

Appendix 1 – Concept Whitepaper, March 2003

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Leader and Team Adaptability in Multinational Coalitions: Cultural diversity in cognition and teamwork

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Preface

Battle command of military operations requires leaders and teams who are able to make decisions and respond in an appropriate, timely manner even in highly uncertain situations. The degree of situational uncertainty has continued to increase as military requirements have evolved in response to changing conditions around the world and advances in information systems that have made more information available, faster than ever before. The superior warfighting capabilities of the U.S. military forces have encouraged our adversaries to adapt their tactics, to operate as terrorists undermining the safety and security of the people in the U.S and the world. To respond to the terrorist threat, military forces must anticipate the unexpected and be prepared for the unimaginable. The people and organizations of the military must be adaptable and technology must enable their adaptability. Adaptability is both a proactive and reactive process and can be seen in what military forces do and how they operate. Information systems are a critical component of adaptable performance—especially of distributed, decentralized, yet highly interdependent military forces required to deftly transition from peacekeeping to warfighting to peacekeeping in collaboration with joint, interagency, and Alliance forces. Countering worldwide terrorism, keeping the peace, and responding to humanitarian crises are operations for coalitions. Experimentation is required to define the training requirements, organizational design, and information system requirements for adaptable performance of military coalitions.

In 2001, the U. S. Army Research Lab (ARL), specifically Dr. Linda Pierce, Dr. Janet Sutton, and Dr. Liz Bowman, engaged in a multidimensional research effort to improve adaptive military performance, both in U.S. and Allied coalition forces. They developed a theory of adaptive performance, an adaptive learning model, and tools to overcome identified barriers to adaptability. Their work initially focused on U. S. forces transitioning from warfighting to peacekeeping operations. They then expanded the adaptive performance spectrum to investigate cultural differences in cognition and teamwork in a multinational operation. Successful validation studies of adaptive performance tools and positive evaluations from leaders of the allied coalition in Bosnia-Herzegovina firmly supported the continuation and expansion of their research program.

ARL researchers identified barriers to adaptability in the training and knowledge components of military units preparing to transition to stability and support operations (SASO). In pre-deployment training exercises, a warfighting mindset interfered with learning how to conduct steady state operations in a peacekeeping environment. Other barriers to learning included the lack of meaningful participation by critical team

members from civil affairs, the international community, and multinational forces and an inability to control the training events to insure that there were consequences for mistakes and to provide opportunities for the participants to correct errors and practice “what right feels like.” Without a grasp of the basics, SASO expertise was slow to develop. Adaptable performance in SASO requires expertise in the art of influence, persuasion, and negotiation with international and national publics. Leaders and teams did not have the opportunity to experience expert decision making based on an accurate situational understanding. These vulnerabilities affected the individuals’ ability to work as members of multifunctional teams (for example, joint U. S., multinational forces, international community groups).

ARL used their model of adaptive learning to develop scenario-based computer training tools. These tools, known as *Simulations for Adaptability (Sfor Adapt)*, allow individuals and teams to make decisions and work together to solve problems they are likely to encounter in conducting peacekeeping operations.

The adaptive learning model was based on the notion that advanced cognitive learning is best served by the opportunity to solve problems while immersed in realistic challenging situations using an iterative process of practice and feedback, both individually and as part of a group. Learning environments were constructed that allowed problem solving in a group, in order to negotiate different viewpoints and gain equilibrium as a group. Learning that occurs in this context helped the learner(s) (both individuals and the team) remember and apply information in later novel situations.

The successful development of the Sfor Adapt tools spurred the investigation into cultural differences in cognition and teamwork in the coalition headquarters in Bosnia-Herzegovina, or Headquarters, Sustainment Force (HQ SFOR). Researchers concluded that cultural differences did exist, and a prototype cultural adaptability-training tool for use by multinational teams was developed, initially named “Training Adaptable Coalition Teamwork (TACT).” Research continued in Bosnia to more clearly link cultural cognitive dimensions and team performance functions. These efforts provide a valuable opportunity for the international research community to synchronize efforts to develop adaptive leaders and teams, an essential component in the development of the NATO Response Force (NRF).

