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Tips for Tackling Team Task Analysis

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**United States Army Research Institute
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14. ABSTRACT Job analysis is a fundamental building block of human resource functions such as designing a selection system or training program. A focus on individual jobs has resulted in limited published guidance on conducting job analysis at the team level despite repeated calls for specification of those techniques. Methods and guidelines for team task analysis data are crucial given the prominence of teams in the workplace. Gathering information about work performed at the team level is important when designing and implementing human resource programs for teams. Important steps for researchers and job analysts conducting a team task analysis include determining the purpose of the analysis, planning and preparing for data collection, identifying a relevant teamwork taxonomy or framework, collecting relevant task ratings, collecting relevant linkages, and analyzing and reporting results. This report discusses the process for conducting a team task analysis, including the five considerations proposed by Burke and Howell (2018), and offers practical guidance for team task analysis.					
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TIPS FOR TACKLING TEAM TASK ANALYSIS

EXECUTIVE SUMMARY

Research Requirement:

In the late 2010s, the United States Army made a commitment to prioritize people as a way to increase effectiveness and maintain readiness (U.S. Army, 2020). As part of the Army People Strategy (APS; U.S. Army, 2019), talent management in the Army will shift to more deliberate management of people and teams to maximize the knowledge, skills, behaviors, and preferences of all Army personnel. Job analysis is an excellent tool to study jobs at the individual level, but a focus on teams requires different and modified methods and processes. A better understanding of how to study teams is needed to design talent management initiatives that leverage the abilities of Army teams.

Approach:

A review of the literature identified various sources that discuss job analysis at the team level. Similar sources about related methods (e.g., hierarchical task analysis for teams, cognitive task analysis) were also reviewed. An in-depth review of the job analysis literature highlighted additional issues for consideration when conducting job analysis at the team level.

Findings:

This report provides a series of steps to consider when conducting a team task analysis. Important milestones in the process include identifying the purpose of the project, planning and preparation for data collection, collecting ratings of tasks, identifying a teamwork taxonomy or relevant teamwork constructs, collecting linkages, and reporting the results. Conducting a team task analysis is a time-consuming, resource-intensive, and iterative process. However, with a clear purpose in mind and careful consideration of the decisions to be made, useful information about the team may be gathered.

Utilization and Dissemination of Findings:

Job analysis at the team level is necessary to design and implement team-level selection systems and training. The information and suggestions for practical application noted here will allow researchers to conduct high-quality work that leads to the design of crucial team-level human resource systems and interventions.

TIPS FOR TACKLING TEAM TASK ANALYSIS

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Introduction

Teams have become a common way of life in organizations, and much research has been conducted to evaluate the effectiveness of teams. Teams allow individuals to specialize and/or collaborate in order to accomplish complex tasks and goals. Like many commercial organizations, the U.S. Army is structured in teams. Soldiers rely on one another while serving and depend on each other to accomplish tasks. The Army's renewed focus on talent management in the late 2010s includes an emphasis on small units and the importance of their readiness (U.S. Army, 2020).

Improving team effectiveness is a recognized human resource intervention goal (Goodwin et al., 2018). Job analysis is the foundation of many human resource functions like designing a selection system or training program. However, the use of existing job analysis methods to study teams introduces issues; job analysis has traditionally been performed at the individual level, creating a disconnect between how the work is performed and how the work is studied. As organizations and jobs become more team-based, there is a need to understand work as it occurs at the team level.

There have been several calls for job analysis for teams and other methods to address human resource functions at the team level (e.g., Mohammed et al., 2010; Singh, 2008). However, there is limited published methodological guidance about team task analysis (e.g., Lorenzet et al. 2003; Mohammed et al., 2010; Morgeson et al., 2012; Pearlman & Sanchez, 2010), and researchers often lament how team-level job analysis is not performed as often as individual level job analysis is (e.g., Baker et al., 1998; Lorenzet et al., 2003). In this report, we aim to offer practical advice on the considerations for conducting a team task analysis offered by Burke and Howell (2018).

When planning a team task analysis (TTA), the analyst will make decisions about data collection that differ from those at the individual level of analysis. Not doing so could result in inaccurate conclusions about the nature of teamwork demands for the job. Burke and Howell (2018) pose five considerations to take into account when deciding how to conduct a TTA.¹ We expand on the considerations with more nuanced issues or points of concern based on our experience conducting a team task analysis. The Appendix includes a quick reference guide with an overview of possible steps to be included in a team task analysis. Researchers and analysts planning to conduct a team task analysis may find it useful to print the quick reference guide and follow along as you review this report.

