

The development of a questionnaire on the subjective experience of teamwork, based on Salas, Sims and Burke's "the big five of teamwork" and Hackman's understanding of team effectiveness

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Abstract

The main aim of this thesis was to develop a questionnaire on the subjective experience of teamwork, based on Burke, Salas, and Sims (2005) model “the big five of teamwork”, and Hackman’s (1990) classification of team effectiveness. The model proposed by Salas et al. (2005) include eight teamwork process factors: mutual performance monitoring, backup behaviour, adaptability, team leadership, team orientation, shared mental models, mutual trust and closed loop communication. The three Hackman team effectiveness outcome factors are labelled team results, team survivability and individual satisfaction. This thesis set out to investigate the psychometric properties of our questionnaire, and whether the proposed eight teamwork factors by Salas et al. (2005), and the three team effectiveness factors by Hackman (1990) were found in our sample of 182 participants. And, additionally, whether any of the Salas factors has predictable value in relations to the Hackman factors. In conclusion, the results from our statistical analyses revealed a three-factor solution of team effectiveness, as proposed by Hackman (1990), and an eight-factor solution of the Salas factors, however, not exactly as proposed by Salas et al. (2005). Additionally, some of the teamwork process factors measured did predict the team effectiveness factors, in our sample. These findings can further clarify the teamwork and team effectiveness constructs, support the theories used, and to some extent validate the psychometric properties of our questionnaire.

Keywords: Teamwork, teams, team effectiveness, questionnaire construction, the big five of teamwork, Hackman’s understanding of team effectiveness.

Organizations are increasingly relying on team-based work structures to accomplish organizational goals, as teams have been argued to potentially overcome complex problems more effectively than individuals working alone (Anderson, Ones, Sinangil, & Viswesvaran, 2001; Bell & Kozlowski, 2002; Borman, Ilgen, & Klimoski, 2003; Buvik, 2006; Jex, 2008; Salas & Fiore, 2004; Salas, Rosen, Burke, Goodwin, & Fiore, 2006). However, not all teams are equally effective (Hackman, 1990; Hopkin, Garland, & Wise, 1999; Salas, Sims, & Burke, 2005), and despite profound research interest in teamwork, researchers continue to disagree on which components subsume the construct (Duel, 2010), and how it relates to team effectiveness.

A team is a complex, social and dynamic entity that consists of two or more individuals with specified roles (Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Rogelberg, 2007). In a team, members interact adaptively, interdependently and dynamically toward a common and valued goal, and typically have limited life-span membership (Arnold, Randall, & Patterson, 2010; Zaccaro, Rittman, & Marks, 2001). Furthermore, teams "...see themselves and are seen by others as an intact social entity embedded in one or more larger social systems ..." (Cohen & Bailey, 1997, p. 241). Hence, simply bringing a collection of individuals together does not make a team, and teamwork is more than an aggregate of multiple individual's behaviour (Mathieu & Rapp, 2009; Paris, Salas, & Cannon-Bowers, 2000). By nature, teamwork is complex and dynamic, and currently, no universally agreed-upon definition exists (Rousseau, Aubé, & Savoie, 2006). Moreover, components argued to subsume teamwork are being labelled differently and used inconsistently, making the construct difficult to measure, and empiric results challenging to compare (Devine, Clayton, Philips, Dunford, & Melner, 1999; Duel, 2010; Salas, Burke, & Cannon-Bowers, 2000; Salas, Cooke, & Rosen, 2008). Research from the past 20 years can, nevertheless, summarize that most scholars view teamwork as "a multidimensional construct that is characterized by a set

of flexible and adaptive behaviours, cognitions and attitudes that interact to achieve mutual goals and adaption to changing internal and external environments” (Duel, 2010, p. 23; Hoegl & Gemuenden, 2001; Kozlowski & Ilgen, 2006; Salas et al., 2000, p. 344). In other words, teamwork consists of knowledge, skills and attitudes (KSA’s) that are exhibited in order to support team members, and team goal accomplishments (Baker, Day, & Salas, 2006; Duel, 2010; Stevens & Campion, 1994).

Salas et al. (2005) argues that it is possible to concretize what is known about teamwork into five core components, which they label the “big five of teamwork”. These components include team leadership, team orientation, mutual performance monitoring, backup behaviour and adaptability (Salas et al., 2000). In addition, the authors posit that these components require the coordinating mechanisms of mutual trust, closed loop communication and shared mental models. The model differs from other classifications available; by offering a practical, yet inclusive taxonomy that is directly related to the teamwork process and team tasks, which they postulate, in turn, will promote team effectiveness. Salas et al. (2005) acknowledges that the importance, and the ability to engage in the “big five of teamwork” components and their coordinating mechanisms will vary as the team gains experience with working together, over the course of team tasks and development of the team process and dynamics (Salas et al., 2005). Furthermore, as there are several different types of teams, Salas et al. (2005) posit that some components will be more important in certain teams than in others. Implicitly the above implies that different types of teams may engage in teamwork differently, a notion that is supported by recent empirical findings that suggest that dissimilar teams do not manifest teamwork processes in the same way (Devine et al., 1999; Kozlowski & Bell, 2003; Salas et al., 2005). Because of these differences, it may be favourable to focus on the actual tasks that teams perform in order to understand the process that will lead to team effectiveness. The effectiveness of a team will be dependent on which task is being

accomplished, and what is effective in one situation may not be so in another (Devine et al., 1999). In sum, there is no one-size fits all-approach to teamwork (Paris et al., 2000; Salas et al., 2000; Sjøvold, 2006).

The coordinating mechanism of the big five of teamwork

According to Salas et al (2005) the coordinating mechanisms of the big five of teamwork are concerned with different aspects of coordination of a team, and are needed to meld together each of the big five of teamwork components.

Shared mental models. According to Salas et al. (2005) shared mental model refers to common or overlapping cognitive representations of the teams characteristics, purpose and goal's (Duel, 2010). This includes the various roles and responsibilities of team members, the behavioural patterns required of team members to accomplish team tasks, and how the team should coordinate in order to achieve it's goals (Cannon-Bowers, Salas, & Converse, 1993, p. 228; Cannon-Bowers, Salas, Volpe, & Tannenbaum, 1995; Hopkin et al., 1999; Klimoski & Mohammed, 1994; Kraiger & Wenzel, 1997; Lim & Klein, 2006; Mohammed, Ferzandi, & Hamilton, 2010; Mohammed, Klimoski, & Rentsch, 2000; Thompson, Levine, & Messick, 1999). Shared mental models are based on the mental model concept, and allows team members to describe, predict and explain behaviour, choose preferred response patterns and recognize and remember relationships between components (Bennett, Lance, & Woehr, 2006; Johnson-Laird, 1983; Mathieu, Goodwin, Heffner, Salas, & Cannon-Bowers, 2000, p. 274; Rouse, Cannon-Bowers, & Salas, 1992; Rouse & Morris, 1986; Veldhuyzen & Stassen, 1977; Zaccaro et al., 2001). Without well developed shared mental models team members could have dissimilar views on team goals and how to attain them, which, for instance, could lead to ineffective communication, backup or a lack of ability to anticipate other team members needs and actions (Salas et al., 2005). However, it is important to note that team members

should not have too similar mental models, as this to a full extent is unattainable and time consuming, and can hinder creative problem solving (Salas et al., 2005).

Closed loop communication. Communication is invaluable in teamwork, and is considered especially important in team situations with a high degree of complexity (Cannon-Bowers, Janis, & Salas, 1998; Duel, 2010; Salas et al., 2005). Under such circumstances, background noise, team members having their attention directed elsewhere (i.e. such as their individual tasks), or information in the environment surpassing individuals mental capacity, can hinder effective communication (Johnston & Briggs, 1968; Salas et al., 2005). Salas et al. (2005) proposed that closed-loop communication would be an effective way of meeting information exchange difficulties in teamwork. Closed-loop communication involves (a) the sender initiating a message, (b) the receiver receiving the message, interpreting it, and acknowledging its receipt, and (c) the sender following up to insure the intended message was received and understood as intended (Salas et al., 2005, p. 568). This type of communication is clear and concise, and has a built in check-mode to ensure that the message gets to the intended recipients(s) (Guzzo & Salas, 1995; Salas et al., 2000). The built in check-mode is especially valuable because different individuals frequently ascribe dissimilar semantic meanings to the same message, due to previous experience with the same types of situations, perceptual mechanisms, biases or personality (McShane & Von Glinow, 2010; Salas et al., 2000; Salas et al., 2005).

Mutual trust. Trust in team-settings can be defined as: “the shared perception ... that individual’s in the team will perform particular actions important to its members and... will recognize and protect the rights and interests of all the team members engaged in joint endeavour” (Salas et al., 2005, p. 568; Webber 2002, p. 569). Based on the above, one could argue that trust is inherently risky because team members have to be able to endure levels of uncertainty regarding other members perceived motives, prospective actions and intentions

(Jarvenpaa, Shaw, & Staples, 2004; Kramer, 1999; Lewis & Weigert, 1985; Martins, Gilson, & Maynard, 2004; McShane & Von Glinow, 2010). Without trust, team members will most likely spend time and energy to check and inspect if other members have done their work (if applicable) and overprotect their own work from other's judgements, instead of collaborating to accomplish the task at hand (Cooper, 1996; Rothmann & Cooper, 2008; Salas et al., 2005). Moreover, team members with low levels of trust, may not share information or communicate as openly as if they had high levels of trust in fear that they will not be taken seriously, which can damage further trust development and task completion (Salas et al., 2005). Lack of trust, may also cause team members to avoid the members that they do not trust, and thus, limit the teams effective functioning even further (Bos, Olson, Gergle, Olson, & Wright, 2002).

The big five of teamwork

According to Salas et al. (2005) the big five of teamwork are components that in a varying degree are required for effective team performance.

Team leadership. Leadership can be defined as a process of social interaction where leaders attempt to influence the behaviour and performance of their subordinates to reach organizational goals (Bass & Bass, 2008; Kerr, Garvin, Heaton, & Boyle, 2006; Yukl, 2006). According to Salas et al. (2005) a team leader can enable and facilitate team effectiveness through three overarching functions (Duel, 2010):

- 1) To maintain and create the teams shared mental models, which enables team members to know their roles, and how to coordinate team tasks to attain goals (Salas et al., 2000; Salas et al., 2005).
- 2) To supervise and monitor the internal and external environment of the team, and inspect that the team is progressing towards their established goal (Duel, 2010). This monitoring ensures that the team is able to adaptably accommodate for changes in the

environment when they occur (Salas et al., 2005).

- 3) To establish behavioural and performance expectations of team members that combine their skills optimally, and reinforce these when appropriate. This includes providing clear direction and establish norms for what team members are expected to do, and what acceptable team interaction is, and why this is important to the teams overall goal (Duel, 2010; Salas et al., 2000; Salas et al., 2005).

Team leadership can in turn encourage behaviours such as mutual performance monitoring, team orientation, backup behaviour and adaptability.

Mutual performance monitoring. Mutual performance monitoring can be defined as “the ability to keep track of fellow team members work while carrying out own work to ensure that everything is running as expected and to ensure that others are following procedures correctly” (Salas et al., 2005, p. 575). Team members engaging in mutual performance monitoring will be aware of how their team is functioning as a whole, and enable them to initiate backup behaviour if needed (Salas et al., 2005). Furthermore, team members need to be situational aware in order to know when to initiate backup behaviour (Salas et al., 2000). However, as people have a limited overview of their complex environment, situational awareness should preferably be shared amongst team members (Salas et al., 2000). Thus, a prerequisite for mutual performance monitoring is well developed shared mental models, so that team members have a common understanding of other team member tasks, and how the team should reach their goals. Mutual trust is a further prerequisite for effective mutual performance monitoring (Duel, 2010). Without mutual trust team members may consider mutual performance monitoring as spying, instead of indirectly aiding team effectiveness, by influencing backup behaviour in the team (Salas et al., 2000).

