

# US/UK MENTAL MODELS OF PLANNING: THE RELATIONSHIP BETWEEN PLAN DETAIL AND PLAN QUALITY

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## ABSTRACT

*This paper presents the results of a research study applying a new cultural analysis method to capture commonalities and differences between US and UK mental models of operational planning. The results demonstrate the existence of fundamental differences between the way US and UK planners think about what it means to have a high quality plan. Specifically, the present study captures differences in how US and UK planners conceptualize plan quality. Explicit models of cultural differences in conceptions of plan quality are useful for establishing performance metrics for multinational planning teams. This paper discusses the prospects of enabling automatic evaluation of multinational team performance by combining recent advances in cultural modelling with enhanced ontology languages.*

## INTRODUCTION

According to existing approaches to measuring cultural differences, Americans and Britons are quite similar. As an example, Hofstede's seminal studies resulted in the documentation of only very subtle differences between the two nations along the dimensions of power distance, individualism/collectivism, etc. (Hofstede, 2001). Still, when US and UK planners interact with one another in operational contexts, they encounter differences. The quote below comes from an interview with an American campaign planner, who illustrates this point in his description of an experience working with a planner from the UK:

*"We worked with the Brits on doing a plan for Pope John Paul when he was there, and that was a real different experience—they have a completely different planning process...I think it's a planning process. They do something anyway, it is far different from what the Americans do. We kind of kept looking at them like, 'are you going to plan this yet?' 'Oh don't worry about it, it'll come together.' 'Do you plan this shit?' Where the American planning process is slightly anal retentive to most of the world, theirs is a lot more kind of, 'oh it'll come together, don't worry about it.' I don't know if they did it just to drive the Americans crazy or what, but it worked. It just kind of drove us nuts."*

An implication from this planner's experiences is that there are different ways of thinking about and approaching planning. Based on his observation that the UK planners do not approach planning the same way he does, the American planner has come to the conclusion that UK planners have a laissez faire attitude towards planning. His observation is consistent with work suggesting that there are significant differences in how coalition partners plan and make decisions (Sieck, & Patel, 2007).

We propose that the challenges experienced by coalition planners are rooted in differences in knowledge relevant to the domain of planning. More generally, we suggest that culturally-determined differences in knowledge about the task and associated domain specific value judgments can present an important obstacle to successful multinational team collaboration and performance.

### *Culture as Shared Knowledge*

A major scientific challenge to understanding the effect of cultural diversity on teamwork rests in generating sound definitions of the construct of culture as well as methods for capturing and representing it. Our approach to culture combines the theoretical approaches of cognitive field research and cognitive anthropology. We conceptualize culture as mental content that is shared among members of a population. Our interest is primarily in the mental content that people use to make decisions and act within specific situations.

Cognitive field researchers have repeatedly reported that the microlevel cognitive processes studied in laboratory experiments do not appear to be nearly as influential on real-world decision making as content knowledge in the form of episodic experiences and well-formed mental models (Klein, 1998). The research from this community clearly identifies the contents of cognition as the major driving force of decisions. Even within laboratory settings, some researchers have shown the important influence of cultural content knowledge on decision making (Briley, Morris, & Simonson, 2000).

Within cognitive anthropology, culture is typically defined as involving shared knowledge (Garro, 2000). One specific conception of culture that characterizes it in this way is the epidemiological view. The epidemiological view regards culture as networks of ideas, or mental models that are widely distributed within a population (for reviews, see Atran, Medin, & Ross, 2005; Sperber, 1996). Mental models are experience-based, causal explanations of how things work that guide a person's assessments, judgments, and their decision-making. A mental model of planning, for example, contains a person's concepts as well as their understanding of the causal relationships between concepts, i.e. the antecedents and consequences of planning activities and their outcomes. This mental model influences the individual's expectations for how the planning process should unfold and provides a framework for selecting behaviors and goals within a planning situation.

### *Shared Mental Models*

The conception of culture as knowledge that is shared by members of a population fits well with current research in the area of team cognition. Researchers in team cognition have developed the construct of 'shared mental models' to describe the knowledge that members of a team should have in common about the task and the team in order to perform well. Shared mental models are believed to improve performance by assisting collaborators in forming accurate explanations and expectations about the task and each other, thus helping them coordinate explicitly (Cannon-Bowers et al., 1993; Klimoski, and Mohamed, 1994; Kraiger, and Wenzel, 1997). The research in team cognition has largely focused on knowledge that relates to methods and actions necessary for carrying out team tasks, as well as the knowledge necessary to coordinate and synchronize efforts across the team.

