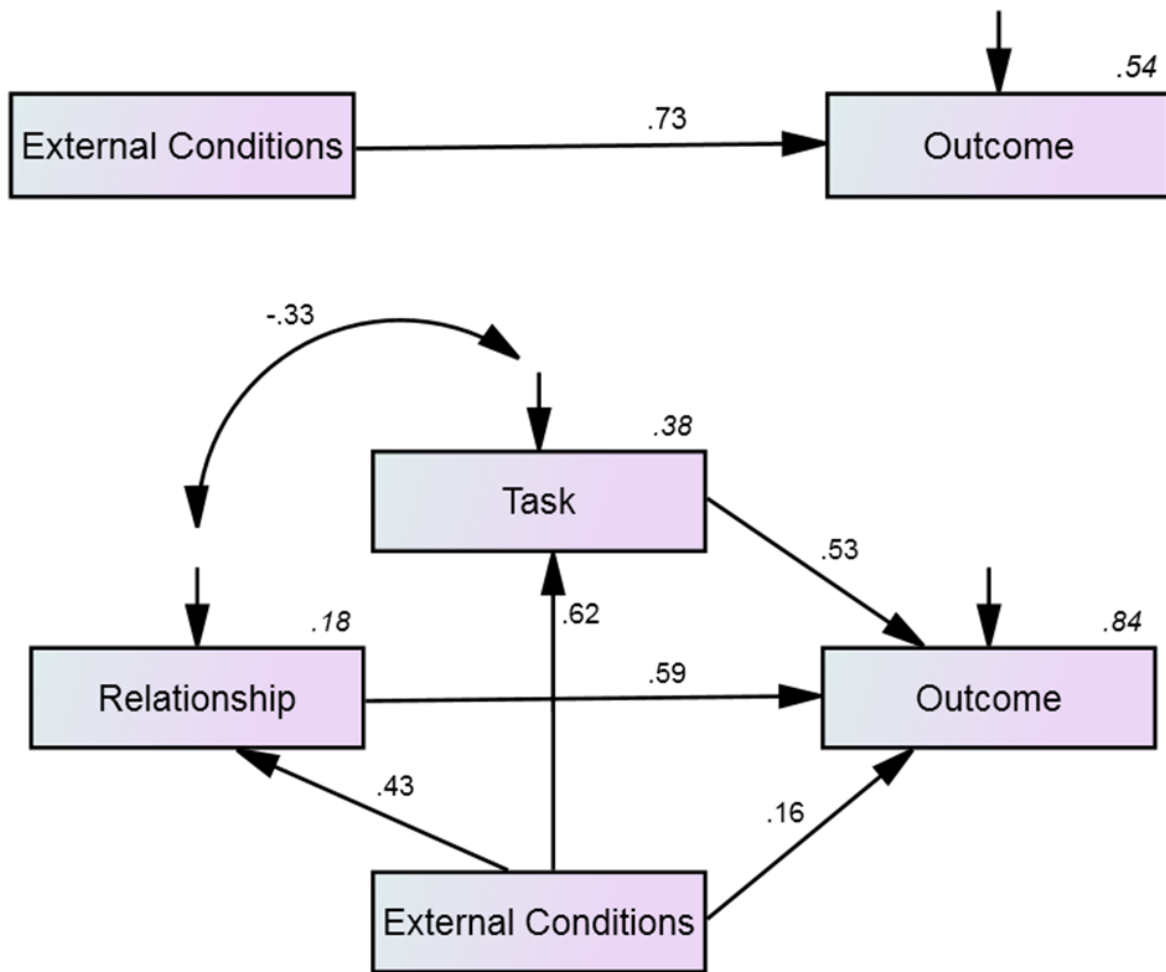


Figure 2. The total effect of External Conditions ( $\beta=.73$ ) is shown in the upper part of the figure. The lower part of the figure show estimated path coefficients and explained variance (in italic) from fitting a saturated structural equation model to the 4\*4 covariance matrix. All coefficients are standardized regression coefficients.

The total effect of external conditions ( $\beta=.73$ ) was modeled as two indirect effects in a saturated SEM. From the SE model, 84% of the variance in MT effectiveness outcomes could be explained when entering the three predictors into the equations. Task- and relationship oriented components had a direct effect on outcomes of  $\beta=.53$  and  $\beta=.59$ , respectively. When modeling the components in this fashion, external conditions had its direct relationship reduced from  $\beta=.73$  to  $\beta=.16$  on the outcome. External conditions also had a direct effect of  $\beta=.43$  and  $\beta=.62$  on relationship and task variables.

# 13 Discussion, Part two

## 13.1 Summary of Results

The second aim of the paper was to examine the relationship between the four components from the PC analysis. The tentative assumption of part two was that the predictor components would positively correlate with the outcome components.

The bivariate relationships were described by a correlation matrix (table 8), which showed that all components from part one positively correlated with the outcomes. The external conditions correlated  $r = .73$ , and the internal conditions correlated  $r = .64$  (task) and  $r = .67$  (relationship). Further, the scales making up the components showed that all aggregated predictor scales except for task conflict correlated significantly and positively with the outcome scales as well. Thus, the tentative assumption that the scales were positively related to the outcomes, was confirmed, both on dimension-level and component-level.

Then, the overall path-relationship between the components was examined through structural equation modeling. According to this analysis, external conditions alone could account for 58% of the variance of the MT effectiveness results, with  $\beta = .73$  (top model, fig 2). This relationship prompted further investigation of the relationship between the components, specifically, looking for the existence of mediated effects.

**Mediated effects.** Following the steps of Baron and Kenny (1986), step one where the total effect of external conditions on outcomes is  $\beta = .73$  (top model of fig. 2), has been established. Step two to four can be observed in the lower model in fig. 2.

In step two, a direct effect on the mediators must be established (Baron & Kenny, 1986). As can be seen in fig. 2, the external conditions were shown to have a direct effect of  $\beta = .43$  and  $\beta = .62$  with the relationship- and task-oriented components, respectively. The third step, imply establishing the relationship between the mediator and the outcome when controlling for the causal variable. From fig. 2, the relationship-oriented factor had a direct effect on outcomes of  $\beta = .59$ . Task-oriented components showed a direct effect of  $\beta = .53$  on outcomes.

This leaves the fourth step where, to support a mediated relationship the direct effect of external conditions should be significantly reduced when controlling for the mediators. As can be observed in the lower model in fig. 2, when modeling and controlling for the components' indirect pathways, the strength of the direct relationship between external

components with the outcomes was reduced from  $\beta=.73$  to  $\beta=.16$ , confirming the fourth step (Baron & Kenny, 1986). Thus, based on the SE-model relationship- and task-oriented components appear to mediate the effect of external conditions on the outcomes of MT effectiveness.

In regards to the aim of part two, the SE-model shows that there is a positive relationship between the predictor-components and the outcome-component measured by “*effect*”. The relationship between these components can be modeled as external conditions having a mediated effect through the internal conditions, explaining 84% of the variance of the outcomes of MT effectiveness.

## 13.2 Interpretation of the Model

The framework suggested by my analysis is not in line with the original model, nor other prominent theories on the field of team or MT effectiveness (Hackman, 2002; Wageman et al., 2008). I will now discuss the dimensionality found, and the paths that existed between the variables. First, regarding the direct effects, in this study I find indications that external conditions are not as strongly correlated with the outcomes, compared to both the internal conditions, when controlling for other variables (fig 2). This is also in line with previous theories, which presented external components as secondary to basic/internal conditions of the group (Hackman, 2002; Wageman et al., 2008). It is perhaps not far-fetched to imagine, that the external organizational surroundings of a MT do not have a direct influence on its effectiveness.