Backup behaviour. Backup behaviour can be defined as “the discretionary provision of resources and task related effort to another when there is recognition by potential backup

providers that there is workload distribution problem in their team (Salas et al., 2005, p. 579).

Marks, Mathiou and Zaccaro (2001) identified three means of providing backup behaviour:

1. To Provide constructive feedback and coaching to improve performance.
2. To provide assistance to team members in their performing tasks.
3. To complete a task for the team member when an overload is detected (Duel, 2010; Marks, Mathieu, & Zaccaro, 2001; Salas et al., 2005).

Thus, backup behaviour can be said to influence team effectiveness directly, because through efficient assistance the team members contribute to that the team as a whole becomes more adaptable, efficient and flexible. Though, prerequisites for backup behaviour is that team members actually have the knowledge and expertise to help (which can be challenging in interdisciplinary teams), have shared mental models (team members must understand where the effort should be put in at any given time to accomplish team tasks), adaptability and mutual performance monitoring (Salas et al., 2000).

Adaptability. The component adaptability can be defined as the ability “to recognize deviations from expected action and readjust actions accordingly” (Salas et al., 2005, p. 582). In order for teams to be adaptive members must constantly exchange information and resources, and simultaneously monitor their environment and team goal accomplishments, and in turn, adapt their behaviour if necessary (Duel, 2010; Zaccaro et al., 2001). Teams capable of flexible adaption when the degree of complexity in the environment changes, can be said to be more effective, thus adaptability is argued to influence team effectiveness directly (Duel, 2010). Prerequisites for adaptability are shared mental models, backup behaviour and mutual performance monitoring (Salas et al., 2005).

Team orientation. Team orientation can be defined as “a tendency to enhance individual performance through the coordination, evaluation, and utilization of task inputs from other members while performing group tasks (Salas et al., 2005, p. 584). Team

orientation is argued to facilitate effective team performance because it increases team member's task involvement, information sharing, and willingness to engage in mutual performance monitoring (Duel, 2010; Salas et al., 2005). Furthermore, team orientation facilitates the acceptance and giving of backup behaviour, resulting in increased cooperation with other team members (Driskell, Salas, & Johnston, 1999; Duel, 2010; Salas et al., 2005).

Team effectiveness

Early research on team effectiveness has frequently been conducted from an input-process-output framework (IPO) which focuses on how team inputs (i.e. task, individual, team and organizational characteristics) combined drive the team process towards team outputs (i.e. performance quality or quantity outcomes, speed, costumer satisfaction, commitment, task accomplishment) (Campion, Medsker, & Higgs, 1993; Goldstein, 1993; Guzzo & Dickson, 1996; Herre, 2010; Mathieu, Maynard, Rapp, & Gilson, 2008; Mathieu et al., 2000). Team effectiveness can be defined as an evaluation of outcomes of the team process relative to some set of criteria (Salas et al., 2008; Salas, Prince, & Brannick, 1997). Given the above, a team can be labelled as effective if it reaches it's set goal's in the established time-frame of the people evaluating their outcome (Egidius, 2005; Forsyth, 2010). However, if a team's effectiveness is evaluated merely in terms of produced outcomes, an untrue picture of their team functioning may appear. After all, factors leading to a teams outcome may be beyond the teams control, circumstantial or contain variance associated with factors other than teamwork (Brannick & Prince, 1997). A team may, for instance, have unresolved conflicts and low individual satisfaction, making them unwilling or unable to work together in the future, but still produce adequate results (Forsyth, 2010; Hackman, 1990; Kennedy, Loughry, Klammer, & Beyerlein, 2009; Sundstrom, De Meuse, & Futrell, 1990; Sundstrom, McIntyre, Halfhill, & Richards, 2000; Van Der Vegt, Emans, & Van De Vliert, 2000). By assessing the process as well as the team output, however, one is able to capture a more accurate overall

picture of effective team performance (Kendall & Salas, 2004; Smith-Jentsch, Johnston, & Payne, 1998). Accordingly, Hackman (1990) argued that a team is effective when it meets and maintains the following three criteria:

1. *The team results*, defined as the performance standard of the people who review the team's outcomes (for instance customer satisfaction, quality, speed or quantity).
2. *The teams (need for) survivability*: Defined as a team's willingness to work together in the future.
3. The team member's *individual satisfaction* defined as satisfaction of team member's personal needs (Bang, 2008; Baninajarian & Abdullah, 2009; Gladstein, 1984; Levine & Moreland; McGrath, 1964).

In sum, a team is considered effective when it benefit's its organization, its members, and its own survival (McShane & Von Glinow, 2010; Shea & Guzzo, 1987).

Aim of this study

To sufficiently evaluate the relationship between teamwork and team effectiveness, theoretically based and psychometrically sound measuring instruments are needed. This thesis sets out to respond to this need, and creates a questionnaire on the subjective experience of teamwork, based on Salas et al. (2005) "the big five of teamwork", and Hackman's (1990) classification of team effectiveness. In accordance with an IPO-paradigm, the eight Salas's factors are considered to be a measure of the teamwork *process*, whereas the three Hackman's team effectiveness factors are considered to be a measure of the teams' *output*. Input factors are not measured explicitly by our questionnaire due to our specific focus on process and outcome. Based on the above-mentioned theory, my problem formulations are as follows: Does the statistical analysis of our questionnaire reveal the eight-factor solution as proposed by Salas et al. (2005) and/or the three team effectiveness factors, as proposed by Hackman's

(1990)? And, furthermore, does the statistical analysis of our questionnaire reveal that the eight Salas teamwork process factors have a statistically significant predictable effect on the three Hackman's outcome variables on team effectiveness? In sum, the statistical analysis of our questionnaire might lend support to the theories used, reveal which components are incorporated in the teamwork construct, and further clarify teamwork's relationship with team effectiveness. Consequently, this questionnaire could aid research, teamwork, team training, business interventions used to increase team effectiveness, and map or chart the subjective experience of teamwork functioning in organizations.

Methods

Project background. This project came into existence when initial contact was established with Safetec Nordic AS via email in early spring, 2011. Hereafter, several face-to-face meetings occurred, and the premise for our collaboration was established. The given project consists of two parts; one part entails the development of a questionnaire on the subjective experience of team functioning, based on Salas, Sims and Burke's (2005) theory: "The big five of teamwork" and Hackman's (1990) theoretical classification of team effectiveness. Safetec Nordic AS is entitled to utilize this questionnaire in future. The other part of this project, involves the answering of an individually chosen problem formulation, related to the questionnaire. Questionnaire construction and data gathering was accomplished in collaboration with fellow master student Vegard Thorbjørnsen, whereas the actual statistical analysis, writing, and answering of problem formulation was done individually. Actual work on questionnaire construction started in August 2011, and the Norwegian social science data services (NSD) application was approved before the questionnaire was subjected to participants in November 2011.

Questionnaire construction and item generation. Initially, a comprehensive pool of items was derived on the basis of the above-mentioned definitions and conceptualizations of

the constructs that we wished to measure. Inspiration for items was also sought from published works, personal experience, and existing questionnaires on teamwork and team effectiveness. Originally, we had 150 self-constructed items, approximately equally divided between the constructs they were meant to measure. However, as we wished to reduce the number of items (due to time and item quality concerns), we chose to retain only the items hypothesized to be most relevant for the general population, and true to our working definitions of the constructs. In addition we tried to avoid unfamiliar, overly academic or ambiguous terms to increase comprehensibility. After deleting redundant items we settled on an 88-item final version of the questionnaire, 8 questions for each category we wished to measure (mutual performance monitoring, team orientation, team leadership, adaptability, mutual trust, backup behaviour, shared mental models, closed loop communication, team results, team survivability and individual satisfaction).

Questionnaire procedure and design. A Likert rating scale was employed, which meant that for each item respondents were asked to indicate the degree to which they felt the statement was true of their specific team experience, in accordance with five anchor points (1=“to a little degree” to 5=“to an extreme degree”) for each question. Participants were asked to keep one specific teamwork experience in mind when answering the entire questionnaire. In hindsight it would have been better to ask participants to keep their latest team experience in mind when answering the questionnaire, to avoid the possible prevalence of bias when participants choose which team to answer from.

Sample and procedure. The data used in this study was obtained solely from our questionnaire, which was distributed in the time period 23.11.2011 to 24.12.2011. The participants were self-recruited from different social media websites, such as google +, facebook, twitter and the internal intranet site at the Norwegian University of Science and Technology: Innsida. The sample consisted of 71 men and 109 women (N=182, two values

were missing). Age ranged from 18 to 50+, the 18-29-category being most represented (N=148), thereafter the 30-39-category (N=15), subsequently the 40-49-category (N=11) and lastly the 50+-category (N=8). Participants decided themselves which team experience they answered from, and assigned themselves to one of the following teams (N=173) Student teams (N=90), production teams (N=8), virtual teams (N=3), management teams (N=14), sales team (N=7), project teams (N=42), service teams (N=9). 9 participants chose the “Other”-option, and specified which team experience they would answer from, through there was no trend in which types of teams these chose to answer from. They were as diverse as: ambulance team, research team, health team, handball/sports team, military team, music team, school team, nursery school/ day care team. How long their teamwork lasted ranged from one week, (N=9), one month, (N=37), 6 months, (N=88), one year, (N=22), several years (N=25) (total 182). In order to participate in answering of the questionnaire participants had to have had a minimum of one team experience throughout his or her life. Though not explicitly asked for in our questionnaire, it reasonable to assume that participants were either Norwegian, or proficient enough with the language to understand written Norwegian, as this was the language of our questionnaire.

Statistics. All calculations and analysis were performed using the statistical software package IBM SPSS Statistics, Version 19. Values were considered statistically significant at the $p < .05$ level. Missing values were deleted pair wise in all the statistical analysis. Sample size was deemed as small but sufficiently adequate for both the factor analysis and the multiple regression analysis. Two separate factor analysis were conducted for the Salas (process) items and Hackman (output) items, to explore and empirically determine the underlying factor structure of the questionnaire. Prior to conducting the factor analysis the suitability of the data was assessed and found to be adequately suitable for the analysis. Principal components analysis (PCA) was used to extract the factors followed by oblique

rotation of factors using oblimin rotation ($\delta = 0$). The number of factors to be retained was guided by the Kaiser's criterion rule (eigenvalues above 1), inspection of the scree plot, as well as inspection of the pattern matrix. During inspection of the pattern matrix, cut off value was set to .5, and items cross loading over .5 were removed. In the factor analysis conducted on the Salas items, one item loaded only in one factor, and the factor had no other item loadings, thus this factor/item was removed. Once redundant and cross loading items were removed, a factor analysis was conducted again without the removed item's, thus the final results of the factor analyses presented in this thesis are a result of several factor analyses. The reliability of the scales in the Salas and Hackman's items was assessed using Cronbach alpha coefficients. Factor mean scores from the eight Salas factors and three Hackman factors were computed prior to conducting multiple regression analysis. To test the hypothesis that the Salas factors (team leadership, team orientation, closed loop communication, shared mental models, mutual performance monitoring, mutual trust, backup behaviour, adaptability) were able to predict the Hackman factors (individual satisfaction, the teams survivability and the teams results) three multiple regression analyses were conducted, one multiple regression analysis for each of the Hackman subscales. Preliminary analysis was conducted to ensure no violation of assumptions of normality, linearity, multicollinearity and homoscedasticity.