Preparing for the TTA

When preparing to conduct a TTA, the researcher will need to make several choices about how to collect the data. This is a similar process to conducting other types of work analysis. However, now the data must relate to the taskwork *and* the teamwork demands of the job. McCormick (1970) identified four dimensions of job-related information (i.e., work analysis

¹ Baker et al. (1998) also offer a list of 10 questions for team task analysis. We elaborate on the considerations from Burke and Howell (2018) because that paper includes more actionable suggestions for conduct of a team task analysis than the Baker et al. (1998) article.

methods) describing options when planning work analysis: (1) type of job-related information, (2) form of job-related information, (3) method of collection of job-related information, and (4) agent used in collecting job-related information. Over the last 40 years, the content and labels of these categories have evolved in pace with the science of work analysis (e.g., McCormick, 1979; Levine, 1983; Levine, Sistrunk, et al., 1988; Morgeson et al. 2020). A recent iteration of the job-information framework by Morgeson et al. (2020) refers to the dimensions as building blocks and the fourth building block as units of analysis. Morgeson and colleagues also give a thorough description of most entries in each dimension. Table 1 includes an updated list of the categories for TTA, reflecting current work analysis research and practice applied to teams (see Morgeson et al., 2020). Decisions about which aspect features to use should include additional contextual information, and should not be selected in isolation. When determining a TTA data collection plan, match at least one option from each of the categories for each round of data collection.

Before data collection planning begins, *know the purpose of the team task analysis* (Burke, 2005; Burke & Howell, 2018; Stanton et al., 2013; van Berlo, 2004). This is an extremely important step. Ensure that the purpose and goals of the team task analysis are clear and known from the beginning of the project. Key decisions points in the project require knowledge of the purpose of the team task analysis to make an informed decision. The purpose of the team task analysis will guide decisions about the number and type of SMEs used for ratings and linkages, the teamwork taxonomy used, and the anchors used for the ratings and linkages. Understandably, resources constraints such as funding, time, and availability of SMEs may dictate what choices the analyst will have to make. Therefore, having the strong foundation of a known purpose will guide decision making throughout the project.

Data Collection Planning

The first step is to collect information necessary to identify the goal of the analysis, to determine the scope of the analysis, and to prepare an analysis and evaluation plan during the initial preparation phase of a TTA, in addition to other project planning details (van Berlo, 2004). To help develop the data collection plan, collect information about factors that may limit the scope of the analysis. These factors may include (a) organizational constraints and resources; (b) the organizational climate or conditions under which TTA data will be collected and the TTA will be implemented; (c) availability and access to data sources; (d) the quantity, quality, and perceived importance of descriptors; and (e) the amount of data needed to ensure representativeness of the underlying population and meet standards of reliability (i.e., sampling plan). The data analysis plan for the TTA should be feasible based on the project constraints. If the goal is training-related, expand the information collected during the needs analysis process to include what is needed for creating the TTA data collection plan (Gregory et al., 2013; Shuffler et al., 2012). Once the analyst determines the goal or purpose of the TTA, they can begin making decisions regarding the selection of work analysis options.

Table 1*Summary of Job-Related Information for Team Task Analysis*

Descriptors	Sources of Team Task Analysis Data	Methods of Data Collection	Methods for Analyzing /Synthesizing Data
1. Organization philosophy, mission, goals, climate, and structure	1. Work analyst	1. Observation	1. Team functions (e.g., individual and collective duties)
2. Licenses and other governmental requirements for team members	2. Job incumbent in target team position	2. Individual or group interviews	2. Individual and collective taskwork/activities and teamwork
3. Responsibilities and mission of teams and team members	3. Job incumbents in other team positions	3. Technical conferences	3. Elemental motions
4. Professional standards for team members and unit/organization norms	4. Officer/supervisor managing the team or team members	4. Questionnaires	4. Team-related job dimensions (e.g., leadership, planning, communication)
5. Job/environmental context (e.g., temperature, crowding, hazards)	5. Higher ranking officer/executive	5. Diaries	5. Teamwork requirements
6. Tangible products, outputs, or services provided by the team or team members	6. Technical expert	6. Equipment-based methods (e.g., video/audio recording, digital trace data, sociometric badge)	6. Team member KSAO requirements
7. Machines, tools, equipment, work aids, and checklists	7. Instructor/training specialist	7. Reviewing records/literature/equipment specifications	7. Scales applied to units of work (e.g., task importance, interdependence)
8. Team performance indicators and standards	8. Clients or customers	8. Doing the work (if feasible)	8. Scales applied to team member KSAOs (e.g., KSAO importance, required at entry)
9. Physical, cognitive, and affective demands on team members (e.g., workload, time pressure, atypical work schedules)	9. Other organizational units		9. Graphical description methods (e.g., workflow diagrams or time charts detailing task interdependence)
10. Elemental motions performed by team members	10. Written documents (e.g., Mission Essential Task Lists [METLs], Training and Evaluation Outlines [T&EOs], field manuals, training manuals, handbooks, equipment specifications)		10. Individual task and team competencies
11. Team and team member internal processing activities (e.g., individual/team cognition)	11. Previous job/work analysis		11. Qualitative versus quantitative analysis
12. Team and team member tasks/activities			
13. Team member knowledge, skills, abilities and other characteristics (KSAOs)			
14. Teamwork taxonomy			
15. Future changes (e.g., technology-based KSAO requirements)			
16. Critical incidents			

Note. Adapted from Morgeson et al. (2020). Used with permission of SAGE College, from *Job and Work Analysis: Methods, Research, and Applications for Management*, F. P. Morgeson, M. T. Brannick, & E. L. Levine, 3rd ed., 2020; permission conveyed through Copyright Clearance Center, Inc.