The following topics are presented as the framework of the adaptive performance effort:

- **Cultural Adaptability:** The effects of cultural diversity in cognition and teamwork in multinational coalitions.
- **Measurement:** The development of team performance metrics suited to multinational coalitions.
- **Training:** The development of scenario-based computer SASO training tools for adaptive learning and enhanced team performance.

Executive Summary

Multinational coalitions are a complicated assembly of leaders, teams, cultures, networks and systems. Not only must leaders and teams adapt in a rapid fashion to the military requirements of operations other than war, but they must also contend with many government and civilian agencies charged with non-military actions, such as diplomatic, information, and economic measures. This complex environment makes adaptive performance more critical than ever, yet the presence of adaptable leaders and teams continues to be elusive.

The development of adaptive performance in multinational coalitions can be rapidly advanced by the collaboration of researchers from the NATO alliance.. The U.S. research methodology, used as a foundation, can be refined, evaluated, and developed for multinational use. The following efforts are proposed as the building blocks of this program.

- Host a NATO alliance working conference to define research relevant to the adaptive performance effort.
- Develop research agenda and core research partnerships among NATO coalition partners.

Once the research group has been established, the following research objectives will support the development of a multinational adaptive performance program:

- **CULTURAL ADAPTABILITY.**
 - Refine framework that links cultural differences to teamwork dimensions to study performance in NATO alliance teams and guide development of methods and tools for adaptive performance
 - Identify, through research partner collaboration:
 - common understanding of cultural implications for teamwork
 - barriers, and underlying causes, to adaptive team performance through the investigation of alliance coalition exercises and test beds
 - current national processes in place to prepare leaders and teams for SASO deployments
 - adaptability potential provided by current national practices
 - Conduct team cognitive task analysis to assess extent to which social cognitive differences due to culture may be limiting team effectiveness
 - Further develop a cultural adaptability scale
- **MEASUREMENT.**
 - Reach common understanding of adaptive team performance
 - Develop a model of team performance applicable to coalition teamwork in coordination with U. S. and international researchers
 - Expand concept development of tools for measuring and predicting team performance
 - Develop adaptable performance metrics for application to multinational teams
- **TRAINING.**
 - Modify Sfor Adapt training tools for coalition use.
 - Enhance the TACT cultural adaptability tool for Alliance use
 - Formulate design recommendations for adaptable leader and team performance
 - Evaluate and refine methods to identify, measure, and train cultural adaptability in multinational teams.

Concept Development and Experimentation Proposal

Cultural Adaptability

Research on culture and individuals can be used as a point-of-departure to understanding the impact of culture on team processes. In a seminal research study, Hofstede (1980) identified cultural dimensions that he used to characterize national differences. The following cultural dimensions describe individual behaviour and cognition along a continuum: Power distance (the degree of inequality in power among members of a community), tolerance of ambiguity (how people deal with unpredictable situations), and individualism (how people define themselves by groups). Additional

Models, methods, and tools to promote development and maintenance of multinational and interagency teams for military operations will advance the state of the art in international cooperation regardless of mission (Klein, Klein, & Mumaw, 2001).

cultural dimensions relate to cognitive differences, for example, whether individuals think hypothetically or concretely, dialectically, and their ability to assess a variety of solutions to a problem.

Theoretical frameworks and models integrating culture to multinational teams and team leadership are limited, but growing. The need exists to leverage what is known about culture, teams, training, and leadership in order to provide a model of coalition teamwork and develop methods and information systems that recognize the importance of political, economic, social, and environmental factors in addition to military strategy. Additionally, knowledge on team adaptation should be expanded to maximize the effectiveness of multinational teams in the NATO Combined Joint Task Force (CJTF) and future NATO Reaction Force (NRF).