Results

Factor analysis on the Salas et al. (2005) items (see tables 1, 2 and 3). A PCA was conducted on the 64 Salas items of the questionnaire. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis ($KMO = .902$, exceeding the recommended value of .6 (Eikemo & Clausen, 2007; Field, 2009; Johannessen, 2009; Pallant, 2007). Bartlett's test of sphericity reached statistical significance ($p < .05$), supporting the factorability of the correlation matrix. Principal component analysis revealed the presence of eight components with eigenvalues exceeding 1, explaining 37.09% (mutual trust/team

orientation), 8,78% (leadership, planning), 6,15% (mutual performance monitoring), 4,99% (adaptability), 4,68% (closed loop communication), 3,53% (leadership, social), 3,27% (shared mental models) and 2,28% (backup behaviour) of the variance respectively. Mutual trust and team orientation landing in the same factor, and the leadership-component splitting in two, was not consistent with what was proposed by Salas et al. (2005). Nevertheless, the eight-factor solution together explained a total of 70,36% of the variance. An inspection of the scree plot revealed a clear break after the 5th factor, however there was a less obvious break after the 8th factor. To aid the interpretation of factors further, oblimin rotation was performed. After removing cross-loading items, an inspection of the pattern matrix revealed a clear factor solution, with all items showing a number of strong loadings and all variables loading substantially on one factor. Overall 37 of the 64 Salas-items remained after cross-loading and redundant items were removed. Correlations between factors was generally considered low, with the highest being .419 (see table 3).

Factor analysis on the Hackman items (see tables 4, 5, and 6). A PCA was conducted on the 24 Hackman items of the questionnaire. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis (KMO= .902, exceeding the recommended value of .6 (Field, 2009; Johannessen, 2009; Pallant, 2007)). Bartlett's test of sphericity reached statistical significance ($p < .05$), supporting the factorability of the correlation matrix. Principal component analysis revealed the presence of three components with eigenvalues exceeding 1, explaining 45,94% (the teams survivability), 12,03% (team results) and 7,16% (individual satisfaction) of the variance respectively. The three-factor solution together explained a total of 65,13% of the variance. An inspection of the scree plot revealed a clear break after the 3rd factor, which was further supported by oblimin rotation where inspection of the pattern matrix revealed a clear factor solution, with all factors showing a number of strong loadings and all items loading substantially on one of the three

factors. Only two redundant items were removed due to high cross-loadings. Correlations between factors was generally considered low, with the highest being .405 (see table 6).

Reliability of the Salas scales. The Cronbach alpha value for the mutual performance monitoring scale was .844, .783 for the backup behaviour scale, .890 for the adaptability scale, .768 for the shared mental models scale, .907 for the mutual trust/team orientation scale, .908 for the closed loop communication scale, .785 for the leadership/management (social) scale, .855 for the leadership/management (planning) scale. All values exceeded the recommended value of .7 (Nunnally, 1978) indicating adequate internal consistency.

Reliability of the Hackman scales. The Cronbach alpha value for team results was .908, the value for the teams survivability was .853 and individual satisfaction was .900. All values exceeded the recommended value of .7 (Nunnally, 1978) indicating adequate internal consistency.

Multiple regression analysis on Hackman's component individual satisfaction (see tables, 7, 8, 9 and 10). The results of the regression analysis indicated that the mutual trust/team orientation and the leadership (social) components significantly predict individual satisfaction in this sample. The beta coefficients were .742 for mutual trust/ team orientation, $t=11.83$ $p < .001$, and .125 for the social leadership component, $t=2.25$, $p < .026$. The rest of the components did not significantly predict Hackman's component individual satisfaction. The overall model explains $R = .810$, $R \text{ square} = .656$. Adjusted $R \text{ square} = .640$.

Multiple regression analysis on Hackman's component team survivability (see tables 7, 10, 11 and 12). The results from the regression analysis indicated that the components mutual trust/ team orientation ($\text{Beta} = .823$, $t=14.23$, $p < .001$), and the social leadership component ($\text{beta} = .107$, $t=2.08$, $p < .039$) significantly predicts the teams survivability. The planning leadership component significantly negatively predicts ($\text{beta} = -.174$, $t=-3.43$, $p < .001$) the team's survivability. The closed loop communication component

also shows a negative tendency ($\beta = -.114$, $t = -1.95$, $p > .052$) towards the predictability of the team's survivability. The rest of the components did not significantly predict Hackman's component teams survivability. The overall model explains $R = .841$, $R^2 = .708$, Adjusted $R^2 = .694$.

Multiple regression analysis on Hackman's component team results (see tables 7, 10, 13 and 14). The results from the regression analysis indicated that the components adaptability ($\beta = .177$, $t = 2.34$, $p < .020$), mutual trust/team orientation ($\beta = .261$, $t = 3.55$, $p < .001$) and the social leadership component ($\beta = .237$, $t = 3.62$, $p < .001$) significantly predicts team results. The rest of the components did not significantly predict Hackman's component team results. The overall model explains $R = .725$, $R^2 = .526$, Adjusted $R^2 = .504$.

Discussion

Firstly, to clarify theory utilized during questionnaire construction this thesis set out to explain "the big five of teamwork" components and its coordinating mechanisms, and Hackman's (1990) classification of team effectiveness. Subsequently, two separate factor analyses were conducted on Salas' eight teamwork process factors: Mutual performance monitoring, team orientation, team management, adaptability, mutual trust, backup behaviour, shared mental models, closed loop communication, and Hackman's team effectiveness output factors: Team results, team survivability and individual satisfaction, to investigate the psychometric properties of the questionnaire. Lastly, three multiple regression analyses were conducted to investigate Salas' eight process factors predictable value in relations to the three Hackman factors of team effectiveness.

The exploratory factor analysis of the Salas-items supported a division of items into eight factors, which is partially consistent with theory, although not exactly as proposed by Salas et al. (2005). The mutual trust and team orientation items, for instance, landed in the

same factor, and were thenceforth labelled mutual trust/team orientation. This finding was not consistent with what was expected based on theory. However, mutual trust and team orientation could be argued to have underlying construct similarities, as both concepts, to some extent, can be considered to be general attitudes (Jones, 1996; Salas et al., 2000; Salas et al., 2005; Salas, DiazGranados, Weaver, & King, 2008). In a teamwork context, for instance, trust can be said to include both team members' beliefs and conscious feelings about the team, and other team members (McShane & Von Glinow, 2010), whereas team orientation can be understood as a general tendency, attitude or preference towards work in team settings (Duel, 2010). Thus, the constructs to some extent resemble each other. Additionally, contrary to what was expected, the factor analysis supported a division of the leadership component into two; one factor was concerned with social aspects, and the other with planning aspects of team leadership. This finding can be supported by the fact that items loading in each factor had conceptual meaning in that factor, and even without the factor analysis one could logically notice this division. In addition to intuitive appeal, definitions, models and research on leadership supports the notion that leaders have several different functions and behavioural duties concerned with social and considerate aspects of leadership, and planning and management aspects of leadership (Bass & Bass, 2008; Bowers & Seashore, 1966; Burke et al., 2006; Fleishman et al., 1991; Forsyth, 2010; Northouse, 2010; Wofford, 1970). The remaining factors corresponded closely with what was proposed by Salas et al (2005), and items loaded highly in only one factor, indicating simple structure (see table 1). Furthermore, internal consistency for all factors was deemed as adequate. The mutual trust/team orientation factor explained the most variance, secondly the leadership, planning-component, mutual performance monitoring, adaptability, closed loop communication, social leadership-component, shared mental models and backup behaviour.

The exploratory factor analysis of the Hackman items supported a division of team effectiveness into three, as proposed by theory. All items loaded highly in their designated factor, and had a simple structure (see table 4). Moreover, internal consistency was adequate. The team's survivability-component explained the most variance, following team results and lastly individual satisfaction. The above findings answer our problem formulation as the statistical analysis of our questionnaire did find eight teamwork process factors, and three team-effectiveness factors. This finding is partially consistent with what was expected based on theory,

The multiple regression analysis of the Salas factors ability to predict the Hackman component individual satisfaction, revealed that the factor's mutual trust/team orientation and the social leadership component significantly predicted individual satisfaction in our sample. Thus, given the above, it would seem that social aspects of teamwork are closely related to individual satisfaction. Definition's on job satisfaction support the notion that social recognition, and cognitive and affective evaluations, has a central role in individual job satisfaction (Einarsen & Skogstad, 2005). Furthermore, a climate of mutual trust, where team members think that other members will look out for them and the team (Duel, 2010) most likely creates a sense of security, which can also influence individual satisfaction. Additionally, feedback from a leader can give team members the feeling of being acknowledged, which can motivate and contribute to a positive self-image (Salas et al., 2005; Skogstad & Einarsen, 2002), which in turn may influence individual satisfaction. The rest of the components did not significantly predict Hackman's component individual satisfaction. The overall model explained 64% of the variance.

The multiple regression analysis of the Salas factors ability to predict the Hackman component team survivability also revealed that the mutual trust/team orientation and the social leadership component significantly predicted the team's survivability in our sample.

Furthermore, the leadership, planning component significantly negatively predicted the teams' survivability, and the closed loop communication component showed a negative tendency and was marginally significant in negatively predicting team survivability. Probable reasons for the leadership, planning-component to negatively predict team's survivability in our sample, could be that the manifestations of teamwork skills, and how these are viewed by subordinates are likely to be influenced by individual, cultural (organizational and national), and age-related differences and preferences (House, 2004; Rosen, Wildman et al., 2008; Skogstad & Einarsen, 2002). Hofstede (1980), for instance, noted that Norwegians compared to Americans prefers egalitarian, democratic and feminine leadership styles, with less power-distance and more equality (Hofstede, 1980). Furthermore, as most of our given sample consists of students, their experience with teams may have been more limited, or democratic, compared with real work teams. In a student team a person that took on leadership responsibilities in an authoritative fashion could have been viewed upon as too controlling for the students liking. Further testing with the questionnaire in other populations would further validate or invalidate this finding, and inspect if this also holds in other populations. The rest of the components did not significantly predict Hackman's component teams survivability. The overall model explains 69% of the variance.

The multiple regression analysis of the Salas factors ability to predict the Hackman component team results revealed that the components adaptability, mutual trust/team orientation and the social leadership component significantly predict team results. That team results are related to adaptability has intuitive appeal, as teams that have the ability to flexibly adapt to their environment, and step in and provide assistance when needed, have been shown to be more effective than teams that do not engage in this behaviour (Salas et al., 2000). Mutual trust/team orientation and the social leadership components are also intuitively, as well as theory-based, related to team results (Salas et al., 2005). The rest of the components

did not significantly predict Hackman's component team results. The overall model explains 50% of the variance.

In sum, the results from the three multiple regression analyses answers our problem formulation and provides partial support for the notion that the Salas factors are able to predict the Hackman factors. Some components, however, did not statistically significantly predict any of the team effectiveness components, and it is important to ask why these components did not have a statistically significant effect. Possibly, the potency of the Salas-components was influenced by our relatively small sample size, and perhaps effects would have been stronger if we would have had a larger sample size. Therefore, it is recommended that our questionnaire be subjected to a larger and more diverse population, in future. Moreover, as mentioned previously, what is needed for effective teamwork changes in different team settings and with different tasks, as different types of teams operate with dissimilar environmental demands and situational characteristic that impact the teamwork process and which teamwork skills are of most importance in that specific team setting (Salas et al., 2000; Salas et al., 2005). Thus, all of Salas' teamwork process components are not always equally important in all types of teams, some components may simply not be that relevant in that specific team settings, and some components may have influenced team effectiveness indirectly, and consequently not found to predict team effectiveness in this study. Furthermore, the measurement of psychological constructs like teams and teamwork in general has always been challenging due to construct complexity, and measurement difficulties (Cannon-Bowers & Salas, 2001; Cooke, Salas, Cannon-Bowers, & Stout, 2000; Kraiger & Wenzel, 1997; Rosen, Salas et al., 2008; Salas, Cooke, & Gorman, 2010). The component shared mental models, for instance, has been notoriously known for being hard to measure (Cannon-Bowers & Salas, 2001; Cooke et al., 2000).