Secondly, regarding the internal conditions, both the relationship component and task component showed a strong correlation with the outcomes (fig. 2). Relationship components showed a bit stronger correlation than task components ( $\beta=.59$  versus  $\beta=.53$ , respectively). This means that the interpersonal conditions of the team plays the largest role in whether a MT is successful or not, closely followed by the task-oriented behaviors it displays.

Thirdly, the SE-model showed that the direct effects of external conditions on both internal conditions were surprisingly strong, which prompted further investigation for the existence of a mediator effect (Baron & Kenny, 1986). A mediating effect was found between the external conditions, through the internal conditions, with a strength of  $\beta=.73$ , a very strong relationship. This way of understanding MT effectiveness is the first of its kind, and should be investigated further. This is addressed closer in the section discussing future studies.

# 14 General Discussion

This study intended to examine the underlying structure of MT effectiveness as measured by “*effect*”, and then establish the relationship between these factors. Supported by results from inter-item correlations and Procrustes analysis, the sampling of items was found reasonable and reflecting the supposed dimensional structure. Further, the PCA indicated that “*effect*” basically measures four components, three predictor-components, and one outcome component. Following, the results from the correlation analysis at team level showed that all but one predictor scale were positively correlated with the outcome scales at team level. Lastly, a SEM-analysis showed that a strong effect existed between external conditions and results, nearly fully mediated by the internal conditions.

Based on the results from the SEM, the present study found that 84% of the variation in outcomes of MT effectiveness could be explained by these three components. Thus, this paper finds that MT effectiveness can be understood through a simpler structure of internal and external conditions. The following part of the paper will discuss practical and theoretical implications of the findings, limitations, and future studies, before concluding.

## 14.1 Practical and Theoretical Implications

As many of the findings in this study are unprecedented, there are several theoretical implications to be considered. This is especially relevant in regards to the unidimensionality of external conditions and outcomes. Further, the mediating effect that arose between the external conditions and outcomes, begs for a theoretical examination of the relationship between external and internal conditions.

Remembering Wageman (2008)’s model and the instrument called TDS (Wageman et al., 2005), it would be highly interesting to see the same type of analysis performed on their data as well. This would provide an empirical confirmation or dismissal of the component structure and pathways discovered in this study, both of which would deliver much-needed insight into the underlying structure and relationship between components of MT effectiveness.

In regards to the model, the results indicate relationship-oriented aspects as the strongest predictor of MT effectiveness ( $\beta=.59$ ), with task-oriented factors very close in tow ( $\beta=.53$ ). Thus, this confirms that one may direct focus towards the internal conditions in order to achieve high performing MTs.

External factors were not found having the same direct influence on MT performance ( $\beta=.16$ ), but due to the exposing of a strong mediator effect, this aspect of MT effectiveness should not be ignored. On the contrary, the present findings indicate that the external conditions a MT exist in have a strong impact on the team's internal processes, which has not been indicated in previous studies. This component therefore deserves thorough examination, in order to disentangle its position in MT effectiveness. It also indicates that it is important to pay sufficient attention to the surrounding conditions of a MT when attempting to increase its effectiveness.

In regards to the survey "*effect*", which assesses and aims to develop MTs based on their score, the results here should lead to an evaluation of the practical use of the results. Perhaps one use of the results from the present study could be utilized by "*effect*" creating an aggregated MT score on the internal and external conditions. Another suggestion is that a MT's score on the test be simpler visualized for the team, based on the three emerged predictor components, perhaps plotted into a circumplex-model with task orientation and relationship orientation as dimensions.

Regardless, for these questions to be of any relevance there needs to be more investigation into the presented structure in this paper, as there are still several questions to be answered and limitations to be addressed.

## 14.2 Limitations

There are several limitations to be mentioned. In particular, methodological limitations are relevant to consider, and how these may have affected the results will be discussed below.

**Instrument validity.** As the results from the analysis reduced the 24 variables to four factors, the chance of an artificially high correlation between the variables making up the factors may have been caused by common method bias (Podsakoff et al., 2003).

**Common method bias.** The high correlation can be inflated as items measuring both criteria and predictor dimensions were assessed by responses from the same informants, by identical method, and at the same point in time. This may have consequences for the results for several reasons. Research shows that negative and positive affect may skew results (Watson & Clark, 1984). Following this logic, members belonging to low performing teams may have been biased towards viewing their team's level lower due to negative affect created from e.g. low individual satisfaction. This may also be a factor with the teams that are high-

performing, and have high individual satisfaction. In combination with the negative affect skew, this could cause an inflation of the correlation of the results.

Social desirability is another potential bias (Podsakoff et al., 2003); participants may lie or construe reality to fit what is expected. This may in particular be an issue with the small teams of only 3-4 members attending the study, especially as feedback reports were provided afterwards. However, the studies were conducted with individual anonymity conserved, which according to Podsakoff et al. (2003), will function to reduce the effect of social desirability.

To reduce common method bias inflation of the relationships between the components, there are several interventions that can be made. This may in future studies be reduced through splitting participants within a MT on criteria variables and predictor variables. Moreover, alternative methods for assessing the variables can also be explored.

Common method bias have also been suggested to be accounted for by comparing scores to similar studies on corresponding themes (Podsakoff et al., 2003), but as stated previously, there have been no similar studies to compare it with. Therefore, in the case of this being available at a later time, results from this study should be compared to these.

**Causality.** Inferences regarding causality should be made carefully. In this instance, although SEM-analysis can indicate the direction of cause and effect, the causality cannot be certain. In some instances, outcomes may function to influence the internal and external conditions, creating a reversed effect. One example of this would be that an organization invest more resources into facilitating external conditions when the MT shows high levels of performance. Moreover, the existence of other, up until now unidentified, third variables that influence or moderate MT effectiveness cannot be ruled out (e.g. like time pressure). Rather, it can be expected. As stated previously, as this a single-standing cross-sectional design with no comparable studies, causality cannot be drawn (Niedhammer & Chea, 2003). To address this, future studies should include longitudinal data (Niedhammer & Chea, 2003).

**Cultural validity.** Participating teams are primarily from Norway and Denmark, and cross-cultural research should be included to investigate if the relationship and task-oriented factors are not a culturally dependent phenomena.

## 14.3 Future Studies

There are few studies attempting to create a complete model of what determines MT effectiveness, and this study is an attempt to contribute to the understanding of this field. With



limitations in mind, future research is needed to find support or expand upon the knowledge gained from the present study.

Firstly, in order to evaluate the validity of the component structure and to reduce the chance of common method bias (Podsakoff et al., 2003), more empirical studies on MT effectiveness are necessary. Repeated studies with “*effect*” where respondents are only able to answer on either predictor or criterion dimensions, and respond at different time points, should be performed. This could possibly shed light on whether common method bias that may be influencing the unusually strong relationships between the factors.

Further, comparisons of studies regarding the factor structure of MT effectiveness based on a different instrument than “*effect*” would provide much-needed further insight into this area of research. Assessing the dimensionality of e.g. TDS (Wageman et al., 2005) could possibly provide support, or antagonizing results, which would shed light on the results from the present study.

Another issue to be addressed is the examination of the previously unobserved unidimensional outcome and external conditions component. It would be interesting to see if this dimensionality appears in other studies. If not, the instrument used in this study should be investigated further. If unidimensionality appears yet again, this would also be an interesting trail to follow, especially the theoretical reasoning behind it.

## 14.4 Conclusions

The purpose of this study was to examine empirically the properties of the MT effectiveness instrument “*effect*”, before investigating what and how many components it measured, and lastly to investigate the relationship between these.