From our standpoint, multinational teams have greater variation in individual mental models than do culturally homogeneous teams. In the specific context of multinational teams, Earley et al. (2000) demonstrated that teams who work together over a period of time can reconcile initial differences in mental models naturally, and develop what they refer to as a hybrid culture. Through the experience of interacting with each other, culturally diverse teams can develop a set of rules, norms, expectations and roles (Hambrick, Davison, Snell, & Snow, 1998).

We propose that one important aspect of diversity in multinational teams is that members may not share the same notions of the task outcome. That is, in addition to differences in their mental models of the team and the task procedures, they have different mental models of what defines a successful end state for the team (see Figure 1). Having a common understanding of what it is the team is working to accomplish is crucial for ensuring both that the team can collaborate with few frictions, and for ensuring that all members of the team are satisfied with the outcome of the collaboration. In this context, if a multinational planning team does not have the same mental model of what the plan they are creating should look like, then they are likely to find themselves working at cross purposes.

Knowledge Content		Planning Domain
Task Models	Procedures	Planning process
	Outcomes	Plan quality
Team Models	Teammates' knowledge	Teammates' task models
	Roles/responsibility	Planning experience/specialty

Figure 1: Framework of types of multinational team shared mental models.

#### *Cultural Analysis of Planning Outcomes*

The present research focuses on cultural commonalities and differences in knowledge that relates to the outcome of a collaborative task. Specifically, our study examines the mental models associated with the complex task of operationalizing military strategy and turning it into a set of specific military objectives—i.e. generating a campaign plan. Studying the knowledge relevant to a plan as a collaborative outcome will allow us to uncover potential differences between the way US and UK planners conceptualize the planning task.

Our general approach to cultural analysis combines qualitative knowledge extraction methodologies with quantitative analysis and representation methods to examine cultural distributions of knowledge (Sieck, & Rasmussen, 2007; Preece, & Sieck, 2007). CNA is comprised of two major phases of research – a discovery phase and a consolidation phase. The current paper reports on the results of the discovery phase only. The discovery phase consists of semi-structured interviews which are designed to extract the causal knowledge associated with mental models of a particular domain. The interview targets causal knowledge by probing the interviewee's understanding of the antecedents of particular states, events, or actions of interest, as well as the outcomes or effects these can have.

In the current research we used CNA to elicit mental models of planning outcomes. The information elicited from the participants in this study included basic concepts of planning and plan quality, causal factors that influence plan quality, consequences of low/high quality plans, as well as artifacts, procedures and tools intended to support planning.

## METHOD

### *Participants*

We conducted semi-structured interviews with fourteen experienced campaign planners in the US (6), at Fort Leavenworth General Staff College, and in the UK (8), at Cranfield Defence College. All the planners were Lieutenant Colonel rank. All the American planners were Army and four of the UK planners were Army, three were Air Force, and one was from the Royal Marines. All planners had between 18 and 33 years of experience in the military. One of the planners we interviewed in the US was from the UK, and three of the planners we interviewed in the UK were not from the UK. We selected ten interviews for analysis in which the planners had been interviewed in their country of origin.

### *Procedure*

Each planner was interviewed individually using the same interview guide. For each question, interviewees were asked to think back to one or more particularly memorable planning experiences that they had encountered in the course of their duties. The purpose was to ground their thinking in specific experiences and thereby ensure the validity of their responses.

A primary and secondary interviewer was present for all interviews. The primary interviewer was responsible for covering the questions in the interview guide. The secondary interviewer was responsible for taking notes and asking questions of clarification. Two pairs of primary/secondary interviewers carried out the interviews. The interviews lasted between one and 2 hours as a function of the availabilities of the planners.

### Materials

The interview guide was developed to elicit mental models of planning. The questions probed the concepts, causal beliefs, and values relevant to the following dimensions of planning:

- Plan quality
- Causal factors that determine plan quality
- Consequences of high/low quality plans
- Functions of plans and planning
- Openness to making revisions in the plan, i.e. replanning
- Supporting processes and tools that lead to high quality plans

We recorded each interview using a digital voice recorder. We created representations of the mental models of planning using the concept mapping software CmapTools (Hoffman, 2006).