Additionally, as our questionnaire measures the subjective experience of teamwork, it is worth noting that there may be differences in team member's perception of their team. One team member may, for instance, consider him or herself as being part of an effective team, whereas this may not be objectively true, or coincide with other team member's perception of the same team. Furthermore, as our questionnaire is a self-report measure it can be susceptible to biases, and claims have been made that self-report measures are easy to systematically respond to in a socially desirable way, and/or be influenced by common method variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Razavi, 2001; Spector & Jex, 1998).

Nevertheless, despite the above limitations the development and psychometric testing of our questionnaire has significantly contributed to the knowledge of teamwork, team effectiveness and team functioning. Furthermore, to our knowledge our questionnaire is one of the first questionnaires based on Salas et al. (2005) and Hackman's (1990) theoretical frameworks that have actually found the factor structure predicted by theory. Though there are other questionnaires on teamwork with similarities to ours. Duel (2010), for instance, developed a questionnaire with the same theoretical background as ours, that was specifically directed towards operational/military team functioning, however, our questionnaire is more general, and has more items. Ultimately, our questionnaire can be used practically to develop team training to remedy team process factors where teams have been given a low score, increase team member's awareness of their own functioning in teams, and aid research with bringing further knowledge to the field. The questionnaire can also be developed further to fit in certain businesses, or with specific team tasks, chart team functioning, and discover discrepancies between team members perception of their team.

Summary and conclusion

To summarize, this thesis set out to create a questionnaire on the subjective experience of teamwork, based on Burke, Salas, and Sims (2005) "The Big Five of teamwork" and

Hackman's (1990) classification of team effectiveness. One of the main aims of this thesis was to investigate the psychometric properties of our questionnaire, based on our sample of 182 participants. My problem formulations were as follows: Does the statistical analysis of our questionnaire reveal the eight-factor solution as proposed by Salas et al. (2005) and/or the three team effectiveness factors, as proposed by Hackman's (1990)? And, does the statistical analysis of our questionnaire reveal that the eight Salas process-factors will have a statistically significant effect on the three Hackman's outcome variables on team effectiveness? The results from this study partially validate the problem formulations. It appears that the eight-factor solution of Salas et al. (2005) is a valid classification of the teamwork process, and that Hackman's understanding of team effectiveness has credibility. Furthermore, some of Salas et al. (2005) teamwork factors do have the ability to predict team effectiveness in our sample, but our study did not find that all factors were able to predict team effectiveness. Further studies would aid the reliability and validity of these results, and our questionnaire, and are therefore recommended. Nevertheless, despite limitations the above findings can be considered valid support for the theories used, and of the psychometric properties of our questionnaire.

References

- Anderson, N., Ones, D., Sinangil, & Viswesvaran. (2001). *Handbook of industrial, work and organizational psychology*. London: Sage.
- Arnold, J., Randall, R., & Patterson, F. (2010). *Work psychology: understanding human behaviour in the workplace*. Harlow: Pearson.
- Baker, D. P., Day, R., & Salas, E. (2006). Teamwork as an essential component of high-reliability organizations. *Health Services Research*, 41, 1576-1598. doi: 10.1111/j.1475-6773.2006.00566.x
- Bang, H. (2008). Effektivitet i lederteam – hva er det, og hvilke faktorer påvirker det? *Tidsskrift for Norsk Psykologforening*, 45, 272-286. Retrieved from http://www.psykologtidsskriftet.no/index.php?seks_id=40729&a=2
- Baninajarian, N., & Abdullah, Z. B. (2009). Groups in context: A model of group effectiveness. *European Journal of Social Sciences*, 8, 335-340. doi: http://www.eurojournals.com/ejss_8_2_13.pdf
- Bass, B. M., & Bass, R. R. (2008). *The Bass handbook of leadership: theory, research, and managerial applications*. New York: Free Press.
- Bell, B. S., & Kozlowski, S. W. J. (2002). A typology of virtual teams - Implications for effective leadership. *Group & Organization Management*, 27(1), 14-49. doi: 10.1177/1059601102027001003
- Bennett, W., Lance, C. E., & Woehr, D. J. (2006). *Performance measurement: current perspectives and future challenges*. Mahwah, N.J.: Lawrence Erlbaum Associates.
- Borman, W. C., Ilgen, D. R., & Klimoski, R. J. (2003). *Industrial and organizational psychology* (Vol. Vol. 12). New York: Wiley.
- Bos, N., Olson, J., Gergle, D., Olson, G., & Wright, Z. (2002). *Effects of four computer-mediated communications channels on trust development*. doi:10.1145/503376.503401.

- Bowers, D. G., & Seashore, S. E. (1966). Predicting Organizational Effectiveness With a Four-Factor Theory of Leadership. *Administrative Science Quarterly*, 11, 238-264. doi: 10.2307/2391247
- Brannick, & Prince, C. (1997). An overview of team performance measurement. In Brannick, Salas & C. Prince (Eds.), *Team Performance Assessment and Measurement: Théory, Methods, and Applications*. Mahwah, N.J.: Lawrence Erlbaum.
- Burke, C. S., Stagl, K. C., Klein, C., Goodwin, G. F., Salas, E., & Halpin, S. M. (2006). What type of leadership behaviors are functional in teams? A meta-analysis. *Leadership Quarterly*, 17, 288-307. doi: 10.1016/j.leaqua.2006.02.007
- Buvik, M. P. (2006). Teamarbeid i en flerkulturell kontekst – utnytting av det kreative potensialet. . In P. Ø. Saksvik. & K. Nytrø (Ed.), *Ny personalpsykologi for et arbeidsliv i endring. Nye perspektiver på samspillet organisasjon og menneske*. (pp. 233-266). Oslo: Cappelens Forlag AS
- Campion, M. A., Medsker, G. J., & Higgs, A. C. (1993). Relations between work group characteristics and effectiveness. implications for designing effective work groups *Personnel Psychology*, 46, 823-850. doi: 10.1111/j.1744-6570.1993.tb01571.x
- Cannon-Bowers, Janis A., & Salas, E. (1998). Individual and team decision making under stress: Theoretical underpinnings. In Cannon-Bowers, Janis A. & E. Salas (Eds.), *Making decisions under stress: Implications for individual and team training* (pp. 17-38). Washington, DC, US: American Psychological Association.
- Cannon-Bowers, Salas, & Converse. (1993). Shared Mental Models in Expert Team Decision Making. In J. N.J. Castellan (Ed.), *Individual and Group Decision Making: Current Issues*. (pp. 221-246). Hillsdale, NL: Erlbaum.
- Cannon-Bowers, Salas, Volpe, & Tannenbaum. (1995). Defining competencies and establishing team training requirements. In E. Salas. & R. A. Guzzo (Ed.), *Team*

- effectiveness and decision making in organizations* (pp. 333-381). San Francisco: Jossey-Bass.
- Cannon-Bowers, Janis. A., & Salas, E. (2001). Reflections on shared cognition. *Journal of Organizational Behavior*, 22, 195-202. doi: 10.1002/job.82
- Cohen, & Bailey. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management*, 23, 239-290. doi: 10.1016/s0149-2063(97)90034-9
- Cooke, N. J., Salas, E., Cannon-Bowers, J. A., & Stout, R. J. (2000). Measuring team knowledge. *Human Factors*, 42, 151-173. doi: 10.1518/001872000779656561
- Cooper, R., Sawaf, A. (1996). *Executive EQ: emotional intelligence in leadership and organizations*. New York: Grosset/Putnam.
- Devine, D. J., Clayton, L. D., Philips, J. L., Dunford, B. B., & Melner, S. B. (1999). Teams in organizations: Prevalence, characteristics, and effectiveness. *Small Group Research*, 30(6), 678-711. doi: 10.1177/104649649903000602
- Driskell, J. E., Salas, E., & Johnston, J. (1999). Does stress lead to a loss of team perspective? *Group Dynamics: Theory, Research, and Practice*, 3, 291-302. doi: 10.1037/1089-2699.3.4.291
- Duel, J. (2010). *Teamwork in action: military teams preparing for, and conducting Peace Support Operations*.
- Egidius, H. (2005). *Psykologisk leksikon*. København: Hans Reitzels Forlag.
- Eikemo, T. A., & Clausen, T. H. (2007). *Kvantitativ analyse med SPSS: en praktisk innføring i kvantitative analyseteknikker*. Trondheim: Tapir akademisk forl.
- Einarsen, S., & Skogstad, A. (2005). *Den dyktige medarbeider: behov og forventninger*. Bergen: Fagbokforl.

- Field, A. (2009). *Discovering statistics using SPSS: (and sex and drugs and rock 'n' roll)*. Los Angeles: SAGE.
- Fleishman, E. A., Mumford, M. D., Zaccaro, S. J., Levin, K. Y., Korotkin, A. L., & Hein, M. B. (1991). Taxonomic efforts in the description of leader behavior: A synthesis and functional interpretation. *The Leadership Quarterly*, 2, 245-287. doi: 10.1016/1048-9843(91)90016-U
- Forsyth, D. R. (2010). *Group dynamics*. Belmont, Calif.: Wadsworth Cengage learning.
- Gladstein, D. L. (1984). Groups in context- a model of task group effectiveness
Administrative Science Quarterly, 29, 499-517. doi: 10.2307/2392936
- Goldstein, I. L. (1993). *Training in organizations: needs assessment, development, and evaluation*. Pacific Grove, Calif.: Brooks/Cole.
- Guzzo, R. A., & Dickson, M. W. (1996). Teams in organizations: Recent research on performance and effectiveness. *Annual Review of Psychology*, 47, 307-338. doi: 10.1146/annurev.psych.47.1.307
- Guzzo, R. A., & Salas, E. (1995). *Team effectiveness and decision making in organizations*. San Francisco, Cal.: Jossey-Bass.
- Hackman, J. R. (1990). *Groups that work (and those that don't): creating conditions for effective teamwork*. San Francisco, Calif.: Jossey-Bass.
- Herre, C. (2010). *Promoting team effectiveness: How leaders and learning processes influence team outcomes*. University of Fribourg. Haale/Saale, Germany. Retrieved from <http://ethesis.unifr.ch/theses/HerreC.pdf?file=HerreC.pdf>
- Hoegl, M., & Gemuenden, H. G. (2001). Teamwork quality and the success of innovative projects: A theoretical concept and empirical evidence. *Organization Science*, 12, 435-449. doi:

<http://lms.powercam.cc/sysdata/user/44/grace/blog/doc/3808d9955db1da56/attach/124.pdf>

Hofstede, G. (1980). *Culture's consequences: international differences in work-related values*.

Beverly Hills, Calif.: Sage.

Hopkin, V. D., Garland, D. J., & Wise, J. A. (1999). *Handbook of aviation human factors*.

Mahwah, N.J.: Lawrence Erlbaum.

House, R. J. (2004). *Culture, leadership, and organizations: the GLOBE study of 62 societies*.

Thousand Oaks, Calif.: Sage.

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations:

From input-process-output models to IMOI models. *Annual review of psychology*, 56, 517-543. doi: 10.1146/annurev.psych.56.091103.070250

Jarvenpaa, S. L., Shaw, T. R., & Staples, D. S. (2004). Toward contextualized theories of trust:

The role of trust in global virtual teams. [Article]. *Information Systems Research*, 15(3), 250-267. doi: 10.1287/isre.1040.0028

Jex, S. M. (2008). *Organizational psychology: a scientist-practitioner approach*. New York:

Wiley.

Johannessen, A. (2009). *Introduksjon til SPSS: versjon 17*. Oslo: Abstrakt forl.

Johnson-Laird, P. N. (1983). *Mental models: towards a cognitive science of language,*

inference, and consciousness. Cambridge: Cambridge University Press.

Johnston, W. A., & Briggs, G. E. (1968). Team performance as a function of team

arrangement and work load *Journal of Applied Psychology*, 52, 89-94. doi:

10.1037/h0025656

Jones, K. (1996). Trust as an affective attitude. *Ethics*, 107(1), 4-25. doi: 10.1086/233694

Kendall, & Salas. (2004). Measuring team performance: Review of current methods and

consideration of future needs In V. T. James W. Ness, and Darren R. Ritzer (Ed.), *The*

Science and Simulation of Human Performance (Advances in Human Performance and Cognitive Engineering Research (Vol. 5, pp. 307-326): Emerald Group Publishing Limited.