Use the information collected in preparation for the TTA to select the building blocks in each of the four categories. Several sources provide information useful for the data collection planning process including Harvey (1991), Harvey et al. (2007), Morgeson and Dierdorff (2011), Morgeson et al. (2020), and Van De Voort and Whelan (2012).² Morgeson et al. (2020) advise making decisions about the data collection plan in the following order:

1. Select descriptors and the order in which they should be collected. Some descriptors can be collected during a single activity. For example, one questionnaire can include ratings of work activities as well as worker characteristics (i.e., knowledge, skills, abilities, and other characteristics; KSAOs) and team requirements. If data from the organization is limited, dated, or does not exist, Dierdorff (2012) offers advice for using secondary sources.
2. Select the TTA data collection method based on the properties of the descriptor and the information gathered during the preparation phase.
3. Match the best available sources of data to the methods of collection. Although some advocate collecting data from as many sources as possible (Lorenzet et al., 2003), use information gathered during the needs assessment (e.g., climate for collecting data, availability, time allotted for data collection) to create an optimal data collection strategy. Regardless of your constraints, use multiple methods to collect data (Morgeson & Dierdorff, 2011). The analyst can include multiple sources each assigned to *different* data collection activities or include multiple sources in a *single* activity. For example, supervisors, technical experts, and training specialists can attend a single group interview to review the content of a work analysis questionnaire before administering it to a sample of job incumbents.
4. Select the units of analysis, including methods of data analysis and reporting. Since the study of teams is, by definition, multilevel, confirm that the level of data analysis and assumptions about the results are appropriate. Check for incongruent levels among proposed analyses and measures (Kozlowski & Klein, 2000). If appropriate, consider including a step to confirm assumptions about the level of analysis once the data is collected.

Burke (2005) recommends a slightly different order in planning data collection, under the umbrella of a requirements analysis. Her method includes four steps. First, write a description of the duties and the conditions under which tasks are performed to define the job being analyzed.

² Work analysis techniques can be roughly organized on a spectrum, defining work more broadly to more narrowly. The references given above mostly focus on the broader end of the work analysis spectrum: job analysis. Methods used to describe work more narrowly are typically referred to as task analysis. Generally, these methods are restricted to a subset of the content described by the job analysis methods but describe the work in smaller units (e.g., elements, activities, tasks). Historically, task analysis was used for engineering purposes while job analysis was for human resources. Task analysis methods also tend to be more descriptive or qualitative than some job analysis methods. However, in practice there is no clear line demarcating job analysis from task analysis. The distinction defies a clear categorization (McCormick, 1979). In fact, several techniques are included in both lists of job and task analyses, including the Critical Incident Technique (Flanagan, 1954), observations, and interviews. See Kirwan and Ainsworth (1992) for a review of task analysis techniques.

Second, select the data collection methods to be used in the TTA based on characteristics of the job and the purpose of the analysis (e.g., training, selection, systems design). Third, draft a protocol for performing the TTA. Finally, identify the sources for collecting TTA data, including the number and type of subject matter experts (SMEs; e.g., incumbents, supervisors, training instructors).

TTA is an iterative process involving multiple rounds of data collection. Several TTA and job analysis researchers recommend collecting data using multiple methods to provide a more complete representation of the team-related aspects of the job, to mitigate bias in the results of the task analysis, and to improve the accuracy of the analysis (e.g., Arthur, Villado, & Bennett, 2012; Goldstein & Ford, 2002; Kato et al., 2018; Lorenzet et al., 2003; Morgeson & Campion, 2012). Each data collection method and source has different strengths. Include options with complementary strengths that best meet the goals of the analysis. Plan for later data collection activities to add important detail to the understanding of the job garnered from previous activities. Doing so will help build a more comprehensive understanding of the teamwork requirements of the job.

The iterative nature of TTA makes it easy to build additional goals into a project. For example, perhaps after a TTA designed for selection is completed, there is a need to design team training for new hires. The sample used to determine ratings of tasks may be appropriate for the training purpose. The researcher could simply collect additional data to fill in gaps (e.g., consequence of error ratings) that were not collected during earlier rounds of data collection.

From Whom to Collect Data?

At some point in the TTA, the analyst will likely need data that can only be gathered from SMEs. The most commonly used methods for collecting data (e.g., individual or group interviews and questionnaires) entail interacting with SMEs. Burke and Howell (2018) note that deciding from whom to collect data is a consideration that may differ depending on the focus of the analysis, at either the individual or team level. Some SME sources of job information are more appropriate than others. The suitability of a source depends on the type of data being collected, data collected earlier in the TTA process, the purpose of the analysis, and the nature of the work being performed.

