

A Research Agenda for Understanding Multi-Agency Collaboration and Decision-Making

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ABSTRACT

The security challenges of the 21st century are qualitatively different than in the past. Due to the complexity of such operations military forces find themselves working with numerous other organisations to achieve a common goal. This has imposed new demands on capacities and capabilities; and consequently requires new models to understand key issues and evaluate options. Successful modeling must consider human and organisational factors, which are currently not adequately addressed and certainly not at a meta-organisational level (i.e., the domain in which organisations are created, operate and are sustained). Military forces are developing new concepts such as network-enabled operations, effects based operations and other information era advances to deal with these challenges. All of these suggest possibilities exceeding the scope of traditional modelling approaches. The aim of this paper is to discuss the issues that would define the necessary modelling skills and tools for operational analysis and propose an appropriate research agenda that has the potential, in time, to lead to the development the required skills and tools. It is further proposed that the skills and tools adequately capture pertinent conceptual and psycho-sociological, as well as informational and physical factors for the purpose of assessing the effectiveness of multi-organisational decision-making structures, practices and processes.

THE MULTI-ORGANISATIONAL MANAGEMENT PROBLEM

The Canadian Forces (CF) characterizes modern military operations as JIMP (Joint, Interagency, Multi-National and Public). (Note: the CF is currently working on a “beyond JIMP” concept called the Comprehensive Approach. Until further information is available, the terms are considered synonymous in this paper.) It is no surprise that a relatively small country like Canada, in terms of population, would typically find its military engaged in

operations that are multi-national military operations. This is not new. Neither is it particularly new that military forces are required to operate “jointly”. Although, it must be admitted that the frequency of acting “jointly” and the associated complexity are greater today than previously. This has led the CF to introduce the term “integrated” to replace “joint”. The implication is that the former implies the seamless force generation and conduct of operations of military force elements without regard to the service parentage of those force elements, while the latter can merely denote the bringing together of separately trained service-oriented force elements in an operation. This places a constraint on the analyst in that increased frequency and complexity of interactions prevent the analyst from “decomposing” the problem into “service-oriented” components (e.g., land, maritime, and air), analysing those components and re-assembling the component results into an overall force-wide result. The CF experience in complex, JIMP-type situations, is hardly unique to the CF, but is shared with those military forces who have been engaged in stability operations. For example, the US Army field manual for stability and support operations describes the US military experience with their perceptions of “best practice.”

The second letter in the CF JIMP acronym is “I,” which stands for “interagency”. It is the norm rather than the exception that both international and domestic CF operations include large numbers of other “partner,” non-military organisations of a diverse nature. Why this might be so is a pertinent question that requires some exploration, since a large number of diverse organisations working together adds to the cost and complexity of a problem (Goldsmith and Eggers, 2004). No doubt this is due to the diverse nature of the problem being addressed in the operation, which often is beyond the problem-solving and management capabilities of an individual organisation. Parker and Selsky (2004) refer to “cause-based” partnerships involving commercial businesses and “not for profit organisations” (NPO):

Why do businesses and NPOs collaborate on social causes? The literature suggests that, in general, collaboration can offer new ways for organizations to acquire expertise and access to other needed resources, cope with increased turbulence in their environments, anticipate potential problems, or learn how to transform themselves for an uncertain future. Business-NPO collaborations appear to be responding to growing demands for nonprofits and businesses to address social meta-problems too complex or protracted to be resolved by actors within a single sector. These “messy and intractable” meta-problems tend to spill beyond the problem-solving and management boundaries of single organizations and also beyond the ambit of established cross-sector forms, for example, public-private partnerships.

The problems the CF and its “partners” encounter in operations, such as in Afghanistan, are messy, intractable, and dynamic; and they spill across the problem-solving and management boundaries of single organisations or established multi-organisational structures. From this perspective, it is the social “cause” or “problem” rather than choice that leads to a large number of diverse partners.

The field of economics offers a different perspective. Ronald Coase, in an influential paper (1937), offered an economic explanation of why people choose to relate through firms or other types of organisations rather than only bilaterally or through contracts. Coase criticised current economic theory with, on the one hand, crediting coordination to the free-market pricing mechanism for society at large and, on the other hand, crediting coordination

to the organisational manager (or entrepreneur in business) within a firm. If the market place provided the cheapest cost of any good or service, it would never be in the interest of an entrepreneur to hire an employee or develop an organic capability to develop a good. The good or service should, in theory, always be able to be contracted for at a cheaper price on the open market. However, Coase noted that there are transaction costs associated with the obtaining a good or service on the market. These transaction costs include the costs for searching for a good or service, bargaining, enforcement of contracts, the value of trade secrets, etc. Firms, Coase suggests, arise because it is often cheaper or more efficient to hire or produce a product or provide service internally than to purchase these on the open market due to these transaction costs. However, there are limits to the size of an organisation due to the diminishing returns of management, such as increasing overhead and the increasing likelihood of an overwhelmed manager making mistakes in resource allocation. The size of a firm, Coase argues, is determined by an optimal balance between “internal” and “external” contractual relations. It should be noted that through the decreasing transaction costs brought about by modern information technologies, we have seen a trend towards smaller firms or “virtual firms” (i.e., a firm that out-sources most of its processes or functions) in recent years.