- Kennedy, F. A., Loughry, M. L., Klammer, T. P., & Beyerlein, M. M. (2009). Effects of organizational support on potency in work teams: The mediating role of team processes. *Small Group Research*, 40, 72-93. doi: 10.1177/1046496408326744
- Kerr, R., Garvin, J., Heaton, N., & Boyle, E. (2006). Emotional intelligence and leadership effectiveness. *Leadership and Organization Development Journal*, 27(4), 265-279. doi: 10.1108/01437730610666028
- Klimoski, R., & Mohammed, S. (1994). Team mental model: construct or metaphor? *Journal of Management*, 20(2), 403-437. doi: 10.1016/0149-2063(94)90021-3
- Kozlowski, S. W. J., & Bell, B. S. (2003). Work groups and teams in organizations. In D. R. I. W. C. Borman, & R. J. Klimoski (Ed.), *Handbook of psychology: Industrial and organizational psychology* (Vol. 12). London: Wiley.
- Kozlowski, S. W. J., & Ilgen, D. R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science*, 77-124. doi: 10.1111/j.1529-1006.2006.00030.x
- Kraiger, K., & Wenzel, L. (1997). Conceptual development and empirical evaluation of measures of shared mental models as indicators of team effectiveness. In Brannick, Salas & C. Prince (Eds.), *Team Performance Assessment and Measurement: Théory, Methods, and Applications*. Mahwah, N.J: Lawrence Erlbaum.
- Kramer, R. M. (1999). Trust and distrust in organizations: Emerging perspectives, enduring questions. *Annual Review of Psychology*, 50, 569-598. doi: 10.1146/annurev.psych.50.1.569
- Levine, & Moreland. Small Groups. In Gardner Lindzey, Daniel Gilbert & S. Fiske (Eds.), *The Handbook of Social Psychology* (4th ed., pp. 415-468). Boston: McGraw-Hill.

- Lewis, J. D., & Weigert, A. (1985). Trust as a social reality. *Social Forces*, 63(4), 967-985.
doi: 10.2307/2578601
- Lim, B. C., & Klein, K. J. (2006). Team mental models and team performance: A field study of the effects of team mental model similarity and accuracy. *Journal of Organizational Behavior*, 27, 403-418. doi: 10.1002/job.387
- Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. [Article]. *Academy of Management Review*, 26, 356-376.
doi: 10.2307/259182
- Martins, L. L., Gilson, L. L., & Maynard, M. T. (2004). Virtual teams: What do we know and where do we go from here? *Journal of Management*, 30(6), 805-835. doi: 10.1016/j.jm.2004.05.002
- Mathieu, & Rapp, T. L. (2009). Laying the Foundation for Successful Team Performance Trajectories: The Roles of Team Charters and Performance Strategies. *Journal of Applied Psychology*, 94, 90-103. doi: 10.1037/a0013257
- Mathieu, J., Maynard, M. T., Rapp, T., & Gilson, L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management*, 34, 410-476. doi: 10.1177/0149206308316061
- Mathieu, J. E., Goodwin, G. F., Heffner, T. S., Salas, E., & Cannon-Bowers, J. A. (2000). The influence of shared mental models on team process and performance. *Journal of Applied Psychology*, 85, 273-283. doi: 10.1037//0021-9010.85.2.273
- McGrath, J. E. (1964). *Social psychology: a brief introduction*. New York: Holt, Rinehart & Winston.
- McShane, S. L., & Von Glinow, M. A. (2010). *Organizational behavior: emerging knowledge and practice for the real world*. Boston, Mass.: McGraw-Hill/Irwin.

- Mohammed, S., Ferzandi, L., & Hamilton, K. (2010). Metaphor no more: A 15-year review of the team mental model construct. *Journal of Management*, 36, 876-910. doi: 10.1177/0149206309356804
- Mohammed, S., Klimoski, R., & Rentsch, J. R. (2000). The Measurement of Team Mental Models: We Have No Shared Schema. *Organizational Research Methods*, 3, 123-165. doi: 10.1177/109442810032001
- Northouse, P. G. (2010). *Leadership: theory and practice*. Los Angeles: Sage.
- Nunnally, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.
- Pallant, J. (2007). *SPSS survival manual: a step by step guide to data analysing using SPSS for Windows*. Maidenhead: McGraw-Hill ; Open University Press.
- Paris, C. R., Salas, E., & Cannon-Bowers, J. A. (2000). Teamwork in multi-person systems: A review and analysis. *Ergonomics*, 43, 1052-1075. doi: 10.1080/00140130050084879
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, 879-903. doi: 10.1037/0021-9101.88.5.879
- Razavi. (2001). Self-report measures: An overview of concerns and limitations of questionnaire use in occupational stress research. Retrieved from <http://eprints.soton.ac.uk/35712/1/01-175.pdf>
- Rogelberg, S. G. (2007). *Encyclopedia of industrial and organizational psychology*. Thousand Oaks, Calif.: Sage.
- Rosen, M. A., Salas, E., Wilson, K. A., King, H. B., Salisbury, M., Augenstein, J. S., . . . Birnbach, D. J. (2008). Measuring Team Performance in Simulation-Based Training: Adopting Best Practices for Healthcare. *Simulation in Healthcare*, 3, 33-41. doi: 10.1097/SIH.0b013e3181626276

- Rosen, M. A., Wildman, J. L., Bedwell, W. L., Fritzsche, B., Salas, E., & Burke, C. S. (2008). *Diagnosing friction points in multicultural team performance: A rationale and measurement approach*. doi:10.1177/154193120805201112.
- Rothmann, S., & Cooper, C. L. (2008). *Organizational and work psychology: topics in applied psychology*. London: Hodder Education.
- Rouse, Cannon-Bowers, & Salas. (1992). Role of mental models in team performance in complex systems. *IEEE Transactions on Systems, Man and Cybernetics*, 22, 1296-1308. doi: 10.1109/21.199457
- Rouse, W. B., & Morris, N. M. (1986). On Looking Into the Black Box. Prospects and Limits in the Search for Mental Models. *Psychological Bulletin*, 100, 349-363. doi: 10.1037//0033-2909.100.3.349
- Rousseau, V., Aubé, C., & Savoie, A. (2006). Teamwork behaviors: A review and an integration of frameworks. *Small Group Research*, 37, 540-570. doi: 10.1177/1046496406293125
- Salas, Burke, C. S., & Cannon-Bowers, J. A. (2000). Teamwork: Emerging principles. *International Journal of Management Reviews*, 2, 339-356. doi: 10.1111/1468-2370.00046
- Salas, Sims, & Burke. (2005). Is there a "big five" in teamwork? *Small Group Research*, 36, 555-599. doi: 10.1177/1046496405277134
- Salas, E., Cooke, N. J., & Gorman, J. C. (2010). The science of team performance: Progress and the need for more. *Human Factors*, 52, 344-346. doi: 10.1177/0018720810374614
- Salas, E., Cooke, N. J., & Rosen, M. A. (2008). On teams, teamwork, and team performance: Discoveries and developments. *Human Factors*, 50, 540-547. doi: 10.1518/001872008X288457

Salas, E., DiazGranados, D., Weaver, S. J., & King, H. (2008). Does team training work?

Principles for health care. *Academic Emergency Medicine*, 15, 1002-1009. doi:

10.1111/j.1553-2712.2008.00254.x

Salas, E., & Fiore, S. M. (2004). *Team cognition: understanding the factors that drive process and performance*. Washington, D.C.: American Psychological Association.

Salas, E., Prince, C., & Brannick, M. T. (1997). *Team performance assessment and measurement: theory, methods, and applications*. Mahwah, N.J.: Lawrence Erlbaum.

Salas, E., Rosen, M. A., Burke, C. S., Goodwin, G. F., & Fiore, S. (2006). The making of a dream team: when expert teams do best. In N. C. K. A. Ericsson, P. J. Feltovich & R. R. Hoffman (Ed.), *The Cambridge Handbook of Expertise and Expert Performance* (pp. 439-453). New York: Cambridge University Press.

Shea, G. P., & Guzzo, R. A. (1987). Group effectiveness - What really matters *Sloan*

Management Review, 28, 25-31. Retrieved from

<http://search.proquest.com/docview/211496379/fulltextPDF/136A2C345224C938252/1?accountid=12870>

Sjøvold, E. (2006). *Teamet: utvikling, effektivitet og endring i grupper*. Oslo: Universitetsforl.

Skogstad, A., & Einarsen, S. (2002). *Ledelse på godt og vondt: effektivitet og trivsel*. Bergen: Fagbokforl.

Smith-Jentsch, Johnston, J. H., & Payne, S. C. (1998). Measuring team-related expertise in complex environments. In Salas & Janis (Eds.), *Making decisions under stress: Implications for individual and team training* (pp. 61-87). Washington, DC, US: American Psychological Association. doi: 10.1037/10278-003

Spector, P. E., & Jex, S. M. (1998). Development of four self-report measures of job stressors and strain: Interpersonal Conflict at Work Scale, Organizational Constraints Scale,

- Quantitative Workload Inventory, and Physical Symptoms Inventory. *Journal of occupational health psychology*, 3, 356-367. doi: 10.1037//1076-8998.3.4.356
- Stevens, M. J., & Campion, M. A. (1994). The knowledge, skill, and ability requirements for teamwork- implications for human-resource management *Journal of Management*, 20, 503-530. doi: 10.1177/014920639402000210
- Sundstrom, E., De Meuse, K. P., & Futrell, D. (1990). Work teams: Applications and effectiveness. *American Psychologist*, 45, 120-133. doi: 10.1037/0003-066X.45.2.120
- Sundstrom, E., McIntyre, M., Halfhill, T., & Richards, H. (2000). Work groups: From the Hawthorne studies to work teams of the 1990s and beyond. *Group Dynamics*, 4, 44-67. doi: 10.1037/1089-2699.4.1.44
- Thompson, L. L., Levine, J. M., & Messick, D. M. (1999). *Shared cognition in organizations: the management of knowledge*. Mahwah, N.J.: Lawrence Erlbaum Associates.
- Van Der Vegt, G., Emans, B., & Van De Vliert, E. (2000). Team members' affective responses to patterns of intragroup interdependence and job complexity. *Journal of Management*, 26, 633-655. doi: 10.1177/014920630002600403
- Veldhuyzen, W., & Stassen, H. G. (1977). The internal model concept: An application to modeling human control of large ships. *Human Factors*, 19, 367-380. doi: 10.1177/001872087701900405
- Webber, S. S. (2002). Leadership and trust facilitating cross-functional team success. *Journal of Management Development*, 21, 201-214. doi: 10.1108/02621710210420273
- Wofford, J. C. (1970). Factor analysis of managerial behavior variables. *Journal of Applied Psychology*, 54, 169-173. doi: doi:10.1037/h0029058
- Yukl, G. A. (2006). *Leadership in organizations*. Upper Saddle River, N.J.: Pearson Prentice Hall.