As an example, if data collected in a prior step of the TTA suggest tasks require a high degree of interdependence, other team members could be an additional source of information for teamwork requirements (Burke & Howell, 2018). Those team members may have a nuanced perspective representing the reciprocal nature of team processes. The data could supplement those collected from incumbents. Table 2 lists categories of SMEs with their suitability as sources of different types of work information, suggestions of when to include each type of SME in data collection, other considerations when considering the source, and supporting references. Refer to Guder (2012) and Van De Voort and Whelan (2012) for more information about the types of SMEs.

The number of SMEs should be based on best practices for the data collection method and adequately address representativeness and reliability concerns. In practical terms, however,

Table 2*SME Sources of Team Task Analysis Data*

SME Sources	Types of Information	When to Use	Other Considerations	Source Citations
1. Work analyst	KSAO information, including trainability Work context information	More abstract judgments are needed. Other sources may be motivated to provide inaccurate information. Other sources' time is at a premium. High-level (versus specific) job information is needed.	Work analysts must familiarize themselves with the work, which often requires extensive observations and interviews (can be costly).	Guder (2012); Morgeson et al. (2020); Sanchez (2000)
2. Job Incumbent in target team position	Work tasks and activities, as they are <i>currently</i> performed	Whenever available, especially when the following are true: <ul style="list-style-type: none"> • Work is complex, knowledge-based, or otherwise difficult to observe. • Other qualified sources are not available. • Potential for user-acceptance issues if incumbents are not involved. 	When selecting participants: <ol style="list-style-type: none"> 1. Include incumbents with varied experience levels. (Minimum tenure requirements may be appropriate.) 2. Use sampling procedures rather than supervisor nominations to improve representativeness of sample. 3. Do not focus exclusively on the top performers or most satisfied employees. <p>Incumbents may overstate the abilities or competencies required to perform the work, especially when there is a perception that doing so will be personally beneficial.</p> <p>If the analysis is intended to generalize across the Army, consider sampling across</p>	Baker & Salas (1996); Dierdorff & Wilson (2003); Guder (2012); Morgeson et al. (2020); Voskuil & van Sliedregt (2002)

(Continued)

SME Sources	Types of Information	When to Use	Other Considerations	Source Citations
			<p>multiple units that have conducted, are currently conducting, or are preparing to conduct a variety of missions.</p> <p>Level of experience:</p> <ol style="list-style-type: none"> 1. Less experienced incumbents may rate the difficulty of performing team behaviors higher than more experienced incumbents, while more experienced incumbents may rate the time spent performing team behaviors higher than less experienced incumbents. 2. Less experienced incumbents may be assigned easier or otherwise different tasks than their more experienced peers, which can affect their ratings. 	
3. Job incumbents in other team positions	Teamwork processes, including information about how the work fits into larger team processes	<p>Tasks require a high degree of interdependence.</p> <p>Team members have been cross-trained in the target job.</p> <p>Teams with low skill differentiation.</p>		Burke & Howell (2018); Cannon-Bowers & Bowers (2011); Hollenbeck et al. (2012); Morgeson et al. (2020); Sundstrom et al. (1990)
4. Officer/supervisor overseeing the team or team members	KSAO information, perspectives on how work <i>should</i> be performed	<p>Supervisors directly observe the work.</p> <p>Incumbent sources are not feasible (e.g., lack of availability, poor</p>	<p>Although less of a concern than with incumbents, supervisors may be motivated to inflate ratings.</p> <p>Combining incumbents with their supervisors in a group interview or technical</p>	Guder (2012); Morgeson et al. (2020); Kato et al. (2018)

(Continued)

SME Sources	Types of Information	When to Use	Other Considerations	Source Citations
		communication skills, or high turnover).	conference may inhibit incumbent participation or bias their responses.	
		Potential for user-acceptance issues if supervisors are not involved.	Supervisors may rate cognitively-loaded knowledge and skills as more important than incumbents, but rate non-cognitive knowledge and skills as less important than incumbents.	
5. Higher ranking officer/ executive	Perspectives on the organization's strategy and goals	Identify organizational philosophy, strategy, or vision. Potential likelihood of organizational-level issues associated with not involving executives or managers.	May be less likely to participate in work analysis activities, particularly questionnaires, than incumbents. Can serve as change agent/organizational champion to improve implementation effectiveness.	Cycyota & Harrison (2006); Gallagher et al. (2002); Goldstein & Ford (2002); Morgeson et al. (2020)
6. Technical expert	Perspectives on best use of new tools, technology, or procedures	Identify the purpose of technically complex tasks. Designing training for new equipment or process.	Reliability of task ratings made by technical experts may be higher than ratings made by incumbents regardless of rating scale or number of SMEs.	Dierdorff & Wilson (2003); Morgeson et al. (2020)
7. Instructor/ training specialist	Perspectives on information relevant to training and critical tasks rarely performed by incumbents	Designing training for new equipment or process. Designing training for KSAOs prone to a high degree of knowledge or skill decay.		Arthur et al., (2013); Morgeson et al. (2020)
8. Clients or customers	Perspectives on how or what work should be performed	When work is customer-focused.		Guder (2012); Morgeson et al. (2020)

(Continued)

SME Sources	Types of Information	When to Use	Other Considerations	Source Citations
		When customers come in contact with some aspect or product of the work.		
9. Other organizational units	Information about the interactions with other units required to perform the work	Interactions with other units is an important facet of work performance.		Guder (2012); Morgeson et al. (2020); Sundstrom et al. (1990)
	Information about how the work fits into larger work processes	Other units come in direct contact with some aspect or product of the work.		
		Units work interdependently.		
		Tasks require a high degree of synchronization with other teams.		