According to the findings in this study, this paper suggests that MT effectiveness can also be understood by a four component model. This model, consisting of three predictor and one outcome component, explains 84% of the variance in MT effectiveness outcome.

This is just a start. Much remains to fully understand or accept aspects of this model. Still, this study provides novel findings and further understanding to the processes that are important in MT effectiveness.

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# Appendix

## Appendix 1. Description of the dimensions measured by “effect”

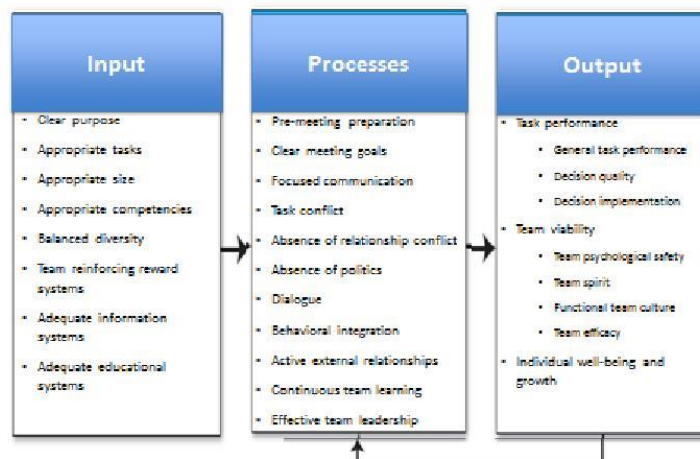
1

### *effect* – an inventory for measuring management team effectiveness

Henning Bang & Thomas Nettet Midelfart, July 2015

The web-based questionnaire *effect* measures 27 factors essential for becoming an effective management team. These factors are further described in two books written in Norwegian (Bang & Midelfart, 2012) and Danish (Bang, Midelfart, Molly-Søholm & Elmholdt, 2015) and in one article (Bang & Midelfart, 2015). The factors are identified through a comprehensive review of international research on management teams and other types of decision making teams, published since 1970 (Bang, 2010), together with the authors’ own research on hundreds of Norwegian management teams (Bang, 2008; Bang, Fuglesang, Ovesen, & Eilertsen, 2010; Bang & Midelfart, 2010; Bang & Øverland, 2009). The 27 factors are divided into three categories:

- A. Basic conditions for team effectiveness (input factors).** This category consists of eight factors describing the basic conditions for effectiveness in management teams.
- B. Processes influencing team effectiveness (process factors).** This category consists of eleven factors describing processes (both work and interpersonal processes) that are important for effectiveness in management teams.
- C. Results achieved by the management team (output factors).** This category consists of eight factors describing the quality of the results achieved by the management team. The results are divided into three main dimensions: Task performance, Team viability, and Individual well-being and growth (Hackman, 2002).



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## BASIC CONDITIONS FOR EFFECTIVENESS IN MANAGEMENT TEAMS

The *basic conditions* for effectiveness in management teams are defined as relatively stable characteristics inside the management team, or in the context surrounding the management team, that influence the quality of team performance – either directly, or indirectly through their influence on the processes of the management team. These basic conditions form the foundation for effective teamwork. Eight conditions have proven to be particularly important:

**I. CLEAR PURPOSE** – *the members of the management team have a clear and common understanding of why the management team exists, what difference it is meant to make for the organization, and what results it is responsible for achieving.*

**A clear purpose** means team members have a common understanding of the management team's role in the organization, what added value the management team is expected to create for the organization, and what the most important tasks are for the management team. It is about defining the mission or mandate of the team. A clear purpose gives unambiguous guidelines for what tasks and issues that should – and should not – be addressed by the team.

**II. APPROPRIATE TASKS** – *the team works with important tasks that are clearly related to the purpose of the management team.*

**Appropriate tasks** are consequential tasks which need the attention of the whole management team, and which could not be better handled elsewhere in the organization. Appropriate tasks include a proper balance of administrative, operative, and strategic issues, and of information, discussion, and decision making.

**III. APPROPRIATE SIZE** – *the size of the management team is optimal for the team purpose and tasks the team is expected to handle.*

**Appropriate size** means the management team is neither too big nor too small, but properly dimensioned for its purpose and tasks. A management team which is too big will struggle to function as a cohesive team, the percentage of team members who actively participates in the discussion will be low, and the risk of misunderstanding increases. On the other hand, if the management team is too small, fewer perspectives will be represented in discussions, and the possibility of creating broad ownership of decisions decreases.

**IV. APPROPRIATE COMPETENCIES** – *members of the management team have the necessary professional, intellectual and interpersonal skills to achieve high quality results together, and become a well-functioning management team.*

**Appropriate competencies** imply that the management team possesses the necessary knowledge, skills and abilities to become well-functioning and effective. It refers to whether the functional roles necessary for effective performance are represented in the management team, and whether each individual team member is competent to contribute optimally to

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effective team functioning. Competencies involve professional/job specific skills, general cognitive/intellectual skills, interpersonal/social skills, and personality.

**V. BALANCED DIVERSITY** – *individual team members are diverse enough to supplement and stimulate each other, and similar enough to understand and interact well with one another.*

**Balanced diversity** means that the team members' knowledge, abilities, skills, personalities, values, and attitudes strike a balance between being too similar and too different. The management team has a good mix of personalities, and team members stimulate and elicit the best from each other. If differences between team members are too large, this can become disturbing and lead to misunderstanding and relationship conflict. If differences are too small, the management team risks becoming a victim of group think, and possibly experiencing a lack of breadth and comprehensiveness when members discuss complex topics.

**VI. TEAM REINFORCING REWARD SYSTEMS** – *the organization has reward systems that reinforce high quality performance and cross-functional collaboration in the management team.*

**Team reinforcing reward systems** imply that the organization has incentive systems that stimulate the management team to perform well. It refers to whether individual members are recognized and rewarded for the results the team collectively achieves, whether any negative consequences are imposed when members limit their concern to their own unit's interests, and whether there are incentives for collaboration between members of the management team.

**VII. ADEQUATE INFORMATION SYSTEMS** – *the management team has access to information needed to perform its tasks effectively.*

**Adequate information systems** imply that the organization provides the management team with relevant high quality information in order to execute its mission effectively.

**VIII. ADEQUATE EDUCATIONAL SYSTEMS** – *the team members can easily access and receive the training, education, and development necessary to function effectively.*

**Adequate educational systems** imply that the organization systematically develops its leaders and management teams, and provides easy access to the training and education needed to function as an effective management team.

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## PROCESSES INFLUENCING EFFECTIVENESS IN MANAGEMENT TEAMS

*Processes* refer to what happens inside individuals and between team members when they perform team tasks, and between the management team and its external environment. Processes include both *task related processes* (how the members work together on team tasks) and *interpersonal processes* (what happens on the psychological level between team members when they work together). We identified ten processes which are particularly important for effectiveness in management teams:

***IX. PRE-MEETING PREPARATION*** – *members are sufficiently prepared for management team meetings, and relevant documents for the meetings are of high quality.*

**Adequate pre-meeting preparation** implies that agenda and meeting documents are of high quality and made available in sufficient time to prepare for management team meetings, core issues of the different agenda items are highlighted, and team members are sufficiently prepared for team meetings.

***X. CLEAR MEETING GOALS*** – *it is made clear why an issue is brought up in the management team meeting, and team members understand what the management team is expected to achieve during the discussion of the topic.*

**Clear meeting goals** imply that agenda issues are presented in a way that highlights what the team members are expected to deliver in the meeting, what they are invited to focus on in the subsequent discussion, and why the issue is brought up in the management team meeting. The presenter's introduction of an agenda item states whether it is an information issue, an issue for discussion, or a decision issue.