Zaccaro, S. J., Rittman, A. L., & Marks, M. A. (2001). Team leadership. *Leadership Quarterly*, 12(4), 451-483. doi: Pii s1048-9843(01)00093-510.1016/s1048-9843(01)00093-5

Tables

Table 1: The pattern matrix, item factor loadings of Salas items after oblimin rotation. (Table continues on next page)

Items:	Factor loading							
	1	2	3	4	5	6	7	8
I hvilken grad:								
Trivdes dere med å samarbeide med hverandre?	.748	.008	.169	-.123	.125	-.091	.013	-.059
Ble oppgaven løst bedre av teamet enn om den skulle ha blitt løst av en person alene?	.745	.077	-.125	-.014	-.060	-.197	-.062	.047
Stolte dere på at teammedlemmene gjorde det de sa?	.722	.008	-.091	-.020	-.172	.191	.150	.100
Var teammedlemmene positivt innstilt til teamarbeidet underveis i arbeidsprosessen?	.711	-.060	.165	-.129	.130	-.077	.002	.006
Stolte dere på at alle i teamet gjorde sitt beste for å nå målet?	.703	.033	.117	-.025	-.058	.036	.099	-.029
Var dere sikker på at de andre teammedlemmene gjorde sin del av arbeidet?	.690	.004	.062	.052	-.184	.148	.147	.062
Forbedret samarbeidet med de andre teammedlemmene dine egne prestasjoner?	.682	.207	-.046	-.089	.015	-.169	.013	-.010
Ble alle teammedlemmenes bidrag til teamet verdsatt?	.617	-.025	.098	-.033	-.013	.074	.135	.125
Hadde dere tillitt til de andre teammedlemmene sine kunnskaper og evner?	.613	-.110	.048	-.120	-.117	.012	.171	-.146
Var det noen i teamet som planla teamets arbeidsprosess?	.015	.921	.058	.103	.016	.125	.007	.030
Var det noen i teamet som koordinerte arbeidsoppgavene underveis i teamprosessen?	.013	.832	-.011	-.061	.060	-.022	-.032	.140
Var det noen i teamet som passet på at teammedlemmene holdt seg på rett spor, selv om det oppstod endringer i teamsituasjonen?	.068	.753	-.014	.035	-.179	-.096	-.026	.064
Var det noen i teamet som tok ansvar for at teammedlemmenes individuelle ferdigheter ble gjort nytte av?	-.065	.638	.042	-.164	-.108	-.118	.123	-.173
Var det akseptabelt å identifisere feil i de andre teammedlemmenes oppgaver?	-.098	.081	.815	-.051	.046	.043	.073	.067
Var dere villig til å gi tilbakemelding til de andre teammedlemmene?	.080	-.050	.744	-.115	-.100	-.113	-.031	-.133
Var det rom for å kommentere de andre teammedlemmenes arbeidsoppgaver?	.017	.041	.726	-.037	-.076	-.067	.074	-.023
Ga dere feedback på hverandres arbeid?	-.047	.024	.683	-.003	-.102	-.281	-.010	.062
Kunne dere spørre om en forklaring hvis de andre teammedlemmene ikke utførte oppgaven som planlagt?	.224	.014	.613	.112	-.048	-.213	.028	.104
Var teamet komfortabel med å skifte retning i en arbeidsoppgave i løpet av arbeidsprosessen hvis dette var nødvendig?	.062	-.017	-.030	-.848	-.025	-.042	-.050	.027
Var dere fleksible i nye situasjoner når de oppsto?	.071	-.013	.050	-.806	-.120	-.029	-.031	-.067
Var teamet villig til å gjøre forandringer i arbeidstilnærmingen på bakgrunn av endringer	-.004	-.023	.003	-.749	-.042	.070	.081	.194

underveis i teamarbeidet?								
Var teamet villig til å forholde seg til uforutsette forandringer underveis i teamarbeidet?	.100	.158	-.002	-.689	-.109	.148	.046	-.005
Var teammedlemmene villig til å justere strategier fordi noen andre i teamet trengte assistanse?	-.051	-.012	.076	-.599	.015	-.087	.215	.093
Ga dere hverandre tilbakemelding om at beskjeder var oppfattet?	-.066	.014	.032	-.093	-.878	-.054	.015	.003
Ga dere hverandre tilbakemelding om beskjeder var mottatt?	-.048	.016	.093	-.008	-.864	-.001	.031	.009
Ga dere hverandre tilbakemelding om beskjeder var forstått?	-.046	.024	.033	-.076	-.862	-.096	.021	-.019
Forsikret teammedlemmene seg om at alle hadde mottatt viktig informasjon?	.087	.202	-.012	-.063	-.654	.054	.019	-.053
Ble informasjonen mottatt?	.247	-.051	.064	-.084	-.539	.076	-.053	.258
Var det noen i teamet som ga skryt hvis man gjorde en god innsats?	.278	.069	.118	-.103	.023	-.684	.035	.067
Var det noen i teamet som ga konstruktive tilbakemeldinger på innsatts i teamet?	.052	.089	.164	.062	-.221	-.680	.114	.059
Hadde teamet en felles forståelse av teamets omgivelser?	-.013	.009	.060	-.098	-.037	.150	.744	-.027
Hadde teamet en felles forståelse av dets mål?	.109	.078	.071	-.081	-.005	.110	.713	-.110
Hadde teammedlemmene et felles mål med teamarbeidet?	.201	-.046	.028	.003	-.020	-.073	.665	.066
Var teamets mål viktigere enn individuelle mål?	-.047	.016	-.042	.015	.002	-.255	.650	.119
Ville et teammedlem tatt over andres tiltenkte oppgave hvis vedkommende ikke hadde tid til å fullføre oppgaven selv?	-.147	.108	-.027	-.158	.051	-.066	-.017	.825
Var dere komfortabel med å ta over andres arbeid hvis de trengte hjelp?	.142	-.005	.016	.048	-.168	-.108	.093	.700
Var teammedlemmene villig til å utføre andre teammedlemmers arbeidsoppgaver ved nødvendighet for dette?	.069	.109	.214	-.179	.020	.173	.059	.621

Values in bold indicate the highest factor loadings in that given factor.

Table 2: The structure matrix, provides information about the correlation between items and factors of the Salas items. (Table continues on next page)

Items:	Factor loading							
	1	2	3	4	5	6	7	8
Trivdes dere med å samarbeide med hverandre?	.817	.128	-.435	-.410	-.243	-.175	.393	.128
Stolte dere på at teammedlemmene gjorde det de sa?	.816	.161	.289	-.400	-.428	.092	.479	.267
Var dere sikker på at de andre teammedlemmene gjorde sin del av arbeidet?	.813	.180	.411	-.367	-.456	.046	.492	.242
Stolte dere på at alle i teamet gjorde sitt beste for å nå målet?	.810	.182	.431	-.390	-.379	-.063	.458	.165
Var teammedlemmene positivt innstilt til teamarbeidet underveis i arbeidsprosessen?	.777	.066	.413	-.393	-.209	-.150	.368	.166
Hadde dere tillitt til de andre teammedlemmene sine kunnskaper og evner?	.743	.047	.362	-.418	-.371	.063	.477	.037
Forbedret samarbeidet med de andre teammedlemmene dine egne prestasjoner?	.741	.336	.281	-.401	-.331	-.269	.355	.189
Ble alle teammedlemmenes bidrag til teamet verdsatt?	.737	.133	.398	-.379	-.317	-.014	.461	.284
Ble oppgaven løst bedre av teamet enn om den skulle ha blitt løst av en person alene?	.736	.216	.190	-.311	-.310	-.269	.262	.189
Var det noen i teamet som planla teamets arbeidsprosess?	.114	.889	-.190	-.144	-.305	-.029	.140	.239
Var det noen i teamet som koordinerte arbeidsoppgavene underveis i teamprosessen?	.139	.858	-.164	-.275	-.297	-.171	.148	.350
Var det noen i teamet som passet på at teammedlemmene holdt seg på rett spor, selv om det oppstod endringer i teamsituasjonen?	.221	.846	.219	-.271	-.480	-.249	.189	.290
Var det noen i teamet som tok ansvar for at teammedlemmenes individuelle ferdigheter ble gjort nytte av?	.165	.717	.256	-.379	-.430	-.259	.296	.068
Var det akseptabelt å identifisere feil i de andre teammedlemmenes oppgaver?	.246	.237	.831	-.320	-.302	-.068	.375	.252
Var dere villig til å gi tilbakemelding til de andre teammedlemmene?	.393	.152	.816	-.384	-.410	-.214	.343	.090
Var det rom for å kommentere de andre teammedlemmenes arbeidsoppgaver?	.351	.232	.809	-.349	-.402	-.168	-.403	.181
Ga dere feedback på hverandres arbeid?	.268	.247	.751	-.301	-.389	-.377	.307	.236
Kunne dere spørre om en forklaring hvis de andre teammedlemmene ikke utførte oppgaven som planlagt?	.429	.143	.683	-.207	-.308	.118	.330	.242
Var dere fleksible i nye situasjoner når de oppsto?	.410	.238	.354	-.868	-.476	-.145	.377	.191
Var teamet komfortabel med å skifte retning i en arbeidsoppgave i løpet av arbeidsprosessen hvis dette var nødvendig?	.365	.216	.261	-.859	-.378	-.145	.331	.255
Var teamet villig til å gjøre forandringer i arbeidstilnærmingen på bakgrunn av endringer underveis i teamarbeidet?	.353	.234	.315	-.839	-.402	-.043	.438	.413

Var teamet villig til å forholde seg til uforutsette forandringer underveis i teamarbeidet?	.422	.368	.323	-.811	-.485	.011	.421	.161
Var teammedlemmene villig til å justere strategier fordi noen andre i teamet trengte assistanse?	.308	.217	.352	-.720	-.339	-.185	.492	.308
Ga dere hverandre tilbakemelding om at beskjeder var oppfattet?	.286	.376	.374	-.464	-.924	-.173	.326	.205
Ga dere hverandre tilbakemelding om beskjeder var forstått?	.298	.381	.376	-.452	-.914	-.214	.329	.187
Ga dere hverandre tilbakemelding om beskjeder var mottatt?	.292	.360	.411	-.401	-.903	-.119	.330	.202
Forsikret teammedlemmene seg om at alle hadde mottatt viktig informasjon?	.345	.453	.306	-.405	-.770	-.072	.302	.157
Ble informasjonen mottatt?	.491	.261	.389	-.450	-.685	-.033	.320	.414
Var det noen i teamet som ga skryt hvis man gjorde en god innsats?	.290	.345	.394	-.271	-.435	-.752	.328	.220
Var det noen i teamet som ga konstruktive tilbakemeldinger på innsatts i teamet?	.449	.287	.361	-.370	-.288	-.752	.315	.234
Hadde teamet en felles forståelse av dets mål?	.442	.203	.390	-.421	-.323	.015	.801	.114
Hadde teamet en felles forståelse av teamets omgivelser?	.348	.151	.363	-.414	-.312	.064	.797	.171
Hadde teammedlemmene et felles mål med teamarbeidet?	.507	.136	.375	-.384	-.314	-.151	.779	.249
Var teamets mål viktigere enn individuelle mål?	.245	.181	.241	-.291	-.228	-.311	.658	.260
Ville et teammedlem tatt over andres tiltenkte oppgave hvis vedkommende ikke hadde tid til å fullføre oppgaven selv?	.046	.321	.140	-.325	-.162	-.135	.165	.854
Var dere komfortabel med å ta over andres arbeid hvis de trengte hjelp?	.358	.280	.301	-.323	-.379	-.191	.352	.775
Var teammedlemmene villig til å utføre andre teammedlemmers arbeidsoppgaver ved nødvendighet for dette?	.340	.334	.437	-.465	-.316	.057	.375	.750

Values in bold indicate the highest factor loadings in that given factor.

Table 3: Factor correlation matrix for the Salas factors.

Factors	Factor loading						
	2	3	4	5	6	7	8
1	.136	.357	-.378	-.332	-.089	.412	.178
2		.183	-.254	-.375	-.172	.170	.253
3			-.321	-.365	-.116	.380	.202
4				.419	.122	-.416	-.272
5					.121	-.318	-.196
6						-.086	-.067
7							.217

Table 4: The pattern matrix shows item factor loadings for the Hackman items after oblimin rotation. Bold values indicate the highest loading factor values, in that factor.