Note. Adapted from Guder (2012). Copyright © 2012 From “Identifying Appropriate Sources of Work Information” by E. J. Guder in *The Handbook of Work Analysis* M. A. Wilson, W. Bennett, Jr., S. G. Gibson, and G. M. Alliger (Eds.). Reproduced by permission of Taylor and Francis Group, LLC, a division of Informa plc.

the type and number of SMEs is frequently limited by organizational constraints, such as time pressures, the budget allocated to the TTA, and availability/scheduling conflicts (Burke, 2005; Goldstein & Ford, 2002).

Can the Same Rating Indices Be Used as in Traditional Task Analysis?

In most cases, the scales employed in individual work analysis questionnaires can be used for TTA. Table 3 contains typical work analysis scales, including those for (individual) task, KSAO, KSAO to task linkages, and team tasks. The lists for task and team task in the table overlap considerably. However, using the same rating scales for individual and team tasks may not always be the case and should not be taken as an assumption.

The TTA study described in Bowers et al. (1994) illustrates how scales do not necessarily translate to the team level. The study compared the reliability and validity of individual (i.e., importance to train, frequency, and importance) and composite (i.e., task difficulty and importance indices) rating scales used in individual-level work analyses, and a scale composite developed specifically for the study (i.e., Team Task-Importance Index [TTII], a composite of task criticality and importance to train). The SMEs were 113 active-duty military pilots who completed a team task inventory unique to their aircraft type. Results indicated that ratings on all of the scales and scale composites exhibited poor reliability. Work analysis scales typically used at the individual level were less effective when used at the team level. Therefore, exercise caution before applying individual-level work analysis scales to TTA.

Although the type of rating scale may be usable across individual and team levels, the wording of scale stems may need to be modified to fit the unit of analysis of the TTA. For example, a commonly used stem for individual-level task importance, “How important is this task to satisfactory performance of *your job*?” may be suitable if the unit of analysis is a job title filling a single position on a team. However, if the job title fills multiple positions on the team, or the unit of analysis for the study is the team, a more appropriate stem would be, “How important is this task to satisfactory performance of *the team*?” The frame of reference used in the scale affects the interpretation of the results.

As shown in Table 3, some rating scales have been developed specifically for TTA. Arthur and colleagues (Arthur et al., 2005; Arthur, Glaze, et al., 2012) developed and validated several rating scales to assess team interdependence, which Arthur et al. also refer to as “teamness.” The scales include team relatedness, or the amount of interdependence (a quantitative attribute of teamness), and team workflow, or the type or pattern of interdependence present in a team (a qualitative attribute of teamness).

Does the Task Require Teamwork?

A fundamental feature of team task analysis that differentiates it from individual-level job analysis is determining which of the tasks require teamwork. This step determines which tasks are the team tasks and which tasks are at the individual level. Whether or not the task requires team members to coordinate while doing their work activities is often the primary metric of interest for determining if teamwork is needed (Burke & Howell, 2018).

Table 3*Type of Work Analysis Rating by Usage*

Type of Work Analysis Rating Scale	Source
Task	
Frequency	Morgeson et al. (2020); Morgeson & Dierdorff (2011); Sanchez & Levine (2001)
Importance for performance	Goldstein & Ford (2002); Morgeson et al. (2020); Morgeson & Dierdorff (2011)
Difficulty to perform	Morgeson et al. (2020); Morgeson & Dierdorff (2011)
Difficulty to learn	Morgeson et al. (2020)
Required on entry	Morgeson & Dierdorff (2011)
Consequences of error	Morgeson et al. (2020)
KSAO	
Importance for performance	Goldstein & Ford (2002); Harvey et al. (2007)
Required on entry	Goldstein & Ford (2002); Harvey et al. (2007)
Difficulty to learn	Goldstein & Ford (2002)
KSAO to Task (or Task Category/Job Duty) Linkage	Goldstein & Ford (2002); Goldstein et al. (1993); Harvey et al. (2007)
Team Interdependence	
Team-relatedness	Arthur et al. (2005); Arthur, Glaze, et al. (2012)
Team workflow pattern	Arthur et al. (2005); Arthur, Glaze, et al. (2012)
Team Task	
Frequency (or time spent)	Arthur, Villado, & Bennett (2012)
Importance for performance	Arthur et al. (2005), Arthur, Glaze, et al. (2012); Arthur, Villado, & Bennett (2012)
Difficulty to perform	Arthur, Villado, & Bennett (2012); Baker & Salas (1996)
Difficulty to learn	Arthur, Villado, & Bennett (2012); Baker & Salas (1996)
Consequences of error	Arthur, Villado, & Bennett (2012); Baker & Salas (1996)
Time to proficiency	Arthur, Villado, & Bennett (2012)
Importance for training	Baker & Salas (1996); Bowers et al. (1994)