***XI. FOCUSED COMMUNICATION*** – *team members stay on topic and deliver according to the goal when discussing issues in management team meetings.*

**Focused communication** implies that team members stick to the goal presented for each agenda item and focus on the essential issue during discussion in meetings. Long-windedness and digressions are avoided, and discussions are well summarized and concluded.

***XII. TASK CONFLICT*** – *the team members openly expose disagreements about the content of the task being performed, including differences in viewpoints, ideas, and opinions.*

**Task conflict** implies that task oriented disagreements are exposed, that team members challenge each other's ideas and views, and that they engage in a healthy exchange of opinions.

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**XIII. ABSENCE OF RELATIONSHIP CONFLICT** – *there are no interpersonal incompatibilities in the management team, including tension, animosity, and annoyance between two or more team members.*

**Absence of relationship conflict** implies that team members generally work well together, and there is no friction, negative tension, or personal conflict in the management team.

**XIV. ABSENCE OF POLITICS** – *none of the team members use covert action to enhance their power to influence decisions and processes in the management team.*

**Absence of politics** means that the management team is not characterized by power struggles or hidden agendas. Matters which should be addressed in the management team meeting are not decided outside the meeting, team members do not deliberately withhold important information, and there are no counter-productive alliances or coalitions between team members.

**XV. DIALOGUE** – *communication between members of the management team is characterized by an open and respectful exchange of ideas, curiosity and willingness to explore various viewpoints, and attempts to build upon each other's ideas.*

**Dialogue** implies that team members freely express their views and opinions without belittling other individuals. They listen carefully and explore other views and ideas, and attempt to understand each other's perspectives during discussion. They try to build upon each other's ideas to help the discussion move forward. The manner of team discussion demonstrates members truly believe they can learn from each other.

**XVI. BEHAVIORAL INTEGRATION** – *management team members engage in mutual and collective interaction, and exhibit a high degree of teamness in their way of working together.*

Behavioral integration implies that the management team actually works as a unit. The members share information and resources, and work collaboratively on projects and tasks. They have a clear understanding of the issues and needs of fellow team members and feel mutually responsible for decisions made in the management team.

**XVI. ACTIVE EXTERNAL RELATIONSHIPS** – *the management team establishes and maintains constructive and productive relationships with relevant stakeholders, both inside and outside the organization.*

**Active external relationships** imply that the management team has good relations with relevant stakeholders, both in and outside the organization, and focuses sufficiently on external matters and important external events. The management team coordinates its work with other units in the organization when necessary, and team members keep the organization informed about management team decisions.

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**XVII. CONTINUOUS TEAM LEARNING** – *the management team regularly monitors its own successes and failures, corrects mistakes, and capitalizes on effective achievement.*

**Continuous team learning** means team members regularly discuss and evaluate the quality of team performance and methods of working, and make alterations accordingly to become more effective. It implies that the management team is capable of learning from its failures and successes.

**XVIII. EFFECTIVE TEAM LEADERSHIP** – *the leader of the management team does whatever necessary to enhance team performance.*

**Effective team leadership** implies that the management team leader ensures that all functions critical to both task accomplishment and team maintenance are adequately taken care of. In other words, the leader makes certain that the management team has the basic conditions and processes in place to perform effectively. An effective team leader helps to facilitate team interaction, creates a safe team climate, and manages team meetings constructively.

## RESULTS ACHIEVED BY THE MANAGEMENT TEAM

Management teams create results according to three dimensions:

- a) *Task performance* – the extent to which the quality of the management team’s performance meets or exceeds the demands and requirements of the team’s stakeholders.
- b) *Team viability* – the extent to which team members increase their ability to work together interdependently in the future.
- c) *Individual well-being and growth* – the extent to which the management team contributes positively to the motivation, well-being, learning, and growth of individual team members.

### A. TASK PERFORMANCE

**XIX. GENERAL TASK PERFORMANCE** – *the task performance of the management team contributes positively to the organization’s value creation process.*

**High quality general task performance** implies that the management team is successful in its efforts, that it achieves results which represent added value to the organization, and team members are given useful input when they raise issues in management team meetings.

**XX. DECISION QUALITY** – *the management team makes decisions beneficial to the organization.*

**High decision quality** implies that the vast majority of decisions made by the management team turn out to be best for the organization, and that those affected by the decisions are generally satisfied.

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**XXI. DECISION IMPLEMENTATION** – *the management team ensures that the decisions it makes are properly implemented.*

**Decision implementation** implies that the management team monitors and ensures that its decisions are being implemented. Team members have a common understanding of, and feel deeply committed to the decisions. It is uncommon for someone in the management team to re-argue decisions made by the team.

## B. TEAM VIABILITY

**XXII. TEAM PSYCHOLOGICAL SAFETY** – *team members feel that the team is safe for interpersonal risk taking.*

**Team psychological safety** implies that relationships between team members are experienced as robust enough for the members to say honestly and directly what they mean, disagree with one another, be vulnerable and ask for help when necessary - all without fear of negative reactions from other team members.

**XXIII. TEAM SPIRIT** – *team members stick together and remain united in the pursuit of management team goals.*

**Team spirit**, also called team cohesion or cohesiveness, is often broadly described as the total set of forces keeping team members together. It implies team members really seem to like one another, are proud to belong to the management team, and see themselves as a tightly knit group of people. They easily take an overall perspective on the matters they discuss, and are willing to exert themselves for the success of the management team.

**XXIV. FUNCTIONAL TEAM CULTURE** – *the management team has a team culture reinforcing effective team performance.*

**Functional team culture** implies the team is characterized by a set of shared values, norms and beliefs that support team effectiveness, both in the management team in general and in team meetings. Team members are clearly expected to cooperate and help one another. They agree on how to manage mobile phones, laptops and tablets during meetings, and members who violate team norms are sanctioned.

**XXV. TEAM EFFICACY** – *team members believe in the management team and its capacity to create high-quality results.*

**Team efficacy** implies the team has confidence in itself, and members believe the team has the potential to be very productive and create high-quality work. They expect the management team to have a lot of influence in the organization, and that they will achieve the objectives they set.

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## C. INDIVIDUAL WELL-BEING AND GROWTH

**XXVI. INDIVIDUAL WELL-BEING AND GROWTH** – *the team experience contributes positively to the learning and well-being of individual team members.*

**Individual well-being and growth** means that members experience the team as an important source of well-being, motivation and learning, and that they feel energized by team meetings. They enjoy working together with their management team colleagues, and feel they develop their professional competencies by participating in the management team.

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## Appendix 2. 118 items underlying the dimensions in “effect”

### BASIC CONDITIONS FOR EFFECTIVENESS IN MANAGEMENT TEAMS

#### I. CLEAR PURPOSE

1. All team members know what the most important tasks are for this management team.
2. The team members don't have a common understanding of the management team's role in the organization (-).
3. All team members know which topics and issues should be addressed by the management team and those that should not.
4. The management team has a purpose with clear guidelines to focus the team.

#### II. APPROPRIATE TASKS

5. We frequently address matters that concern only a few team members in our management team meetings (-).
6. The management team often works on tasks which could be better handled by others (-).
7. The management team spends too little time on the really important matters (-).
8. We bring up important matters in the management team meetings early enough to contribute to the further process.
9. We have an appropriate balance of administrative, operative, and strategic issues in our management team meetings.
10. We have an appropriate balance of information, discussion and decision making in our management team meetings.
11. The matters addressed by the management team are strategically important for the organization.
12. There is no obvious relationship between the purpose of the management team and the topics we bring up in team meetings (-).