Proposed is an expansion of an on-going investigation into the impact of cultural differences on cognition and behaviour relative to team performance in a multinational military environment. Team models and theories to identify team process or organizational barriers unique to a military system will highlight the impact of several possible variables on team performance. These variables may include, but are not limited to, the presence of a military culture that transcends national cultural boundaries, organizational issues that arise from distributed teams and collaborative information technology, and cognitive differences in teamwork that can be attributed to culture. This program of research will also address training design requirements for adaptable leaders and teams.

Measurement

A team's performance will depend on many factors, such as team members' knowledge, skills, and abilities relative to a task or the team (Cannon-Bowers & Salas, 1997) and the team situational awareness, or understanding of a particular situation (Cooke, Stout, & Salas, 1997). Thus, team knowledge and methods to define and measure this concept have gained attention. Team knowledge can be characterized along several dimensions, to include mental versus situational models, homogenous versus heterogeneous knowledge distribution, the form of knowledge (declarative, procedural, strategic) or the content of knowledge (task work or teamwork) (Cooke, Salas, Cannon-Bowers & Stout, 2000).

One promising avenue of research for the elicitation of knowledge among team members is linguistic analysis (Cooke, 1994; Foltz & Wells, 1999; Foltz, Kintsch, & Landauer, 1998; Foltz, 1996; Rowe, Cooke, Hall, & Halgren, 1996). One variant of linguistic analysis, Latent Semantic Analysis (LSA), is a method of understanding the contextual meaning of words used in team communications using statistical analysis (Foltz & Wells, 1999). A successful and ongoing research project by New Mexico State University (NMSU) Psychology Department promises additional support for this effort. NMSU researchers are engaged in using PRONET as a method for identifying, describing, and representing sequences of complex behavior (Cooke & Gillan, 1999). This method uses the Pathfinder algorithm to analyze and represent behavioral sequences in a network and has been shown to be predictive of knowledge and performance (Gillan & Cooke, 2001). The improved understanding of multinational team knowledge structures and related team performance metrics are a critical component of improving adaptable performance within the NATO community.

Training

U.S. researchers have developed two PC, web-based scenario driven training programs to build expertise among teams preparing to deploy to SASO environments. These tools enhance team performance through improved decision making, appropriate use of resources, and an accurate understanding of roles and responsibilities of key team members in peacekeeping environments. These programs, developed for U.S. forces, could be easily adapted for a NATO Alliance staff as a training program. Experimentation with U.S. forces pre- and post- deployment to Bosnia-Herzegovina showed conclusively that the transition from warfighting to peacekeeping was a very difficult process unsupported by adequate and realistic training (Klein & Pierce, 2002; Pierce & Klein, 2002; Pierce & Pomranky, 2001). The experience in Bosnia clearly showed that as the threat level changes, leaders and teams must be adaptable. These tools have been validated with U.S. officers and were shown to have good face validity and to improve the ability of officers to learn adaptive responses to SASO. Adapting these tools for multinational use will increase the adaptive learning potential for the NATO alliance.

PART ONE

Operational Context

1.0 NATO desired operational capabilities

Multinational formations are a critical component of the NATO Strategic Concept. In an environment of continuous change, achieving leader and team adaptability improves the CJTF capacity to attain transparency between forces and achieve effective joint action (NATO 1991; NATO 1999b).

This program of research addresses cultural barriers to teamwork in a multinational coalition, team performance metrics based on the concept of team knowledge and situation awareness, and training issues. Each of these areas is mutually supportive and offers NATO opportunities to make significant advances toward adaptable and efficient CJTF and NRF leadership and teamwork. The theory, models, and training tools that result from this project will promote the development of adaptable systems, leaders and teams.

1.1 Type of capability

The products resulting from this research project will include models and measures of team performance (to address cultural and organizational barriers), and training methods and tools to rapidly develop knowledge, skills, and abilities required for adaptable leaders and teams in the NATO alliance.