Researchers can use a simple method to identify which tasks require teamwork. A straightforward yes or no question about whether or not the task requires teamwork may be sufficient, so long as there is a definition of what is meant by teamwork present. The researcher may also evaluate the use of active verbs used to describe the tasks as a preliminary gauge of team interdependence (Arthur, Villado, & Bennett, 2012). Words like “coordinate” and “support” signal a higher likelihood that interdependence is involved, which the researcher could verify through conversations with SMEs (Arthur, Villado, & Bennett, 2012). Using some methods of collecting tasks could remove the need to determine which tasks require teamwork. For example, organizational documents or SMEs may provide tasks that the team is responsible for accomplishing rather than an individual. If collective, or team, tasks are identified during the information gathering phase, determining whether or not the task requires teamwork becomes less relevant than determining what *type* of teamwork the task requires.

Some researchers have advocated for obtaining more information about the tasks than simply whether or not it requires teamwork. For example, Arthur and colleagues (2005) described a method to determine whether or not a task requires teamwork. They called this assessment a measure of team relatedness. Tasks were rated on a 5-point scale from 1 (*not required to work with team members at all for optimal performance*) to 5 (*very much required to work with team members for optimal performance*) in order to determine the *amount* of interdependence (Arthur et al., 2005). Incorporation of a scale with degrees of interdependence allows for determination of the extent to which the task requires interdependence between team members.

In addition to the *degree* of interdependence required, the researcher may also be interested in the *type* of interdependence required. For that measurement, Arthur et al. (2005) recommend an assessment of team workflow. Team workflow includes the patterns of reciprocity described by Saavedra and colleagues (1993). The workflow patterns include pooled, or additive, interdependence; sequential interdependence; reciprocal interdependence; and intensive interdependence. Thus, SMEs could make ratings on a scale from 1 (*NOT a team task/activity*) to 5 (*intensive interdependence*). Depending on the target of the team task analysis, it might be appropriate to rate the level of interdependence and type of interdependence necessary for the job or team rather than for each task. Whatever is being rated, include definitions and figures to show raters what is meant by each type of interdependence.

Depending on the purpose of the team task analysis, the researcher may determine knowing that the task requires teamwork is sufficient. However, the researcher should not easily dismiss needing to know the type of interdependence. Understanding the relationship between team members for the tasks is an important part of team task analysis (van Berlo, 2004), and, in some cases, knowing the type of interdependence may be of great importance. For example, if designing the performance appraisal for a team, knowing how the work is passed from one team member to another can provide information about considerations to make when rating team members. Teams with members who depend solely on output from other team members (sequential interdependence; e.g., widgets on an assembly line) may need different ratings than teams where there is a constant input-output exchange between team members (intensive interdependence; e.g., a business team designing a marketing campaign).

What Teamwork Components are Tied to Specific Tasks?

Determination of whether or not the task requires teamwork (consideration 1, Burke & Howell, 2018) is really meant to identify which tasks are at the individual level and which tasks involve more than one person on the team. Rating tasks to determine whether or not they involve teamwork using the team relatedness scale and team workflow pattern scale described by Arthur et al. (2005) measures the extent and type of interdependence. The information missing from those ratings is what parts of teamwork itself (e.g., team process, emergent states) are necessary for the task.

Similar to how KSAOs are linked to tasks in an individual-level job analysis, a linkage analysis can be used to determine how teamwork is tied to tasks. Such information is a useful supplement to other rating data collected as part of a team task analysis. For example, the researcher might want to know which types of teamwork are most relevant for the tasks identified as being performed most often. Or, depending on the purpose, it might be more important to know which types of teamwork are most relevant for tasks with a low tolerance for error.

A variety of methods to define the teamwork related to each task exists. Morgeson and colleagues (2020) suggest using flowcharts and time charts to determine the teamwork needed. Researchers using a Hierarchical Task Analysis for Teams (HTA[T]) work with SMEs to decompose tasks and identify where teamwork occurs (e.g., tasks where communication and/or coordination are implied) through an iterative process (Annett et al., 2000; Stanton et al., 2013).

Burke (2005) calls this part of the process a coordination analysis. The goal of the analysis is to identify which tasks require coordination and to what extent coordination is required. Surveys are often used to conduct coordination analyses (Burke, 2005). One example is a coordination demand analysis performed by Bowers and colleagues (1993). Bowers et al. were designing training to improve specific coordination behavior among aircrew members. For that purpose, SMEs linked teamwork concepts identified as components of aircrew coordination to tasks. The teamwork components included communication, situational awareness, decision making, mission analysis, leadership, adaptability, assertiveness, and an overall coordination score (Bowers et al., 1993).