#### III. APPROPRIATE SIZE

13. Considering the purpose of our management team and the tasks we are expected to handle, our management team is:
  - 1: far too small
  - 4: just the right size

7: far too large

#### IV. APPROPRIATE COMPETENCIES

14. We possess the necessary professional competencies to achieve high quality results.
15. There are certain team members who need to develop their interpersonal skills for us to become a well-functioning management team (-).
16. Certain team members have a manner that prevents the management team from functioning well (-).
17. Our management team is composed of people with the necessary knowledge, skills and abilities.

#### V. BALANCED DIVERSITY

18. The members of our management team are so different from each other that the performance of the team suffers (-).
19. The members of the management team strike a balance between being too similar to one another on the one hand and too different on the other.
20. Our management team consists of an unfortunate mix of personality types (-).
21. Our management team is composed of people who elicit the best from each other.

#### VI. TEAM REINFORCING REWARD SYSTEMS

22. Our organization recognizes and rewards management teams that perform well.
23. In this organization you are rewarded only for the results you achieve in your own unit/department (-).
24. We have reward systems stimulating cross-functional collaboration in the management team.
25. There are no negative consequences even if I am only concerned with my own unit/department in this management team (-).

#### VII. ADEQUATE INFORMATION SYSTEMS

26. We have easy access to the information we need in our management team.
27. The information we use in our management team is generally of high quality.

## VIII. ADEQUATE EDUCATIONAL SYSTEMS

- 28. Our organization is systematically developing the management teams.
- 29. It is easy to get the training and education you need in our organization.
- 30. Management development is a low priority in our organization (-).

## PROCESSES INFLUENCING EFFECTIVENESS IN MANAGEMENT TEAMS

### IX. PRE-MEETING PREPARATION

- 31. Certain team members are not sufficiently prepared for management team meetings (-)
- 32. The relevant documents for the management team meetings are generally of high quality.
- 33. Agendas and documents are made available in sufficient time to prepare for the management team meetings.
- 34. We receive just the right amount of relevant documentation prior to our management team meetings.
- 35. The meeting documents highlight the core issues of the different topics on the agenda.

### X. CLEAR MEETING GOALS

- 36. It is often unclear why an issue is brought up in the management team meeting (-).
- 37. Topics brought up in the management team meetings are clearly presented as either issues for information, discussion or decision.
- 38. The presenter's introduction of an agenda topic in the management team meeting is clear and precise, which helps us to understand what to focus on in the subsequent discussion.
- 39. Often it is necessary to ask for a more precise explanation of what we are actually meant to discuss in our management team meetings (-).

### XI. FOCUSED COMMUNICATION

- 40. We have a tendency to digress from the important issues during discussions in the management team (-).
- 41. Team members keep the focus on the essential questions when discussing topics in the management team meeting.
- 42. During management team meetings, members too often talk about matters irrelevant to the topic under discussion (-).
- 43. Some team members are too long-winded during management team meetings (-).
- 44. Discussions in the management team meetings are well summarized and concluded.



## XII. TASK CONFLICT

- 45. There are rarely explicit conflicting opinions during management team discussions (-).
- 46. We often have different views and ideas on the topics we discuss in the management team.
- 47. Management team meetings frequently include a healthy exchange of opinions.
- 48. In our management team we often challenge each other's opinions.

## XIII. ABSENCE OF RELATIONSHIP CONFLICT

- 49. There is not much friction among members of the management team.
- 50. There are members of the management team who do not work well together (-).
- 51. There are personal conflicts between some members of the management team (-).
- 52. There are some negative tensions among members of the management team (-).

## XIV. ABSENCE OF POLITICS

- 53. Often matters which should have been addressed in the management team meeting are decided outside the meeting (-).
- 54. Some members of the management team have hidden agendas (-).
- 55. There are coalitions or alliances between some of the management team members (-).
- 56. Certain team members deliberately withhold information that may be important for the management team (-).
- 57. There are few power struggles between the members of our management team.

## XV. DIALOGUE

- 58. Members of the management team freely express their views and opinions to each other.
- 59. We listen carefully to each other's views and opinions in our management team.
- 60. We frequently explore each other's ideas and views.
- 61. The way we discuss matters in the management team shows that we truly believe that we can learn from each other.
- 62. We rarely try to build upon each other's ideas in the management team (-).
- 63. Sometimes during discussions I feel belittled by certain members of the management team (-).

64. We easily understand each other's perspectives during discussion in the management team.

#### XVI. BEHAVIORAL INTEGRATION

65. Team members feel mutually responsible for decisions made in the management team.

66. Team members have a clear understanding of the issues and needs of each member of the management team.

67. Management team members help each other solve problems.

68. Management team members share relevant information with each other.

69. Management team members share resources with each other.

#### XVII. ACTIVE EXTERNAL RELATIONSHIPS

70. The management team focuses sufficiently on external matters and important events outside the organization.

71. The management team has too little contact with the rest of the organization (-).

72. When required, we coordinate our work with other units in the organization.

73. When dealing with matters that affect other units in the organization, we ensure that they are involved in the work.

74. Our management team is not very good at keeping others in the organization informed about our decisions (-).

#### XVIII. CONTINUOUS TEAM LEARNING

75. We rarely discuss how we function as a management team (-).

76. We evaluate how satisfied we are with the results we achieve in the management team.

77. We discuss whether we are addressing the appropriate matters in the management team.

78. We alter the way in which we work if we learn more effective ways the management team can function.

#### XIX. EFFECTIVE TEAM LEADERSHIP

79. Our management team has good leadership.

80. The leader of my management team helps to facilitate the team's interactions.

81. Our leader helps to create a safe climate in the management team where we can openly discuss what we see as important.

- 82. Our leader does what it takes to ensure effective functioning of the management team.
- 83. The leader of the management team ends and concludes discussions constructively.

## RESULTS ACHIEVED BY THE MANAGEMENT TEAM

### XX. GENERAL TASK PERFORMANCE

- 84. Our management team is very successful in its efforts.
- 85. Our management team does not perform well as a team (-).
- 86. You are given useful input when you bring up an issue in the management team.
- 87. We receive positive feedback on our performance as a management team.
- 88. It is difficult to see what added value the management team contributes to our organization (-).

### XXI. DECISION QUALITY

- 89. We consistently make high quality decisions in our management team.
- 90. The vast majority of decisions made by the management team turn out to be beneficial for the organization.
- 91. Those affected by the decisions of the management team are generally very satisfied with the decisions we make.

### XXII. DECISION IMPLEMENTATION

- 92. We implement the decisions made by the management team.
- 93. We monitor whether decisions made by the management team are implemented.
- 94. There are management team members who are not entirely committed to the decisions we have made (-).
- 95. Members of the management team frequently have a different understanding of the decisions we have made (-).
- 96. Too often someone in the management team re-argues the decisions we have made (-).

### XXIII. TEAM PSYCHOLOGICAL SAFETY

- 97. If you make a mistake in this management team, it is often held against you (-).
- 98. It is easy to bring up problems and controversial issues in this management team.
- 99. It is safe to take a risk in this management team.
- 100. It is difficult to ask other management team members for help (-).

101. It can easily go against you if you openly express your opinions in the management team (-).

102. It is easy to query any issues in the management team.

103. There is little room for expressing your uncertainty in the management team (-).

#### XXIV. TEAM SPIRIT

104. Our management team is not particularly cohesive (-).

105. I feel proud to belong to this management team.

106. There are not many team members who would be willing to exert themselves for the success of this management team (-).