1.2 Scope

Adaptive performance for leaders and teams will develop through identification of how cultural dimensions impact multinational teamwork, experimentation and testing of adaptive learning theory, models of teamwork, and computer assisted training aids. The timeframe for this experiment is envisioned as a multi-year effort, which will leverage ongoing research currently supported in ARL through the Science Technology Objective (ARL-1) and the Collaborative Technology Alliance (CTA), a research consortium comprised of government, university, and industry cognitive scientists. Efforts to expand this research effort to the NATO alliance will require additional funding.

1.3 Status

The NATO Defense Capabilities Initiative (1999a; 2000a) and Lord Robertson's address to the Brookings Institution (Aviation Week & Space Technology, 2002) clearly indicate that the CJTF concept, though structurally sound, lacks the necessary doctrine, training, and shared system capabilities to achieve the

required level of interoperability for joint action by a highly integrated NATO coalition. This research program will provide the tools to develop these necessary leader and team adaptable performance capabilities, through the development of a multinational adaptive performance model, a clear understanding of collaborative team actions and techniques for measuring performance, and a comprehensive set of recommendations and tools for training adaptive leaders and teams.

PART TWO

Operational Concept

2.0 Hypotheses

2.0.1 Cultural Adaptation. Cultural dimensions (power distance, uncertainty avoidance, and activity orientation) linked to team functions (situation assessment, coordination, roles and responsibilities, and supporting behavior) cluster to predict patterns of leader and team adaptability.

2.0.2 Measurement. The possibility exists to measure adaptable multinational team performance.

2.0.3 Training. Scenario-based training tools enhance leader and team adaptable performance.

2.1 General Description

Developing adaptable leaders and teams for a multinational CJTF as described in this research proposal will be an iterative, knowledge building process. Central to the research effort is an improved understanding of multinational team cognition, including, but not limited to, cultural and organizational barriers to adaptation. Knowledge gained in this initial stage will allow the development of training tools to rapidly build expertise needed for adaptable leaders and teams operating in the CJTF or the future NRF.

2.2 Relationship to other operational capabilities

Developing adaptive tools for leaders and teams in the CJTF or NRF poses no additional requirements on new or existing systems. These advancements would have significant impact on the NRF concept development, mandated at the Prague Summit (NATO 2002).

PART THREE

Assessment of military worth and R&D potential

3.0 Relevance to key capability needs

The need to improve leader and team adaptability in the CJTF is expressed within a number of NATO documents and initiatives.

The Combined Joint Task Forces Concept

- Establishes the concept of a CJTF for a multinational, multi-service deployable task force generated primarily for humanitarian relief and peacekeeping.
- The demands on leaders and teams within CJTF are recognized as considerable, resulting in a nuclei of core staffs established within the NATO military command structure

- Initial experimentation demonstrated the value of the CJTF concept. Current efforts are underway for full implementation, including the acquisition of command and control and communications equipment. These efforts imply the existence of adaptable leaders and teams.

Defence Capabilities Initiative

- Command and control and information systems must be better matched to requirements. A greater volume of information flowing to lower echelons of command and control create challenges to adaptability and interoperability, including doctrine, training and operational procedures, and the increased pace of technological change.

NATO Strategic Concept

- The integrated military structure necessary to sustain the NATO alliance is based on cooperation and coordination agreements, including collective force planning, common operational planning, and multinational formations. These agreements depend on the ability of leaders and teams to adapt to uncertain and complex conditions.
- The challenge of interoperability depends on increased transparency between national systems, mutual confidence and the capacity for joint action.

Prague Summit Declaration

- On 21 November 2002 NATO invited Bulgaria, Estonia, Latvia, Lithuania, Romania, Slovakia, and Slovenia to begin accession talks to join the Alliance. The introduction of new cultures and militaries to the NATO family will require leaders and teams to accommodate to the new entrants.
- An announcement was made of the creation of a NATO Response Force (NRF) consisting of a technologically advanced, flexible, deployable, interoperable and sustainable force. This force will be a catalyst in improving the Alliance's peacekeeping capabilities, but again, will challenge leaders and teams to recognize the effect of cultural diversity on teamwork.