Items	Factor loading		
	1	2	3
Likte teammedlemmene hverandre?	.730	.082	-.111
Ble dere lei av de andre teammedlemmene?	.719	.001	.120
Var du utslitt etter endt teamarbeid?	.700	-.125	.156
Var du frustrert etter endt teamarbeid?	.680	.165	-.082
Var vi vennlige mot hverandre i teamet?	.642	.132	-.113
Kunne dere tenke deg å jobbe med de samme teammedlemmene igjen?	.575	.088	-.370
Var det et godt samhold i teamet?	.550	.121	-.396
Var moralen i teamet god?	.532	.159	-.352
Fikk dere en positiv tilbakemelding på det arbeidet dere hadde gjennomført?	-.113	.889	-.051
Ble sluttresultatet av teamarbeidet vellykket	.078	.816	.006
Var teammedlemmene enig i at sluttresultatet av teamarbeidet ble vellykket?	.185	.778	.017
Tror dere brukerne av produktet/sluttresultater ble fornøyd?	-.030	.759	-.088
Fattet teamet gode beslutninger?	.002	.755	-.192
Var teamarbeidets resultat i overensstemmelse med, eller overgikk organisasjonens forventninger/målet for teamarbeidet?	-.025	.726	-.078
Klarte teamet å holde seg innenfor tidsrammen som ble satt av til teamarbeidet?	-.032	.719	.247
Var teamarbeidets resultat i overensstemmelse med dine forventninger for teamarbeidet?	.219	.534	-.265
Lærte du noe av å arbeide i dette teamet?	-.173	.058	-.907
Utviklet du deg som følger av at du deltok i teamet?	-.010	-.001	-.848
Fikk dere en positiv opplevelse av teamarbeid generelt?	.006	.058	-.846
Kunne dere tenke dere å arbeide i et team igjen?	.352	-.049	-.555
Fikk du noe igjen av å være med på teamarbeidet?	.466	.067	-.554
Var du mer tilfreds enn frustrert etter endt teamarbeid?	.348	.241	-.512

Table 5: Structure matrix, provides information about the correlations between the Hackman items and factors. Bold values indicate the highest loading factor values in that factor.

Items:	Factor loadings		
	1	2	3
Likte teammedlemmene hverandre?	.800	.354	-.438
Var du frustrert etter endt teamarbeid?	.765	.410	-.422
Kunne dere tenke deg å jobbe med de samme teammedlemmene igjen?	.751	.416	-.636
Var det et godt samhold i teamet?	.746	.452	.666
Var vi vennlige mot hverandre i teamet?	.728	.377	-.424
Var moralen i teamet god?	.723	.456	.630
Ble dere lei av de andre teammedlemmene?	.671	.176	-.169
Var du utslitt etter endt teamarbeid?	.599	.029	-.074
Fikk dere en positiv tilbakemelding på det arbeidet dere hadde gjennomført?	.182	.875	-.365
Ble sluttresultatet av teamarbeidet vellykket	.329	.838	-.356
Fattet teamet gode beslutninger?	.313	.834	-.499
Var teammedlemmene enig i at sluttresultatet av teamarbeidet ble vellykket?	.419	.834	-.372
Tror dere brukerne av produktet/sluttresultater ble fornøyd?	.241	.786	-.383
Var teamarbeidets resultat i overensstemmelse med, eller overgikk organisasjonens forventninger/målet for teamarbeidet?	.231	.750	-.361
Var teamarbeidets resultat i overensstemmelse med dine forventninger for teamarbeidet?	.491	.709	-.569
Klarte teamet å holde seg innenfor tidsrammen som ble satt av til teamarbeidet?	.093	.609	-.032
Fikk du noe igjen av å være med på teamarbeidet?	.364	.402	-.872
Lærte du noe av å arbeide i dette teamet?	.209	.371	-.861
Utviklet du deg som følger av at du deltok i teamet?	.330	.339	-.844
Fikk dere en positiv opplevelse av teamarbeid generelt?	.709	.436	-.768
Var du mer tilfreds enn frustrert etter endt teamarbeid?	.698	.556	-.749
Kunne dere tenke dere å arbeide i et team igjen?	.560	.285	-.677

Table 6: Factor correlation matrix for the Hackman factors.

Factors	Factor loadings		
	1	2	3
1	1.000	.310	-.401
2	.310	1.000	-.405
3	-.401	-.405	1.000

Table 7: Descriptive statistics, means and standard deviations for the Salas factor's and the Hackman factors.

	M	SD	N
Individual satisfaction	3,9668	.83017	182
Team survivability	3,6050	.81490	182
Team results	2.0442	.68087	182
Mutual performance monitoring	3,9047	.73205	182
Backup behaviour	3,8241	.76411	182
Adaptability	3,7288	.71827	182
Shared mental models	3,9602	.68890	182
Mutual trust/team orientation	3,8179	.82598	182
Closed loop communication	3,4712	.81502	182
Leadership, social	3,9753	.79236	182
Leadership, planning	3,6781	.84544	182

Table 8: Model Summary of the multiple regression analysis on the Salas factors predictability for the Hackman factor individual satisfaction.

R	R square	Adjusted R Square	Std, error of the estimate
.810	.656	.640	.49831

Table 9: Multiple regression analysis summary of the Salas-factor predicting the Hackman factor individual satisfaction

Variable	B	SE	β	t	p
Mutual performance monitoring	-.054	.068	-.048	-.798	.426
Backup behaviour	.096	.060	.089	1.601	.111
Adaptability	-.047	.074	-.041	-.636	.526
Shared mental models	.070	.074	.058	.944	.346
Mutual trust/team orientation	.746	.063	.742	11.829	.000
Closed loop communication	-.071	.065	-.70	-1.097	.274
Leadership, social	.131	.059	.125	2.247	.026
Leadership, planning	.029	.054	.030	.542	.588

(N=182, p<.05) Values in bold indicates statistical significance at the p < .05-level.

Table 10: *Correlations (Pearson) between the Salas factors and the Hackman factors.*

	Mutual performance monitoring	Backup behaviour	Adaptability	Shared mental models	Mutual trust/team orientation	Closed loop communication	Leadership , social	Leadership, planning
Individual satisfaction	.423	.384	.451	.523	.795	.377	.460	.275
Teams survivability	.427	.322	.441	.488	.817	.298	.403	.058
Teams results	.450	.355	.571	.536	.603	.490	.539	.368
Mutual performance monitoring		.410	.466	.515	.525	.524	.482	.325
Backup behaviour			.503	.407	.383	.414	.349	.418
Adaptability				.560	.560	.582	.405	.375
Shared mental models					.603	.448	.409	.283
Mutual trust/team orientation						.486	.456	.277
Closed loop communication							.451	.507
Leadership, social								.411

Table 11: Model Summary for the multiple regression analysis on the Salas factors predictability for the Hackman factor team survivability.

R	R square	Adjusted R Square	Std, error of the estimate
.841	.708	.694	.45082

Table 12: Multiple regression analysis summary of the Salas-factors predicting the Hackman factor teams survivability.

Variable	B	SE	β	t	p
Mutual performance monitoring	-.024	.061	-.022	.392	.695
Backup behaviour	.074	.054	.069	1.360	.176
Adaptability	.030	.067	.027	.449	.654
Shared mental models	-.008	.057	.006	-.112	.911
Mutual trust/team orientation	.812	.057	.823	14.235	.000
Closed loop communication	-.114	.058	-.114	-1.964	.052
Leadership, social	.110	.053	.107	2.077	.039
Leadership, planning	-.168	.049	-.174	-3.431	.001

(N=182, p<.05) Values in bold indicates statistical significance at the p < .05-level.

Table 13: Model Summary for the multiple regression analysis on the Salas factors predictability for the Hackman factor team results.

R	R square	Adjusted R Square	Std, error of the estimate
.725	.526	.504	.47964

Table 14: Multiple regression analysis summary of the Salas-factors predicting the Hackman factor team results.

Variable	B	SE	β	t	p
Mutual performance monitoring	-.024	.065	-.029	-.409	.684
Backup behaviour	.098	.058	.110	1.699	.091
Adaptability	.168	.072	.177	2.341	.020
Shared mental models	.177	.071	.119	1.645	.102
Mutual trust/team orientation	.215	.061	.261	3.548	.000
Closed loop communication	.043	.062	.052	.695	.488
Leadership, social	.204	.056	.237	3.619	.000
Leadership, planning	.029	.052	.035	.548	.585

(N=182, p<.05) Values in bold indicates statistical significance at the p < .05-level.

Appendix

Underneath follows the original questionnaire with instructions, as it was presented to participants.

Informasjon om prosjektet

Formålet med dette spørreskjemaet er å få økt forståelse og ny kunnskap om hvilke teamfaktorer som kan føre til effektiv teamfungering. Besvarelsene vil også bli brukt til å validere dette spørreskjemaet, som vi har utviklet for å måle teameffektivitet. Resultatene fra denne spørreundersøkelsen vil bli benyttet i våre mastergradsoppgaver ved Psykologisk Institutt, Norges teknisk naturvitenskapelige universitet (NTNU). Videre vil resultatene muligens bli benyttet i en vitenskapelig artikkel.

Det er frivillig å delta i undersøkelsen, og man kan trekke seg underveis i besvarelsen uten at man må oppgi grunn. Ingen navn eller personopplysninger vil bli registrert. Når spørreskjemaet er sendt inn, vil det ikke være mulig å trekke seg. IP-adresser vil bli lagret på fakultetsservere, for å holde kontroll på muligheter for doble besvarelser, men disse vil bli slettet når datainnsamlingen avsluttes (januar 2012). Prosjektet er meldt til Personvernombudet for forskning, norsk samfunnsvitenskapelige datatjeneste AS (NSD).

Det er ingen "riktige" eller "gale" svar på spørsmålene i dette spørreskjemaet, det er dine egne meninger og subjektive oppfatninger vi er interesserte i. Selv om noen spørsmål ikke vil passe like godt til din situasjon, er det viktig for kvaliteten til undersøkelsen at alle spørsmål blir besvart.

Du skal besvare hele spørreskjemaet med utgangspunkt i en spesifikk teamerfaring som du spesifiserer tidlig i spørreskjemaet. Med "team" menes to eller flere personer som jobber sammen mot et felles mål, samt at de har et gjensidig avhengighetsforhold.

På forhånd takk for at du er villig til å delta.

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- Kjønn?
o Kvinne
o Mann

- Fra hvilket team har du erfaring med? Du skal besvare hele spørreskjemaet med utgangspunkt i en spesifikk teamerfaring.

- produksjonsteam
- studentteam
- service team
- virtuelt team
- ledelsesteam
- salgsteam
- prosjekt team
Annet: (før inn)

- Alder?
o 18-29
o 30-39
o 40-49

o 50+

- Hvor lenge pågikk teamarbeidet?

o en uke

o en måned

o ett halvt år

o ett år

o flere år

I denne første delen vil vi gjerne at du forholder deg til din opplevelse under teamarbeidsprosessen.

I hvilken grad:

1. Visste alle hva de andre teammedlemmene jobbet med?
2. Holdt dere oversikt over de andre sine oppgaver, samtidig som dere gjennomførte egne oppgaver i teamet?
3. Var det rom for å kommentere de andre teammedlemmenes arbeidsoppgaver?
4. Var det akseptabelt å identifisere feil i de andre teammedlemmenes oppgaver?
5. Ga dere feedback på hverandres arbeid?
6. Kunne dere spørre om en forklaring hvis de andre teammedlemmer ikke utførte oppgaven som planlagt?
7. Ble eventuelle misforståelser tatt opp på en konstruktiv måte?
8. Hadde dere kunnskap om hverandres ansvarsområder?