### Data Preparation/Analysis

We transcribed the interviews. Subsequently, we extracted all references in the interviews to either the causal attributes of the planning process, the planning team, or the plan itself. This is an example of a reference from a UK interview "*I think if you plan too much and if you have too many contingencies, everything is fine-tuned down to the last minute, when it goes wrong, as it will, it throws you because you're so tied in to this rigid structure and you're expecting to pick up the next COMM Plan or when it doesn't happen it throws you out even more.*" These references were then translated into one or more propositions relating the causal relationships referred to in more simple terms. For example, the propositions resulting from the above reference were "*including too many contingencies leads to a plan with a rigid structure*", and "*a plan with a rigid structure limits your ability to react to unexpected circumstances*". This translation process generated a total of 210 propositions relating to the causal relationships between planning components as well as definitions of planning concepts across the ten interviews.

We then used these propositions to create two separate concept maps, one for the US and one for the UK. Each of these concept maps served as a representation of the union of ideas from a given cultural group.

## RESULTS

This paper will focus on the relationship between amount of detail and plan quality, rather than present the total set of concepts contained in the mental models we captured in our interviews. We believe that US/UK differences in this particular concept demonstrate a fundamental point of divergence between American and British planners' understanding of planning.

Overall, our results indicate that the US and UK agree on a very fundamental notion of what planning is about. They both note that planning is about identifying an end, or a goal, figuring out ways to get to that end, and with what means you are going to get there. Our results also indicate that the US and UK planners agree on another high level planning notion, namely that there is a relationship between amount of detail in the plan and overall plan quality. Both US and UK planners indicate that the plan should be somewhat detailed in order to be a high quality plan. However, interestingly planners from these two nations seem to have different ideas about which dimension of the plan should have a relatively high level of detail. Overall, the US planners indicated that a plan should specify action at an 'adequate' level of detail. The UK planners, on the other hand, emphasized that a good plan should have sound and coherent logic.

Below are shown excerpts from the aggregated concept maps (see Figure 1). These concept map excerpts illustrate the difference between the US and the UK in their mental models of the relationship between detail and plan quality. Each of the conceptual relationships expressed will be discussed further in the following.

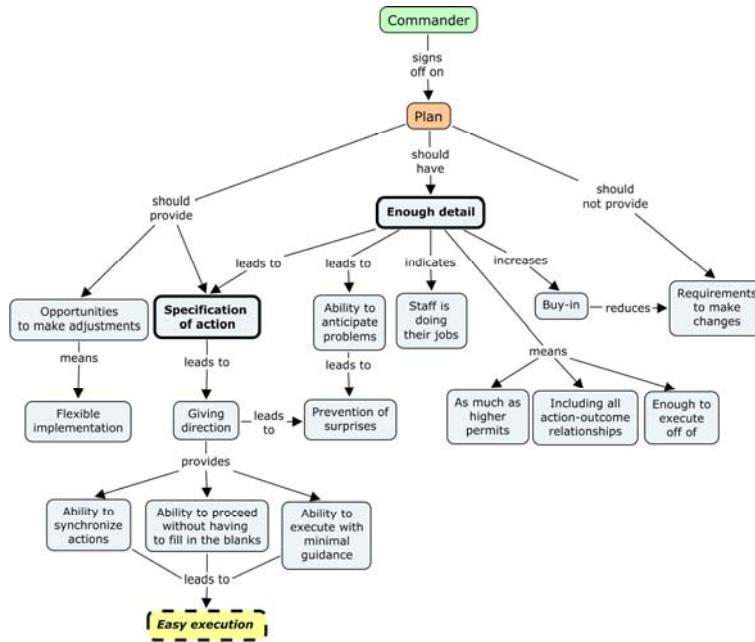


Figure 1: Concept map illustrating the US conceptions of the relationship between detail and plan quality.