The above economic argument might seem somewhat removed from the world of stability and counter-insurgency operations. However, if one understands “costs” as “difficulty” or “degree of effort,” then one can see that it is applicable. For a military force to operate solely in a stability operation it would require expertise in all the sectors of a normal society. Recent examples of this tendency to acquire non-traditional skills in the military have been seen, as witnessed by activities such as the hiring or recruitment of anthropologists and other social scientists by the US Army as widely reported in the news media (Rohde, 2007, International Herald Tribune). While this perhaps makes some sense as military forces grapple understanding the culturally complex environments in which they must now operate, if one follows Coase’s arguments, a firm cannot simply continue to hire more and more people with increasingly diverse skills without incurring increased overhead costs and increased likelihood of “resource allocation errors.”

While the US Army may need the expertise of an anthropologist, the commander or decision-maker also needs to understand sufficiently the importance and implications of the advice given by the anthropologist to avoid decision errors. This was mentioned by the same International Herald Tribune article describing the above US Army initiative. “Yet criticism is emerging in academia. Citing the past misuse of social sciences in counterinsurgency campaigns, including in Vietnam and Latin America some denounce the program as ‘mercenary anthropology’ that exploits social science for political gain.” Clearly some question whether military commanders have the wisdom to use such specialised advice. This may be arguable in this instance, but developing commanders with sufficient understanding to make wise and informed choices across the diverse range of issues associated with stability and counter-insurgency operations is an obvious challenge.

Effective use of specialised advice implies devoting resources to train commanders in the use of that advice. These are, of course, resources which must be diverted from other, often equally critical, military requirements. As an alternative, the military could “contract” the services of a firm specialised in the “culture” within the area of operations to be responsible for assessing cultural implications, recommending courses of action and even to have a degree of functional responsibility for cultural issues. However, this also has other issues, such as, trust, a degree of dependency on the “contractor”, and “contractual enforcement” in the case of poor performance, which are all forms of “transaction costs.” At the same time as

militaries seek to include non-traditional skills, knowledge or capabilities within their organisations, they have also sought to outsource traditional military functions, primarily, but not only, logistics through private military companies as a way of reducing overall costs. As noted by Coase, we see in these recent choices of the military examples of the balancing that is continually required between “external” and “internal” costs for optimal organisational size and structure.

Taking the economic perspective further we can ask another question of large, diverse multi-agency operations. For an effort or “cost” to be worthwhile, the return or benefit must be of sufficient worth. What is the “worth” of these operations to governmental and non-profit organisations? For stability and counter-insurgency operations in particular, this is pertinent since these operations are difficult, protracted and high risk undertakings. This leads to the final letter in the JIMP acronym, which is “P” for “public”. Many may take this “public” to mean “public affairs” or dealing with the news media. However, if we understand media interest to be a reflection of public interest, the “P” can refer to the more direct influence on the conduct of operations of the public’s overarching concerns and values. We have now returned from our excursion into economics back to Parker’s and Selsky’s “cause-based” partnerships whereby organisations from different sectors collaborate to achieve public or social values.

Organizations in both sectors face external pressures to address social challenges as partners. Many nonprofits have been encouraged to become more business-like in response to funders’ demands. On the other hand, businesses are enjoined to be more socially responsible; there are growing demands that they be held more accountable for social and environmental problems and engage in the resolution of them. ...the potential for simultaneous economic and social benefits draws businesses into strategically targeted involvements with nonprofits.

The Sloan School of Management, Massachusetts Institute of Technology, has been one of many that champion the use of information technology to create networked, or so-called “21st century”, organisations. However, they have also recognised the importance of public values in producing a “manifesto” for 21st century organisations, including commercial ones, calling on them to do better in providing social well-being:

In many ways, today’s organizations are working very well. But few institutions anywhere -- be they educational, governmental, community, or business institutions -- are serving societies’ and individuals’ needs as well as they could. In particular, business institutions, while arguably the healthiest of society’s institutions, are operating far short of their potential to contribute broadly to societal well being.