3.1 Exploits emerging technology

This proposal exploits the development of scenario-based computer training tools to rapidly develop SASO expertise among leaders and teams, while not new, is continuing to expand with the use of web-based technology to improve the conditions, settings, and application of the training.

3.2 Likely impact on capability

Developing adaptive leaders and teams will enhance the ability of NATO alliance to operate the CJTF, NRF, or other military and non-military actions. Participating nations in this research effort will contribute to the NATO products and will also benefit their own nations' leader and team adaptable performance.

3.3 Utility across several capabilities, missions, tasks

The attainment of adaptable leaders and teams will increase the capability of NATO to plan and conduct full spectrum operations. In the case of multinational peacekeeping operations, capability will also be generated in the ability to integrate political, military, economic, social, infrastructure, and information elements to contribute to stabilization of the local area.

3.4 Potential for collaboration

This project has great potential for collaboration. From the U.S., collaboration is possible from government, university, and industry researchers. Within the U.S. military, collaboration is possible with Joint Forces Command. Several countries are currently engaged in JFCOM research, and would likely contribute to research of this type. Those include Australia, Canada, Germany, the United Kingdom, and the U.S. This research effort should be expanded to include all NATO nations, if interested in participating.

3.5 Affordable (R&D, procurement, support costs)

Research costs are estimated at \$70K provided in yearly increments for three years to cover purchase of materials needed for experimentation, meeting facilities, and travel and allowances for scientists. This is a multi-year cost estimate, and anticipates a cost-sharing relationship among participating Alliance and Partnership for Peace members.

3.6 Implications for doctrine, training, personnel, organization, and materiel

Improving multinational team performance and developing training solutions for multinational team challenges offer opportunities for more adaptable leaders and teams in a CJTF. Recommendations would be forthcoming for training, selection of personnel, and organization of the CJTF.

3.7 Presence of other competing solutions

None.

3.8 Operational, practical limitations

Adaptive leader and team training programs resulting from this program of research must be low cost, easily modifiable, and usable with co-located or distributed teams.

3.9 Technical risk

No technical risk has been identified.

3.10 RED Team Vulnerability assessment

No RED Team vulnerability has been identified, nor is it required.

3.11 SUMMARY

The ability to predict adaptable performance in leaders and teams and the promise of improving alliance adaptability provide an opportunity for NATO to optimize the CJTF and NRF concepts. These goals, supported by a multinational research effort, will ensure that cultural and organizational requirements of participating countries are well represented in final models, metrics, and training tools.

PART FOUR

Preliminary Project Plan

4.1 Lead agency (POC) & Potential Supporting National and NATO bodies, POCs

ARL is the agency proposing the project and is willing to be the leading agency in the Feasibility Study Phase. This study phase would build a plan for future development and experimentation, to include invitations to nations and NATO commands and agencies to build a project team. The lead agency point of contact is Dr. Janet Sutton who will remain the project POC regardless of her agency affiliation. Victor Edelmann, NATO CDE Analyst, Allied Command Atlantic Headquarters, will act as Allied Command

Transformation point of contact. Participation is expected from military and civilian scientists who currently support military leadership in their own nations.

4.2 Concept packages to be assessed

Package 1: Cultural Adaptability.

A theoretical framework for understanding the relationship between national cultural dimensions and team performance developed by ARL based on research conducted at HQ SFOR and MND (N) in Bosnia-Herzegovina. The framework would form the basis and define the scope of future collaborative research.

Package 2: Measurement.

Team performance metrics suited to a military multinational coalition. The initial plan is to use linguistic analysis techniques, though other techniques may also be considered.

Package 3: Training.

The Sfor Adapt toolkit and cultural adaptability scenario-based training tools.