107. The management team members seem to really like one another.

108. The management team members rarely take an overall perspective on the matters we discuss (-).

109. The management team is a tightly knit group of people.

#### XXV. FUNCTIONAL TEAM CULTURE

110. We have developed a team culture that helps us perform as an effective management team.

111. The management team members do not seem to agree on how we should function together as a management team (-).

112. It is clearly expected that we cooperate and help one another in our management team.

113. If anyone turns up unprepared for the management team meeting, no remarks are made (-).

114. We agree on how to manage mobile phones, laptops and tablets during our management team meetings.

#### XXVI. TEAM EFFICACY

115. This management team has little confidence in itself (-).

116. This management team believes it has the potential to produce high-quality work.

117. This management team expects to have a lot of influence in our organization.

118. This management team believes it can be very productive.

119. We achieve the goals we set in our management team.

## XXVII. INDIVIDUAL WELL-BEING AND GROWTH

120. I develop my professional competencies by participating in this management team.

121. Working in this management team contributes to my learning.

122. I really enjoy working together with my management team colleagues.

123. Being part of this management team has had little impact on my development as a leader (-).

124. I get a lot of energy from our management team meetings.

## Appendix 3. Component loadings from target rotation of 95 items into 20 dimensions (predictors).

[ 1]	0.660	0.244	0.063	0.099	0.094	0.047	0.080	0.107	0.093	0.060	0.018	0.059	0.157	0.106	0.046	0.156	0.129	0.174	0.162	0.206
[ 2]	0.617	0.252	0.083	0.112	0.092	0.033	0.060	0.020	0.092	0.100	0.022	0.044	0.133	0.064	0.076	0.081	0.084	0.158	0.143	0.162
[ 3]	0.638	0.299	0.057	0.087	0.020	0.076	0.030	0.103	0.128	0.131	0.028	0.022	0.152	0.091	0.052	0.130	0.128	0.128	0.118	0.149
[ 4]	0.645	0.275	0.042	0.071	0.065	0.068	0.064	0.124	0.113	0.111	0.040	0.020	0.163	0.098	0.130	0.166	0.097	0.101	0.138	0.167
[ 5]	0.072	0.570	0.060	0.069	0.028	-0.038	0.054	0.040	0.137	0.174	-0.033	-0.015	0.040	0.015	0.040	0.021	0.101	0.069	0.032	0.037
[ 6]	0.055	0.621	0.060	0.041	0.029	-0.034	0.021	0.073	0.185	0.190	-0.039	0.067	0.085	0.060	0.051	0.094	0.107	0.124	0.068	0.041
[ 7]	0.116	0.607	0.049	0.042	0.104	0.037	0.053	0.132	0.118	0.116	0.041	0.075	0.133	0.105	0.068	0.142	0.037	0.097	0.159	0.068
[ 8]	0.109	0.504	0.032	0.058	0.118	0.122	0.061	0.172	0.062	0.070	-0.008	0.031	0.177	0.142	0.094	0.129	0.096	0.086	0.117	0.095
[ 9]	0.125	0.682	0.014	0.038	0.082	0.074	0.069	0.115	0.098	0.113	0.032	0.032	0.140	0.135	0.089	0.163	0.152	0.107	0.104	0.149
[10]	0.146	0.567	0.037	0.077	0.075	0.081	0.037	0.151	0.137	0.074	0.074	0.048	0.118	0.113	0.094	0.199	0.130	0.087	0.116	0.151
[11]	0.183	0.534	0.069	0.100	0.094	0.074	0.065	0.131	0.071	0.064	0.092	0.007	0.153	0.112	0.090	0.130	0.080	0.142	0.068	0.239
[12]	0.263	0.620	0.041	0.115	0.100	0.058	0.098	0.142	0.157	0.123	0.017	0.041	0.148	0.123	0.002	0.125	0.112	0.106	0.120	0.156
[13]	0.104	0.088	0.600	0.117	0.026	0.133	0.067	0.084	0.064	0.039	0.031	-0.028	0.073	0.094	0.014	0.073	0.084	0.144	0.019	0.150
[14]	-0.015	0.052	0.651	0.218	0.032	-0.021	0.018	0.013	0.015	0.109	-0.046	0.303	0.165	0.064	0.034	0.129	0.193	0.158	0.055	-0.006
[15]	0.043	0.112	0.594	0.284	0.062	0.024	0.026	0.013	0.011	0.165	-0.023	0.330	0.233	0.060	0.015	0.158	0.180	0.193	0.116	0.022
[16]	0.112	0.110	0.714	0.228	0.058	0.050	0.039	0.035	0.032	0.108	-0.010	0.124	0.188	0.073	-0.004	0.101	0.141	0.173	0.086	0.144
[17]	0.089	0.170	0.251	0.646	0.056	0.034	0.037	0.035	0.059	0.140	-0.049	0.188	0.185	0.083	0.020	0.117	0.215	0.195	0.084	0.123
[18]	0.097	0.120	0.191	0.675	0.028	0.059	0.033	0.072	0.024	0.152	0.035	0.098	0.167	0.081	0.044	0.058	0.140	0.171	0.101	0.086
[19]	0.068	0.089	0.229	0.638	0.033	0.010	0.042	0.021	0.059	0.094	-0.016	0.254	0.169	0.069	0.005	0.117	0.231	0.204	0.034	0.118
[20]	0.115	0.161	0.177	0.514	0.088	0.026	0.073	0.066	0.053	0.092	0.009	0.186	0.350	0.081	0.067	0.201	0.185	0.274	0.171	0.127
[21]	0.078	0.144	0.035	0.023	0.675	0.094	0.128	0.086	0.055	0.047	0.057	0.026	0.125	0.115	0.084	0.121	0.035	0.088	0.079	0.143
[22]	0.038	0.135	0.030	0.035	0.639	-0.013	0.017	0.038	0.065	0.027	0.030	0.017	0.092	0.065	0.011	0.015	0.130	0.034	0.076	0.016
[23]	0.074	0.120	0.013	0.030	0.720	0.071	0.065	0.091	0.037	0.051	0.004	0.008	0.142	0.083	0.124	0.091	0.075	0.108	0.109	0.120
[24]	0.080	0.231	0.101	0.118	0.609	0.010	0.068	0.049	0.037	0.116	0.045	0.041	0.120	0.109	0.108	0.082	0.096	0.135	0.136	0.109
[25]	0.110	0.193	0.086	0.040	0.085	0.816	0.066	0.099	0.094	0.064	0.057	0.056	0.110	0.124	0.033	0.125	0.147	0.056	0.069	0.119
[26]	0.114	0.181	0.101	0.090	0.077	0.756	0.073	0.229	0.101	0.141	0.025	0.026	0.124	0.127	0.025	0.178	0.088	0.135	0.061	0.168
[27]	0.103	0.151	0.030	0.051	0.104	0.029	0.740	0.062	0.067	0.062	0.006	0.012	0.103	0.058	0.209	0.152	0.095	0.122	0.099	0.075
[28]	0.086	0.159	0.001	0.065	0.092	0.099	0.721	0.080	0.049	0.083	0.001	0.067	0.141	0.120	0.069	0.137	0.142	0.100	0.080	0.138
[29]	0.045	0.149	0.119	0.068	0.082	0.011	0.761	0.029	0.088	0.026	-0.016	0.020	0.111	0.078	0.085	0.086	0.117	0.056	0.096	0.082
[30]	0.046	0.147	0.140	0.087	0.088	0.020	0.006	0.493	0.113	0.200	0.004	0.104	0.131	0.124	0.008	0.055	0.034	0.091	0.146	0.029
[31]	0.089	0.203	0.021	0.063	0.065	0.129	0.016	0.699	0.181	0.095	0.033	0.001	0.094	0.129	0.034	0.187	0.040	0.046	0.035	0.092
[32]	0.025	0.120	-0.004	-0.001	0.047	0.046	0.047	0.736	0.071	0.103	0.011	0.045	0.076	0.007	0.082	0.111	0.040	0.009	0.031	0.096
[33]	0.075	0.254	0.016	0.035	0.007	0.035	0.065	0.715	0.098	0.063	-0.002	0.041	0.073	0.060	0.108	0.115	0.045	0.077	0.102	0.075
[34]	0.119	0.233	-0.027	0.009	0.058	0.099	0.037	0.665	0.270	0.111	0.055	0.021	0.126	0.090	0.056	0.156	0.043	0.053	0.097	0.088
[35]	0.139	0.314	0.039	0.094	0.049	0.032	0.032	0.141	0.571	0.181	-0.008	0.051	0.154	0.093	0.080	0.104	0.131	0.112	0.098	0.112
[36]	0.068	0.168	0.001	-0.020	0.062	0.016	0.069	0.188	0.660	0.114	0.029	0.018	0.056	0.082	0.088	0.126	0.038	0.048	0.082	0.090
[37]	0.101	0.199	0.038	0.040	0.057	0.049	0.073	0.228	0.623	0.149	0.025	0.038	0.171	0.119	0.083	0.190	0.104	0.096	0.094	0.120
[38]	0.119	0.285	0.044	0.082	0.026	0.098	0.030	0.177	0.570	0.243	-0.040	0.075	0.143	0.092	0.036	0.139	0.114	0.125	0.074	0.034
[39]	0.075	0.199	0.024	0.067	0.021	0.042	0.061	0.121	0.132	0.691	-0.065	0.080	0.091	0.091	0.035	0.133	0.043	0.070	0.067	0.084
[40]	0.145	0.192	0.107	0.114	0.046	0.063	0.063	0.127	0.152	0.611	0.001	0.075	0.231	0.101	0.055	0.123	0.117	0.180	0.141	0.152
[41]	0.046	0.167	0.115	0.120	0.079	0.058	0.032	0.107	0.138	0.695	-0.068	0.164	0.129	0.047	0.057	0.040	0.151	0.102	0.094	0.054
[42]	0.034	0.144	0.134	0.113	0.022	-0.031	-0.004	0.018	0.078	0.595	-0.041	0.117	0.159	-0.009	0.030	0.009	0.144	0.091	0.108	0.028
[43]	0.103	0.222	0.041	0.065	0.074	0.073	0.018	0.198	0.186	0.441	0.093	0.055	0.122	0.136	0.090	0.301	0.048	0.064	0.083	0.096
[44]	-0.096	-0.034	-0.034	-0.042	0.022	-0.003	-0.039	-0.057	-0.037	-0.020	0.726	-0.110	-0.080	-0.021	0.024	-0.065	0.031	-0.003	-0.060	0.010
[45]	-0.050	-0.019	-0.039	-0.051	0.013	0.005	0.017	-0.013	-0.034	-0.041	0.768	-0.124	-0.076	-0.001	0.024	-0.037	-0.032	-0.034	-0.037	0.048
[46]	0.148	0.134	-0.009	0.041	0.012	0.031	0.015	0.094	0.031	-0.018	0.701	-0.061	0.200	0.082	0.054	0.070	0.079	0.070	0.092	0.033
[47]	0.106	0.092	0.034	0.033	0.090	0.048	-0.003	0.078	0.046	-0.002	0.709	-0.027	0.266	0.043	0.113	0.071	0.113	0.167	0.124	0.091