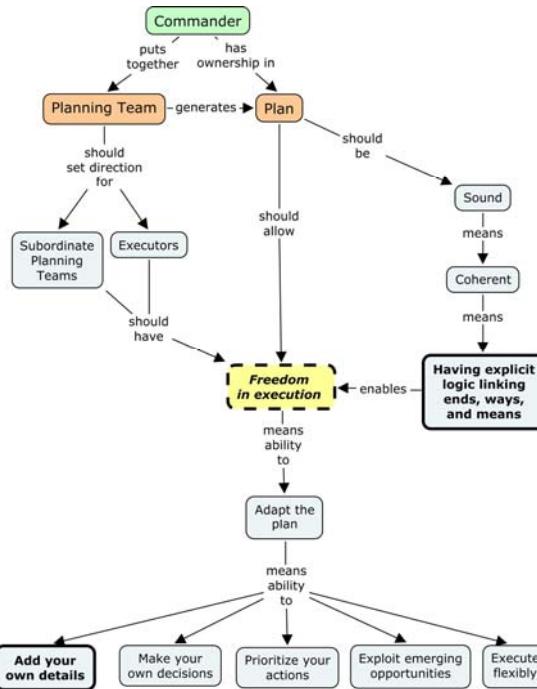


Figure 2: Concept map illustrating the UK conceptions of the relationship between detail and plan quality.

#### *US: Specifying Actions/Outcomes to enable Synchronization*

When we asked the US planners we interviewed about the factors that lead to generating a high quality plan, they told us about the value of providing direction both in terms of goals and methods. However, most of the ideas they expressed had to do with providing direction on methods. They noted that a high quality plan should both specify what needs to be done, as well as how it should be done—and specifying the ‘how’, or the actions is particularly important. Most of the US planners expressed this idea by emphasizing the importance of working out the ‘how’, both through specifying the actions and generating contingent methods to support meeting an objective. The underlying implication was that if this is not done, the resulting plan

will be of inferior quality. One planner described in more detail the consequences of not providing ‘enough’ detail:

*“So all of a sudden you come out of division rehearsal with a completely new plan, because you went into it with a very general plan, as opposed to a detailed plan. And then, all of a sudden, you know you come out of the division rehearsal and instead of being well synchronized, you come out having to write a whole new plan because subordinate commanders have all changed their minds because you didn’t tell them what to do. And I’ve seen that happen. And, as a result of a poor initial plan that was left to the subordinate commanders to kind of fill in the blanks.”*

From this American planner’s perspective, failing to provide enough detail makes it less likely that the subordinate commanders will buy into the plan. The US planners emphasized that a plan with detailed specification of actions and resources provides direction for the individuals who are inheriting the plan. Better direction, in turn, means that the plan will be easier to execute because it reduces the number of decisions that have to be made down the line. The US planners therefore appeared to express the idea that a plan is a representation of decisions that have been made ahead of execution time—i.e. it provides a roadmap for execution.

In fact, the US planners were so emphatic about the notion that the plan should provide a roadmap that they even expressed a disdain for failing to specify actions appropriately. One US planner indicated that a plan lacking action specification would indicate laziness on the part of the planner. Specifically, he said *“We’re going to do it in enough detail that subordinate units can execute it. ... to say that the plan is just a starting point, I couldn’t disagree with you more. I think that is a cop-out for a staff that doesn’t do detailed planning.”*

#### *UK: Specifying Logic to enable Adaptation*

UK planners consistently emphasized that the links between the ends, the ways, and the means are more important than providing a lot of detail on the ways and means. Specifying these logical linkages are also more important than generating a lot of contingencies—i.e. providing alternative ways and means. The UK planners indicated that the logic of the plan, when made explicit, could serve to communicate the plan’s intent, i.e. the commander’s intent. If the plan fails to demonstrate the logic then whoever inherits the plan will be less likely to pick up the intent. If a subordinate fails to inherit the intent, they will be less likely to be able to adapt and execute flexibly—in a manner that is in line with the intent. Having the ability to execute flexibly and still satisfy the commander’s high-level objectives is paramount to success in a dynamic operating environment.

One British planner described a specific planning experience which provided a particularly detailed account of the importance of preserving the logic within a plan, and what it means to do so:

*“I was able to comprehensively, convincingly demonstrate the etymology of the plan, the genesis of the plan linking it from the policy, which I had been given, and I had no input to the policy itself, how we broke that down into a set of conditions and a strategy. How that could be developed and implemented in terms of money and time, programming. And then how that could be realized in a plan. And once I’d got that into the minds of the command group, then they were comfortable in terms of there were no holes in that deductive, rational, analytical thought process.”*

Our conclusion is that, instead of seeing the plan as a record of decisions made by the planning team, the UK planners see the plan as a representation of the reasons that underpin particular decisions. That is, the plan should contain the reasons behind selecting a particular strategy, or course of action, towards achieving the commander’s intent. The UK planners, in fact, were adamant about explicitly representing the logic in the plan. They talked about a good plan as one that was ‘transparent’, i.e. anyone who picks up the plan can

recognize the high-level intent. As one planner put it: “*the articulation of the commander’s ideas and his intent, as long as that thread is throughout the whole plan that makes it transparent*”.