Given the high cognitive load that a linkage analysis can place on SMEs, keep the linkage as simple as possible. A linkage analysis will likely be set up in a matrix format with the tasks on the y-axis. Depending on the number of concepts to be rated, the teamwork concepts to be linked or the rating scale will be listed on the x-axis. SMEs make judgments about the relationship between each task and each teamwork concept. Judgments may be categorical, where SMEs make yes/no decisions about if a teamwork concept is necessary for the task, or on a sliding scale where SMEs rate the extent to which the teamwork concept is necessary for the task. Consider the purpose of the team task analysis when making a decision about the linkage format and type that will be used. See Figure 1 for an example linkage analysis format.

Figure 1

Example Linkage Analysis

Instructions: This section contains tasks that were determined by your peers to be important for and/or frequently performed by [Team Type]. Please rate how critical each type of teamwork is for performing each task.

Criticality Rating

Use the following scale to rate the criticality of each type of teamwork.

- N – Not Relevant** This type of teamwork is not needed to perform this task.
- U – Useful** This type of teamwork is useful in performing this task. This task could be performed without this type of teamwork, although it would be more difficult or time-consuming
- E – Essential** This type of teamwork is essential to the successful performance of this task.

How relevant is [Teamwork Concept and Definition] for each task?

Task	Not Relevant	Useful	Essential	Don't Know
Task 1	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Task 2	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If the number of tasks that require teamwork is large, it might not be practical to have SMEs link all tasks to all teamwork components. First, revisit the purpose of the team task analysis to ensure that the number of tasks chosen is relevant and necessary. For example, the purpose of the team task analysis may only require knowledge of what teamwork components are connected to the tasks that are performed by individuals within their first twelve months of employment or for tasks that are performed most frequently. Or, consider decreasing the number of linkages by grouping similar tasks into task groups. Alternately, if the number of tasks is large, consider increasing the sample size and having participants complete a smaller subset of the linkages.

What Should I Link?

Depending on the purpose of the team task analysis, it may be appropriate to also link KSAOs to teamwork concepts in addition to linking teamwork concepts to tasks. For example, if one of the goals of the team task analysis is to design a training program to improve generic team skills, knowing which skills are required for the teamwork performed by certain teams is valuable. If the purpose of the team task analysis is to improve team composition, it may also be beneficial to link KSAOs to tasks determined to require teamwork. Ultimately, the components

included in the linkage analysis depend on the purpose of the team task analysis and how teamwork is defined.

How to Operationalize Teamwork?

For ease of understanding, consider teamwork, teamwork components, and types of teamwork to be synonymous. Teamwork can mean many things including team processes, emergent states, and shared cognition. The teamwork components used in the linkage analysis can be specified in a myriad of ways. The taxonomy, framework, or list of teamwork chosen may be an existing framework, a new operationalization, or a revised version of an existing framework that has been customized for the purpose of the TTA.

How teamwork is operationalized may be decided before the tasks are determined to be taskwork or teamwork, or after the tasks have been identified. A single existing taxonomy may not include all parts of teamwork that are necessary to incorporate depending on the purpose of the team task analysis. Data collection during the task collection phase may provide information about what needs to be included for teamwork concepts. For example, perhaps there is an existing framework that seems relevant to the project but only has limited validity evidence and no evidence in the context in which the analyst is working. In that case, conduct additional data collection to gather more information about teamwork in that setting and incorporate it into the taxonomy or framework that the analyst chooses to operationalize teamwork. A variety of teamwork taxonomies and frameworks are available in the literature. A brief summary of a few prominent models is presented next.

One seminal taxonomy is the team process taxonomy proposed by Marks and colleagues in 2001. The taxonomy focuses on team process as cyclical and carried out in three higher order phases: transition processes, action processes, and interpersonal processes. The lower order processes that comprise transition processes are mission analysis formulation and planning, goal specification, and strategy formulation. The action processes are monitoring progress toward goals, systems monitoring, team monitoring and backup behavior, and coordination. Interpersonal processes include conflict management, motivation and confidence building, and affect management.

Salas and colleagues (2014) offered nine critical considerations for teamwork and collaborations. They include six core processes and emergent states: cooperation, coordination, cognition, conflict, coaching, and communication. In addition, there are three influencing conditions: context, composition, and culture. Another model from Annett and colleagues (2000) summarized team process variables, their relationship to one another and to the team product. In this model there are three categories of team process: behavioral, cognitive, and affective. The process categories include concepts like communication, coordination, and team plans.