4.3 Tasks and responsibilities

Under Dr. Sutton's leadership, a team of human factors cognitive scientists from participating nations will

- Define cognitive requirements to work within multinational peacekeeping coalitions at the tactical and strategic levels
- Develop team performance metrics suitable to the multinational component of the CJTF and NRF
- Build on the theoretical understanding to develop training programs to prepare NATO nations to participate as members of cross-cultural, multifunctional, non-hierarchical teams

4.4 Timelines

Timelines will have to be established by the Lead Agency when determining tasks and responsibilities. Current activities that will contribute to the proposed research effort. This research effort is anticipated as a multi-year effort, with anticipated conclusion in 2007.

4.5 General outline of type and level of support for each contributor

Dr. Sutton, supported by Mr. Edelmann (HQ SACT), would manage the collaborative research process between U.S. and non-U.S. scientists. Initially, current observations of multinational teamwork at the sustainment force headquarters in Sarajevo, Bosnia-Herzegovina and theoretical research would be made available to multinational partners, including identified team, organizational, and cultural barriers to adaptable performance. Multinational research partners would contribute access to leaders and teams for research purposes, as relevant. Once research partners are identified, a discussion of resources and research venues would lead to a prioritized plan of research. This plan may have to be limited initially if fiscal resources are limited. During the first year, it is hoped that each participating nation will actively pursue national funding sources to support the research effort. Once research partners are identified, a division of labor will be proposed that will leverage existing research or national strengths presented by the ally. Possible activities include theory development, measurement tools and methods, model and simulation development, and concept development of specific tools for application to the CJTF and NRF.

4.6 Contingent fallback if support reduced

The contingent fallback is to continue the program of research with Support and Stability Operations (SASO) within the U. S. frame of reference.

4.7 General outline of cost

This multi-year research project, as proposed, is expected to cost \$1,475,000 USD. This can be broken down into annual costs of \$70,000 each year from 2004 – 2006 and \$50,000 in 2007. Travel and allowances for the overall research effort and semi-annual working group meetings to plan and evaluate research efforts. These figures anticipate a cost-sharing arrangement among participating nations to cover concepts development, model development, metric and training tool development, and validation studies of research products. The activities will have to be scaled back if CD&E funds are not available. However, interested nations will be encouraged to pursue national funding sources during the first year in order to continue the program as scheduled in the 2004-2007 timeframe.

4.8 Summary of related CDE efforts in nations, NATO that can be tapped. To be determined at the exploratory meeting once concept is approved as a NATO CDE project.

Appendix A – Project Plan Specifics

<u>Research Task</u>	<u>Anticipated Work Activities</u>
Concept Development	<ul style="list-style-type: none"> Refine framework of national cultural dimensions and impact on teamwork Develop a common understanding of cultural implications for teamwork Conduct inventory of national processes for leader and team development, assess adaptability potential Develop cultural adaptability scale Expand concept development of tools for measuring and predicting team performance
Model Development	<ul style="list-style-type: none"> Develop a model of leader and team adaptability based on the adaptive learning model that is relevant to multinational coalitions
Metrics Development	<ul style="list-style-type: none"> Develop metrics of adaptable performance for application to multinational teams
Data Collection	<ul style="list-style-type: none"> Identify common understanding of cultural implications for teamwork Identify barriers and causes of adaptive team performance through the investigation of multinational coalition exercises and test beds Identify current national processes in place to prepare leaders and teams for SASO deployments Identify adaptability potential provided by current national practices Conduct multinational experimentation to assess the extent to which social cognitive differences due to culture may be limiting team effectiveness
Project Team Meetings	<ul style="list-style-type: none"> Semi-annual working group meetings to set the research agenda and track progress toward achieving goals. Also to collaborate on research findings and share information among partners
Validation Studies	<ul style="list-style-type: none"> Studies to validate the usability and usefulness of

cognitive tools to increase adaptability among leaders and teams

Appendix B – Resource Implications

It is highly likely that nations will be interested in contributing key research personnel to participate in this project due to its high degree of military relevance. However, without CD&E funding, it is unlikely that nations will be able to fund the level of financial support needed to effectively complete the project as proposed.

Appendix C – Vulnerability Assessment

None

Appendix D – Reference material

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