The UK planners’ further emphasized that a plan with a clear logic provides a platform for the individuals who are inheriting the plan to understand the link between the commander’s intent (the high-level guidance) and the ways outlined in the plan. A plan that provides a solid platform will lead to more successful execution because it enables the individuals who are executing it to make their own decisions.

The US planners did not mention logic as an important, perceptible attribute of the plan. The UK planners tended to see detailed specification of action as a constraint on flexible execution. They saw detailing of the logical relationships as a way to facilitate decision making on the part of those who are executing the plan. The instances where the UK planners talked about specification of action, it was in the context of how detrimental over-specification could be for the flexibility of their colleagues inheriting the plan.

#### *Indicators of Plan Quality*

The US and UK planners agreed that you really cannot know whether or not you have a high quality plan until after it has ‘made contact’. That is, you have to implement a plan in order to know whether it is a good one. Planners from the US and the UK, however, did not have the same ideas about what are the indicators you look for, after the plan has been implemented, to inform whether the plan was good or not. The US planners tended to talk about synchronization as an indication that a plan had been implemented successfully. That is, were the specified actions carried out at the right time and in the right order? The UK planners, however, seemed to focus on adaptation instead of synchronization. In this case, did the plan enable making the right decisions at the right time and appropriately adjusting actions to evolving circumstances?

## DISCUSSION

Our results have demonstrated two types of cultural differences between US and UK planners in their concepts of the relationship between detail and plan quality. In the case of the importance of logic—the UK planners appear to think of logic as an important, positive influence on plan quality, the US planners may not consider the concept of logic as an influence at all.<sup>1</sup> In the case of action specification—the US planners think of the detailed specification of actions as a positive influence on plan quality, the UK planners think of it as a negative influence. This summary of results is of course generalized. There were individual planners who expressed ideas that were inconsistent with the cultural models outlined for their nation in this paper. However, the preponderance of ideas expressed by planners from the US were consistent with the cultural model outlined for the US, and vice versa.

#### *Potential Explanations for Conceptual Differences*

We propose that there are at least three different types of explanations that can be brought forward to account for differences in how the US and the UK conceptualize planning. The first concerns the potential historical influences on current planning concepts. It is possible that differences in US and UK military histories may have lead to different potential to adopt an agile and adaptive mindset today (Nagl, 2002). British military history reveals a long-standing tradition for emphasizing adaptation. In contrast, US Army culture currently still places too much value on process (Paparone, 2001).

A second explanation of our findings considers the effects of national policies on planning concepts. It appears that the US and UK historically have developed mindsets that are more (the UK) and less (the US) ready to adopt a fourth-generation vision for command and control. National policies in both the US and the UK have been implemented in an effort to modernize official doctrine to reflect the global shift towards fourth-generation warfare (see UK Joint High Level Operational Concept, 2005; Office of the Secretary of Defense, 2003). However, it may be that the US and the UK have been differentially successful in inculcating the spirit of new command philosophies in their armed forces.

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<sup>1</sup> Assuming that absence of mention can be interpreted as the absence of a concept. Future research is planned to explicitly verify all major conceptual relationships revealed in the present study.

Finally, the third type of explanation regards differences in the tools available to support planning as a potential influence on how planners conceptualize planning. Tendencies to use different tools to develop and represent plans as well as differences in general attitudes towards tools and the role of tools in the planning process are also potential sources of differences between the US and UK conceptualizations of planning. The US uses PowerPoint to capture and brief plans whereas the UK tends to use Word documents. This makes for an important difference in the work processes between the two nations. Within the interviews, the US planners expressed strong opposition to using Word, and the UK planners expressed the opposite sentiment.

Note that these explanations are interrelated, rather than independent. Further research is required clarify and test these explanations of differences in cultural models of planning and decision-making.

#### *Improving Multinational Team Performance*

Solving wicked problems requires a diversity of perspectives and expertise which can only be applied through collaboration between culturally dissimilar coalition partners and local delegates (Pierce and Dixon, 2006). Leveraging diverse perspectives will be difficult if coalition partners disagree on fundamental assumptions such as the characteristics of a high quality plan.