*Component loadings from target rotation of 95 items into 20 dimensions (continued).*

[48]	0.002	0.045	0.130	0.145	0.013	0.034	0.055	0.060	0.023	0.094	-0.170	0.670	0.167	0.060	-0.022	0.129	0.151	0.139	0.047	0.072
[49]	0.006	0.049	0.209	0.203	0.027	0.021	0.007	0.037	0.029	0.135	-0.063	0.744	0.198	0.031	0.040	0.106	0.190	0.200	0.064	0.080
[50]	0.054	0.083	0.173	0.178	0.010	0.017	0.022	0.064	0.077	0.121	-0.044	0.769	0.181	0.053	-0.014	0.104	0.198	0.195	0.104	0.084
[51]	0.083	0.108	0.218	0.200	0.040	0.010	0.016	0.052	0.052	0.141	-0.045	0.729	0.234	0.063	0.032	0.143	0.195	0.199	0.099	0.043
[52]	0.086	0.107	0.135	0.084	0.079	0.082	0.013	0.105	0.094	0.094	0.181	0.140	0.501	0.116	0.050	0.093	0.291	0.151	0.074	0.113
[53]	0.100	0.127	0.124	0.143	0.015	0.036	0.056	0.095	0.126	0.158	-0.025	0.150	0.594	0.120	0.064	0.155	0.249	0.225	0.069	0.122
[54]	0.123	0.147	0.049	0.120	0.055	0.034	0.077	0.083	0.062	0.077	0.115	0.053	0.678	0.111	0.120	0.104	0.163	0.190	0.151	0.124
[55]	0.113	0.167	0.094	0.140	0.069	0.029	0.076	0.081	0.053	0.099	0.062	0.112	0.679	0.096	0.117	0.145	0.210	0.230	0.162	0.131
[56]	0.077	0.188	0.071	0.133	0.110	0.000	0.049	0.050	0.096	0.106	0.053	0.037	0.604	0.135	0.113	0.133	0.168	0.199	0.143	0.104
[57]	-0.013	0.123	0.105	0.099	0.081	0.031	0.033	0.013	0.028	0.110	-0.043	0.152	0.475	0.037	0.059	0.129	0.321	0.114	0.080	0.059
[58]	0.119	0.136	0.080	0.154	0.069	0.020	0.051	0.074	0.065	0.089	-0.034	0.135	0.614	0.111	0.062	0.090	0.172	0.212	0.114	0.158
[59]	0.122	0.202	0.067	0.071	0.049	0.082	0.061	0.087	0.114	0.037	0.021	0.017	0.173	0.568	0.067	0.079	0.070	0.118	0.132	0.096
[60]	0.031	0.099	0.063	0.069	0.098	0.031	0.054	0.014	0.053	0.049	-0.003	0.047	0.096	0.610	0.044	0.137	0.094	0.153	0.092	0.120
[61]	0.088	0.175	0.082	0.055	0.062	0.044	0.068	0.067	0.060	0.090	0.018	0.036	0.152	0.665	0.055	0.127	0.164	0.140	0.109	0.214
[62]	0.061	0.153	0.054	0.045	0.031	0.074	0.050	0.086	0.099	0.088	0.037	0.049	0.155	0.669	0.050	0.142	0.211	0.098	0.097	0.156
[63]	0.057	0.176	0.024	0.074	0.133	0.021	0.023	0.157	0.059	0.102	0.030	0.057	0.150	0.556	0.078	0.069	0.082	0.090	0.069	0.081
[64]	-0.011	0.071	0.037	0.011	0.037	0.000	0.093	0.050	0.047	-0.019	0.073	0.015	0.106	0.043	0.765	0.092	0.102	0.118	0.109	0.028
[65]	0.147	0.171	-0.012	0.053	0.140	0.025	0.115	0.098	0.064	0.089	0.041	-0.002	0.169	0.073	0.653	0.155	0.028	0.124	0.157	0.108
[66]	0.077	0.090	0.025	0.005	0.048	0.048	0.070	0.098	0.096	0.059	0.089	-0.019	0.119	0.089	0.764	0.114	0.112	0.126	0.123	0.102
[67]	0.090	0.196	0.010	0.068	0.103	-0.015	0.086	0.043	0.081	0.137	0.012	0.042	0.191	0.090	0.577	0.182	0.154	0.202	0.177	0.190
[68]	0.141	0.222	0.076	0.106	0.058	0.059	0.098	0.134	0.137	0.126	-0.006	0.098	0.144	0.102	0.114	0.735	0.133	0.169	0.124	0.156
[69]	0.109	0.204	0.095	0.115	0.062	0.062	0.083	0.118	0.093	0.110	0.024	0.072	0.199	0.163	0.112	0.732	0.176	0.183	0.145	0.128
[70]	0.063	0.171	0.144	0.086	0.057	0.066	0.073	0.069	0.056	0.033	0.048	0.183	0.213	0.047	0.042	0.679	0.312	0.169	0.051	0.096
[71]	0.135	0.232	0.077	0.117	0.084	0.051	0.077	0.117	0.098	0.105	-0.018	0.084	0.157	0.112	0.167	0.700	0.152	0.186	0.147	0.131
[72]	0.085	0.174	0.069	0.068	0.048	0.065	0.045	0.186	0.175	0.233	-0.008	0.045	0.136	0.131	0.107	0.670	0.067	0.111	0.121	0.147
[73]	0.063	0.113	0.094	0.144	0.058	0.022	0.037	0.031	0.092	0.077	-0.049	0.160	0.215	0.104	0.013	0.118	0.647	0.147	0.055	0.105