I hvilken grad:

1. Ville et teammedlem tatt over andres tiltenkte oppgave hvis vedkommende ikke hadde tid til å fullføre oppgaven selv?
2. Var dere villig til å gi råd til hverandre i teamet?
3. Var dere komfortabel med å ta over andres arbeid hvis de trengte hjelp?
4. Kunne teammedlemmene be hverandre om hjelp?
5. Ville alle vært villig til å bistå i andres teammedlemmers arbeidsoppgaver, hvis dette krevdes for å bli ferdig i tide?
6. Var teammedlemmene villig til å utføre andre teammedlemmers arbeidsoppgaver ved nødvendighet for dette?
7. Fikk dere hjelp fra de andre teammedlemmene hvis dere hadde vanskeligheter med dine arbeidsoppgaver.
8. Var dere villig til å gi tilbakemeldinger til andre teammedlemmer?

I hvilken grad:

1. Var teammedlemmene villig til å justere strategier fordi noen andre i teamet trengte assistanse?
2. Var teamet komfortabel med å skifte retning i en arbeidsoppgave i løpet av arbeidsprosessen hvis dette var nødvendig?
3. Var dere fleksible i nye situasjoner når de oppsto?
4. Var alle i teamet klar over de ressurser teamet hadde til rådighet?
5. Var teamet villig til å forholde seg til uforutsette forandringer underveis i teamarbeidet?

6. Var teamet villig til å gjøre forandringer i arbeidstilnærmingen på bakgrunn av endringer underveis i teamarbeidet?
7. Sjekk dere hvordan dere lå an i forhold til teammålet iløpet av arbeidsprosessen?
8. Klarte dere å tilpasse arbeidet basert på erfaringer dere fikk underveis?

I hvilken grad:

1. Var teamets mål viktigere enn individuelle mål?
2. Ble alle teammedlemmene hørt når de snakket om sine meninger?
3. Trivdes dere med å samarbeide med hverandre?
4. Forbedret samarbeidet med de andre teammedlemmene dine egne prestasjoner?
5. Var teammedlemmene positivt innstilt til teamarbeidet underveis i arbeidsprosessen?
6. Trengte dere å være et team for å lykkes med oppgaven?
7. Løste dere teamets problemer sammen?
8. Ble oppgaven løst bedre sammen av teammedlemmene enn om den skulle ha blitt løst av en person alene.

I hvilken grad:

1. Hadde teamet en felles forståelse av dets mål?
2. Hadde teamet en felles forståelse av teamets omgivelser?
3. Hadde teammedlemmene et felles mål med teamarbeidet?
4. Var det en felles forståelse på fordeling av arbeidsoppgaver?
5. Forstod de andre teammedlemmene hverandre under arbeidsprosessen?
6. Forstod alle hva de andre teammedlemmene jobbet med under teamprosessen?
7. Visste alle hvordan teammedlemmene skulle oppføre seg?
8. Kjente dere hverandres styrker og svakheter i forhold til oppgaveløsningen?

I hvilken grad:

1. Stolte dere på hverandre i teamet?
2. Hadde dere tillitt til de andre teammedlemmenes kunnskap og evner?
1. Godtok dere andre teammedlemmers kommentarer om arbeidsutførelse?
2. Hadde dere problemer med å innrømme feil dere gjorde?
3. Aksepterte dere andre teammedlemmers feil?
4. Delte dere informasjon med hverandre?
5. Stolte dere på at de andre teammedlemmene gjorde det de sa?
6. Ble alle teammedlemmenes bidrag til teamet verdsatt?
7. Var dere sikker på at de andre teammedlemmene gjorde sin del av arbeidet?
8. Stolte dere på at alle i teamet gjorde sitt beste for å nå målet?

I hvilken grad:

1. Forsikret teammedlemmene hverandre om at innspill ble forstått slik de var ment?
2. Prøvde teammedlemmene å få oppklart informasjon de ikke forsto, eller var usikre på?
3. Var dere bevisst på at misforståelser kunne vanskeliggjøre teamarbeidet?
4. Ga dere hverandre tilbakemelding om at beskjeder var oppfattet?
5. Ga dere hverandre tilbakemelding om beskjeder var forstått?
6. Ga dere hverandre tilbakemelding om beskjeder var mottatt?

7. Ble informasjonen mottatt?
8. Forsikret teammedlemmene seg om at alle hadde mottatt viktig informasjon?

I hvilken grad:

1. Var det noen i teamet som tok ansvar for at teammedlemmenes individuelle ferdigheter ble gjort nytte av?
2. Var det noen i teamet som gav skryt hvis man gjorde en god innsats?
3. Var det noen i teamet som gav konstruktiv tilbakemelding på innsats i teamet?
4. Var det noen i teamet som passet på at teamet forholdt seg til et felles mål under hele teamarbeidet?
5. Var det noen i teamet som gjorde en innsats for å motivere teammedlemmene?
6. Var det noen i teamet som planla teamets arbeidsprosess?
7. Var det noen i teamet som passet på at teammedlemmene holdt seg på rett spor, selv om det oppsto endringer i teamsituasjonen?
8. Var det noen i teamet som koordinerte arbeidsoppgavene underveis i teamprosessen?

I de neste spørsmålene vil vi at du forholder deg til din opplevelse etter at teamarbeidet var fullført.

I hvilken grad:

1. Ble sluttresultatet av teamarbeidet vellykket?
2. Var teammedlemmene enig i at sluttresultatet av teamarbeidet ble vellykket?
3. Klarte teamet å holde seg innenfor tidsrammen som ble satt av til teamarbeidet?
4. Fikk dere en positiv tilbakemelding på det arbeidet dere hadde gjennomført?
5. Fattet teamet gode beslutninger?
6. Tror dere brukerne av produktet/sluttresultater ble fornøyd?
7. Var teamarbeidets resultat i overensstemmelse med, eller overgikk organisasjonens forventninger/målet for teamarbeidet?
8. Var teamarbeidets resultat i overensstemmelse med dine forventninger for teamarbeidet?

I hvilken grad:

1. Kunne dere tenke dere å jobbe med de samme teammedlemmene igjen?
2. Fikk dere en positiv opplevelse av teamarbeid generelt?
3. Kunne dere tenke dere å arbeide i et team igjen?
4. Ble dere lei av de andre teammedlemmene?
5. Var det et godt samhold i teamet?
6. Var moralen i teamet god?
7. Var vi vennlige mot hverandre i teamet?
8. Likte teammedlemmene hverandre?

I hvilken grad:

1. Lærte du noe av å arbeide i dette teamet?
2. Var du frustrert etter endt teamarbeid?
3. Var du tilfreds etter endt teamarbeid?
4. trivdes du med måten dere arbeidet på i teamet?

5. Fikk noe igjen av å være med på teamarbeidet?
6. Var du utslitt etter endt teamarbeid?
7. Utviklet du deg som følger av at du deltok i teamet?
8. Var du mer tilfreds enn frustrert etter endt teamarbeid?

Underneath follows items that remained after the factor analyses.

The Salas et al. (2005) items:

Gjensidig tillitt/team orienteering (mutual trust/ team orientation) factor 1

- Stolte dere på at de andre teammedlemmene gjorde det de sa?
- Var dere sikker på at de andre teammedlemmene gjorde sin del av arbeidet?
- Stolte dere på at alle i teamet gjorde sitt beste for å nå målet?
- Ble alle teammedlemmenes bidrag til teamet verdsatt?
- Hadde dere tillitt til de andre teammedlemmenes kunnskap og evner?
- Var teammedlemmene positivt innstilt til teamarbeidet underveis i arbeidsprosessen?
- Forbedret samarbeidet med de andre teammedlemmene dine egne prestasjoner?
- Trivdes dere med å samarbeide med hverandre?
- Ble oppgaven løst bedre av teamet enn om den skulle ha blitt løst av en person alene.

Ledelsesorientering, planlegging, (leadership, planning) faktor 2

- Var det noen i teamet som planla teamets arbeidsprosess?
- Var det noen i teamet som koordinerte arbeidsoppgavene underveis i teamprosessen?
- Var det noen i teamet som passet på at teamet holdt seg på rett spor, selv om det oppsto endringer i teamsituasjonen?
- Var det noen som tok ansvar for at teammedlemmenes individuelle ferdigheter ble gjort nytte av?

Gjensidig prestasjonsovervåking, (mutual performance monitoring) faktor 3

- Var dere villig til å gi tilbakemeldinger til andre teammedlemmer?
- Var det akseptabelt å identifisere feil i de andre teammedlemmenes oppgaver?
- Var det rom for å kommentere de andre teammedlemmenes arbeidsoppgaver?
- Ga dere feedback på hverandres arbeid?
- Kunne dere spørre om en forklaring hvis de andre teammedlemmene ikke utførte oppgaven som planlagt?

Tilpasningsdyktighet, (adaptability) factor 4

- Var teamet komfortabel med å skifte retning i en arbeidsoppgave i løpet av arbeidsprosessen hvis dette var nødvendig?
- Var dere fleksible i nye situasjoner når de oppsto?
- Var teamet villig til å gjøre forandringer i arbeidstilnærmingen på bakgrunn av endringer underveis i teamarbeidet?
- Var teammedlemmene villig til å justere strategier fordi noen andre i teamet trengte assistanse?
- Var teamet villig til å forholde seg til uforutsette forandringer underveis i teamarbeidet?

Closed loop communication, faktor 5

- Ga dere hverandre tilbakemelding om at beskjeder var oppfattet?
- Ga dere hverandre tilbakemelding om beskjeder var mottatt?
- Ga dere hverandre tilbakemelding om beskjeder var forstått?
- Forsikret teammedlemmene seg om at alle hadde mottatt viktig informasjon?
- Ble informasjonen mottatt?

Ledelsesorientering, sosial, (leadership, social) faktor 6

- Var det noen i teamet som ga skryt hvis man gjorde en god innsats?
- Ble det gitt konstruktiv tilbakemelding på innsats i teamet?

Delte mentale modeller, (shared mental models) faktor 7

- Hadde teamet en felles forståelse av teamets omgivelser?
- Hadde teamet en felles forståelse av dets mål?
- Var teamets mål viktigere enn individuelle mål?
- Hadde teammedlemmene et felles mål med teamarbeidet?

Støttende atferd, (backup behaviour) faktor 8

- Ville et teammedlem tatt over andres tiltenkte oppgave hvis vedkommende ikke hadde tid til å fullføre oppgaven selv?
- Var dere komfortabel med å ta over andres arbeid hvis de trengte hjelp?
- Var teammedlemmene villig til å utføre andre teammedlemmers arbeidsoppgaver ved nødvendighet for dette?

The Hackman (1990) items:

Saksresultater (team results, faktor 2)

- Ble sluttresultatet av teamarbeidet vellykket?
- Var teammedlemmene enig i at sluttresultatet av teamarbeidet ble vellykket?
- Klarte teamet å holde seg innenfor tidsrammen som ble satt av til teamarbeidet?
- Fikk dere en positiv tilbakemelding på det arbeidet dere hadde gjennomført?
- Fattet teamet gode beslutninger?
- Tror dere brukerne av produktet/sluttresultater ble fornøyd?
- Var teamarbeidets resultat i overensstemmelse med, eller overgikk organisasjonens forventninger/målet for teamarbeidet?
- Var teamarbeidets resultat i overensstemmelse med dine forventninger for teamarbeidet?

Teamets overlevelsessevne (the teams survivability), faktor 1

- Kunne du tenke deg å jobbe med de samme teammedlemmene igjen?
- Ble dere lei av de andre teammedlemmene?
- Var det et godt samhold i teamet?
- Var moralen i teamet god?
- Var vi vennlige mot hverandre i teamet?
- Likte teammedlemmene hverandre?
- Var du utslitt etter endt teamarbeid?
- Var du frustrert etter endt teamarbeid?

Individuell tilfredshet (individual satisfaction), faktor 3

- Lærte du noe av å arbeide i dette teamet?

- Fikk du noe igjen av å være med på teamarbeidet?
- Utviklet du deg som følger av at du deltok i teamet?
- Var du mer tilfreds enn frustrert etter endt teamarbeid?
- Fikk dere en positiv opplevelse av teamarbeid generelt?
- Kunne dere tenke dere å arbeide i et team igjen?