We propose that formal representations of domain-specific cultural knowledge, i.e. cultural models, provide a basis for developing tools and training that can assist a multinational team in developing hybrid cultures more quickly. For example, a better understanding of the different ways of conceptualizing the team's product(s) will enable team members to better leverage the unique skills and perspectives that are present within the team. In this way, cultural models can be employed to facilitate improved performance of ad hoc multinational teams. The next section presents specific applications of cultural models to the development of tools that support coalition planning.

#### *Practical Implications and Tool Development*

The current study has a number of implications for the development of technologies to support coalition planning. First and foremost the results suggest that future technology development initiatives should be sensitive to the norms, expectations and values judgements of different cultural groups. The findings of the current study have a number of implications for technology development. These include, but are not necessarily limited to technology design, transmission of intent, and performance evaluation. We will discuss the latter in more detail, as the cultural models discussed in the present paper are particularly relevant in the context of performance evaluation.

An implicit assumption in many experimental research studies focusing on multinational teams is that there should be a single standard for assessing the performance of the team. The results of the present study suggest that it is possible that using a single standard may be a culturally biased approach for evaluating performance. For example, evaluating a plan created by UK planners against a performance criteria developed based on a US concept of a high quality plan will lead to the conclusion that the UK plan is of poor quality, and vice versa. The planner quoted on the first page of this paper provides a demonstration of what happens when you apply a culturally biased metric of performance.

Explicit representations of differences in criteria for evaluating plan quality can be employed in a number of ways to support team performance. First, an explicit specification can be employed to help planners validate coalition plans along different quality dimensions. Second, it can contribute to the design of intelligent assistive functions that support the development of plans that are acceptable along multiple evaluative dimensions.

In order to perform a culturally sensitive evaluation of plans, we need a common representational scheme for describing plan structure and content as well as a representation of the contents of the cultural models themselves. In addition to representing the plan itself, there are two important requirements that a plan representation must meet in order to facilitate evaluating the quality of plans relative to specific user groups. First, it needs to represent culturally relative notions of plan quality and second; it must do so in a way that

makes the plan amenable to automatic evaluation with respect to plan quality criteria. In the following we will discuss recent advances in ontology development which can potentially provide solutions to these representational challenges.

In order to support culture-sensitive evaluations of plan quality we need to capture the contents of the cultural models themselves, e.g. we need to be able to define what it means for something to be a good or acceptable plan from a specific cultural viewpoint. One way of explicitly representing the content of cultural models is to capitalize on the technological outcomes of the Semantic Web initiative (Berners-Lee, Hendler, and Lassila, 2001). Ontology languages such as the Ontology Web Language (OWL) (Antoniou, and van Harmelen, 2004; McGuiness, and van Harmelen, 2004) could be useful because they provide a means to create conditions for category membership based on the properties of plans and their component parts. It is not a simple matter to formalize highly complex concepts, such as 'plan quality' in such a way as to support automatic inference. That is, it is not straightforward to define this concept in terms of necessary and sufficient conditions. Nevertheless, the current study does suggest some of the features that could be the focus of attention in ontology development within the planning domain (Mott & Hendler, 2007).

OWL also provides a way to establish a representational foundation for making machine-based evaluations of plan quality. The OWL makes it possible to explicitly represent meaning in a machine-accessible fashion. The requirement in this case is an ontology of plans and plan-relevant information such that target features (e.g. linkages between goals, methods and resources) and constituent plan elements (e.g. actions, goals, rationales, etc.) can be identified in a semantically unambiguous fashion.

In summary, cultural models of planning concepts expressed using an ontology language such as OWL can form the basis for a culturally sensitive evaluation of plans. The ontology-language naturally imposes representational constraints on the type of conceptual relations that can be expressed, and we plan to consider these constraints in future research studies geared towards developing cultural models. A priori consideration for these constraints will ensure that the cultural knowledge can be readily employed to support team performance.

### *Conclusion*

Our results demonstrate that it is possible to detect fine-grained cultural differences by studying concepts specific to a domain. The advantage of cultural modelling is that it offers a view into the complex network of ideas that drive decisions in particular contexts. The results of our study provide initial empirical evidence that domain specific characterizations of cognitive content may be especially useful for understanding and improving multinational teams.

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