[74]	0.096	0.102	0.098	0.107	0.022	0.044	0.057	0.033	0.065	0.075	0.096	0.132	0.284	0.070	0.072	0.156	0.618	0.230	0.094	0.089
[75]	0.102	0.118	0.092	0.110	0.053	0.010	0.067	0.066	0.041	0.065	0.041	0.094	0.273	0.085	0.088	0.126	0.657	0.214	0.118	0.157
[76]	0.047	0.122	0.114	0.060	0.049	0.003	0.076	0.027	0.043	0.094	0.039	0.077	0.190	0.099	0.020	0.048	0.584	0.170	0.137	0.139
[77]	0.037	0.132	0.102	0.171	0.072	0.057	0.034	0.031	0.062	0.066	0.029	0.156	0.200	0.085	0.040	0.139	0.662	0.196	0.060	0.093
[78]	0.051	0.082	0.059	0.081	0.009	0.048	0.018	-0.004	0.011	0.066	0.026	0.043	0.220	0.102	0.062	0.129	0.663	0.166	0.067	0.074
[79]	0.041	0.147	0.040	0.098	0.073	0.051	0.065	0.019	0.074	0.059	0.009	0.071	0.194	0.077	0.101	0.125	0.667	0.191	0.078	0.065
[80]	0.121	0.131	0.091	0.143	0.057	0.020	0.034	0.023	0.040	0.058	0.070	0.176	0.218	0.090	0.130	0.133	0.181	0.635	0.176	0.117
[81]	0.112	0.186	0.104	0.122	0.091	0.075	0.069	0.035	0.070	0.088	0.039	0.093	0.173	0.093	0.104	0.228	0.255	0.536	0.146	0.299
[82]	0.068	0.097	0.135	0.169	0.086	0.018	0.065	0.061	0.043	0.082	-0.013	0.045	0.134	0.093	0.066	0.106	0.208	0.572	0.134	0.184
[83]	0.079	0.101	0.124	0.182	0.012	0.023	0.051	0.056	0.055	0.100	0.020	0.196	0.262	0.069	0.076	0.158	0.252	0.593	0.139	0.175
[84]	0.068	0.178	0.125	0.086	0.094	0.032	0.016	0.057	0.122	0.103	0.032	0.091	0.294	0.157	0.105	0.082	0.186	0.526	0.132	0.164
[85]	0.114	0.124	0.089	0.141	0.026	0.023	0.043	0.044	0.051	0.076	0.052	0.132	0.241	0.097	0.088	0.112	0.232	0.641	0.170	0.131
[86]	0.209	0.186	0.083	0.147	0.058	0.048	0.063	0.071	0.074	0.107	0.069	0.116	0.265	0.119	0.151	0.175	0.178	0.348	0.454	0.239
[87]	0.162	0.139	0.085	0.128	0.073	0.063	0.039	0.037	0.072	0.097	0.000	0.137	0.208	0.103	0.123	0.119	0.106	0.241	0.533	0.150
[88]	0.125	0.193	0.065	0.107	0.071	0.018	0.111	0.060	0.060	0.060	0.027	0.058	0.209	0.150	0.079	0.149	0.243	0.233	0.454	0.229
[89]	0.018	0.163	0.040	0.008	0.117	0.022	0.017	0.101	0.079	0.124	0.042	0.013	0.069	0.026	0.114	0.067	0.011	0.053	0.584	0.058
[90]	0.046	0.102	0.002	0.000	0.080	-0.020	0.045	0.142	0.065	0.105	-0.020	-0.010	0.042	0.102	0.099	0.077	0.072	0.020	0.596	0.057
[91]	0.159	0.206	0.083	0.154	0.057	0.019	0.063	0.041	0.092	0.065	0.027	0.084	0.187	0.117	0.051	0.142	0.220	0.245	0.169	0.585
[92]	0.162	0.171	0.099	0.080	0.071	0.065	0.029	0.063	0.089	0.055	0.025	0.075	0.201	0.126	0.082	0.130	0.180	0.272	0.161	0.648
[93]	0.092	0.133	0.018	0.046	0.167	0.070	0.064	0.096	0.023	0.095	0.066	0.016	0.073	0.149	0.065	0.150	0.065	0.181	0.090	0.635
[94]	0.143	0.195	0.055	0.085	0.049	0.055	0.043	0.090	0.078	0.066	0.064	0.020	0.173	0.108	0.098	0.093	0.100	0.182	0.166	0.652
[95]	0.128	0.232	0.054	0.088	0.043	0.078	0.095	0.089	0.073	0.132	0.001	0.084	0.177	0.166	0.132	0.142	0.157	0.191	0.146	0.621

Appendix 4. Component loadings from target rotation of 18 items into 4 dimensions (outcomes).

[ 1]	<b>0.69</b>	0.30	0.25	0.30
[ 2]	<b>0.71</b>	0.14	0.27	0.33
[ 3]	<b>0.56</b>	0.23	0.29	0.38
[ 4]	<b>0.71</b>	0.14	0.14	0.20
[ 5]	<b>0.69</b>	0.17	0.20	0.24
[ 6]	0.36	<b>0.69</b>	0.30	0.29
[ 7]	0.35	<b>0.74</b>	0.26	0.26
[ 8]	0.28	<b>0.74</b>	0.28	0.18
[ 9]	0.23	0.25	<b>0.75</b>	0.16
[ 10]	0.23	0.24	<b>0.72</b>	0.14
[ 11]	0.27	0.12	<b>0.73</b>	0.17
[ 12]	0.24	0.11	<b>0.71</b>	0.19
[ 13]	0.18	0.12	<b>0.71</b>	0.13
[ 14]	0.28	0.16	0.16	<b>0.78</b>
[ 15]	0.27	0.17	0.16	<b>0.80</b>
[ 16]	0.35	0.19	0.22	<b>0.71</b>
[ 17]	0.21	0.07	0.11	<b>0.70</b>
[ 18]	0.35	0.15	0.13	<b>0.67</b>