Determination of the list of teamwork is an important step in team task analysis (Baker et al., 1998). The point of this step is not to generate a list of measures for the teamwork but to identify a list of relevant teamwork concepts and their operational definitions. The list of teamwork concepts allows for identification of the teamwork KSAs needed to perform the tasks (Burke & Howell, 2018). No matter the list of teamwork chosen, it is more important to include

all *relevant* parts rather than including teamwork concepts solely because they are a part of the seminal taxonomy. Once again, the importance of having a clearly defined purpose is brought to the forefront. For example, a focus on teamwork KSAOs may be appropriate for a team task analysis being conducted for selection purposes, but a team task analysis for the purpose of designing an organization-specific team process training might be more focused on workflow patterns and how they are related to teamwork. Following identification of relevant teamwork concepts, the researcher can complete the linkage analysis.

Additional Considerations

Burke and Howell (2018) presented five considerations for researchers to make when conducting a team task analysis. We offer the following as additional points for consideration and guidance.

First, much of the process for a team task analysis is iterative and cyclical. A researcher may need to collect data from organizational materials, confirm accuracy of information with SMEs, ask SMEs for any missing information, and then reduce the list based on frequency and/or importance ratings to generate a list of tasks to be used in the linkage (or coordination) analysis. Depending on the purpose of the TTA, the researcher should consider multiple rounds of data collection to refine the task list. Some or all of those iterations may involve incumbent SMEs.

Second, the process is resource-intensive, but there are ways to conserve resources. Perhaps the greatest way to conserve resources is by only collecting the data needed, which the analyst can determine based on the purpose of the team task analysis. For example, not all purposes would require a linkage between KSAs, teamwork, and tasks. Nonetheless, when choosing the sample size in the data collection plan, consider the statistical inferences the analyst will make from the survey data.

Third, inconsistency in ratings may be a function of raters and their positions or experience. Researchers should be alert to the notion that error created by disagreement might be a result of legitimate views from different sources (Sanchez & Levine, 2000). Lower agreement may be acceptable for some purposes. The caveat is that the source of the disagreement is identified (Harvey, 2012). It may be that the representative sample of SME raters breaks down into sub-groups that have rated differently because of their experience with the task. For example, in the U.S. Army, officers are less frequently involved with vehicle maintenance than enlisted Soldiers. Because of this, enlisted Soldiers may rate vehicle maintenance tasks as being performed more frequently than officers, creating lower agreement. Be sure to consider the purpose of the team task analysis, the level of analysis for the data, and the practical implications of differences in ratings when determining if inconsistency in ratings is an issue of concern for your project.

Finally, as work analysis encompasses considering more contextual factors than job analysis, the nature of teams (e.g., the interdependence between members) requires a broader focus on more than just a job within a team. Analysis at the team level can serve an assortment of human resource functions making it likely that a variety of types of information will need to be

collected. For this reason, we believe that “work analysis for teams” is a better descriptor of the process than team task analysis. A broader label also grants more flexibility in the effort (e.g., focusing on the team itself or a particular role situated within a team). Having the process focus on the work allows for emphasis on what tasks are being completed, how the tasks are being completed, and/or who is completing the tasks. We encourage researchers to let the purpose of the analysis drive the focus of the project.

There is no one-size-fits-all method for job analysis at the team level. The steps taken and the order of those steps will be determined by the purpose of the analysis and the resources available. The Appendix offers a checklist as a quick reference guide to ensure that all potential parts of the team task analysis are considered during the planning phases. Whether or not each step occurs for a particular project will depend on the purpose of the analysis.

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Appendix

Quick Reference Guide: Work Analysis for Teams Steps

✓	Step	Description	Supporting Information in this Report
<input type="checkbox"/>	1. Determine the purpose of your analysis.	What are the goals of your project? What do you want to use the data for? Example purposes: selection, team task design, team composition, team training, compensation	Page 2
<input type="checkbox"/>	2. Define the target of your analysis.	Will your analysis be centered around an entire team, a job within a team, or another entity?	Page 12, Page 16
<input type="checkbox"/>	3. Plan and prepare for your analysis.	Establish the timeline for the project, determine the type and amount of data collection you expect, and decide on the project team. Identify resources available and project stakeholders.	Pages 1-5, Table 2
<input type="checkbox"/>	4. Collect information about the job/team.	Use methods such as focus groups and organizational documents to learn about the team/job. Factors of interest may include interpersonal and technical requirements of the job and level of interdependence among tasks.	Table 1, Table 2
<input type="checkbox"/>	5. Identify teamwork.	A taxonomy or framework may be created from information collection about the job or may be based on, or modified from, existing literature.	Pages 14-15
<input type="checkbox"/>	6. Collect ratings.	Ratings should be relevant to the purpose of the analysis. Identify sources for each type of rating. Ratings may include rating tasks, rating KSAOs, and rating teamwork.	Pages 5-10
<input type="checkbox"/>	7. Collect linkages.	Linkage should be relevant to the purpose of the analysis (e.g., selection, training). Identify sources for each type of linkage.	Pages 13-14, Figure 1
<input type="checkbox"/>	8. Analyze and report results.	Share results with stakeholders. Publish results to organizational records or publicly available data repositories if applicable.	Page 4
<input type="checkbox"/>	9. Design human resource product.	Use results to design and implement new or updated human resource functions or processes as specified in the analysis purpose.	Page 1