The manifesto goes on to articulate the challenges as (1) the need for environmentally sustainable organisations, (2) socially sustainable organisations and (3) personally sustainable organisations. If there is a “whiff” in these phrases of “sustainable peace,” we shouldn’t be surprised as “peace” sought through stability operations, for example, requires the creation or nurturing of such “sustainable” organisations accepted by the indigenous, strife-ridden societies in question. Guntram Werther (2007) argues that this “sustainability” can only be achieved as a “sustainable” change management process instead of through the precise articulation of a so-called end state. Werther states that all nations are in a continual process amongst the state and “other” institutions of a society. This process consists of the

negotiation of mutually accommodating outcomes, the institutionalisation of these outcomes in civil and legal practice, and the adaptation of societal “mythology” to support the resulting practical accommodations. This continually negotiated accommodation is likely the dynamic behind commonly heard phrases, such as, “if you don’t like change, you’ll like irrelevance even less.” Seen from this perspective, organisations become involved in difficult enterprises, like stability operations, because their supporting societies expect it.

This section has explored the problem of managing multi-organisational or agency operations by considering a few disparate viewpoints. Considerably more exploration is warranted from each of these perspectives, as well as others not considered. However, this brief effort may still be sufficient to place a few guide-posts for the characterisation of multi-organisational enterprises. These characteristics, unlikely to be included within a single organisation, include:

1. A diversity of functions such as security, judicial, governmental, social and even commercial services.
2. Participation of multiple sectors, that is, governmental, both national and international, voluntary and private.
3. The involvement of several nationalities, including both foreign and indigenous, with a similar general goal, such as “sustainable peace,” but also with differing motivations for participation in the multi-organisational enterprise.
4. An underlying “cause” or desired social “good” that provides the common sense of purpose amongst the participating entities of a multi-organisational effort. The aforementioned “sustainable peace” is such an example of a social “cause.”
5. A dynamic balancing between the tendency to integrate goods and services within a single organisation and the tendency to fragment or to outsource these same goods and services that is dictated by the relative “costs” of internal versus external transactions.
6. An environment in which institutions seek legitimacy or continued legitimacy through a negotiated accommodation ultimately supported by the evolving “mythology”, collective social “fictions”, values or belief system of the society.

When we re-consider the objective of a capability to assess the effectiveness of multi-organisational decision making structures or forms, it would seem to be a naïve goal, but only if we see such a capability within the constraints of a solely mathematical framework. Greater possibilities exist if we consider the capability to be “a change profiling approach” and to include “analyses of a holistic, dynamically integrative type built upon a socio-psychological grounding.”

COLLABORATION

Himmelman (1997) has proposed a four-level hierarchy to describe multi-organisational relationships:

1. Networking: defined as the exchange of information for mutual benefit;
2. Coordinating: defined as Networking plus the altering of activities for mutual benefit and to achieve a common goal;
3. Cooperation: defined as Coordinating plus the sharing of resources for mutual benefit and to achieve a common goal; and
4. Collaboration: defined as Cooperation plus the enhancing of another's capability for mutual benefit and to achieve a common goal.

Since these are nested definitions, they are by default a hierarchy and, therefore, Himmelman's theory is dependent upon the validity of his definitions. Most organisational literature does support Himmelman and defines collaboration as the process by which "autonomous actors interact through formal and informal negotiations, jointly creating rules and structures to govern the relationship and ways to act or decide on the issues that brought them together; it is a process of involving shared norms and mutually beneficial interactions" (Thomson and Perry, 2006). Collaboration is seen as a process of achieving something new – an additional outcome that was beyond the individual aspirations of the participants. Thomson and Perry also argue that collaboration, in the US public domain is rooted in two competing traditions:

1. *Classic Liberalism, with its emphasis on private interests, views collaboration as a process that aggregates private preferences into collective choices through self-interested bargaining. Organisations enter into collaborative agreements to achieve their own goals, negotiating among competing interests and brokering coalitions among competing value systems, expectations and self-interested motivations; and*
2. *Civic Republicanism, on the other hand, with its emphasis on commitment to something larger than the individual (whether that be a neighbourhood or the state), views collaboration as an integrative process that treats differences as the basis for deliberation in order to arrive at "mutual understanding, a collective will, trust and sympathy [and the] implementation of shared preferences.*

Whether or not networking, coordination, and cooperation are sub-elements of a hierarchy with collaboration at the apex, organisational literature agrees that collaboration must include some degree of the others activities or attitudes. Somewhat in contrast the networking capability afforded people by the World Wide Web has generated numerous instances of like-minded people, who had formerly been geographically disconnected, seeking out opportunities for collaboration. In this case "networking" has generated possibilities for "collaboration" rather than "collaboration" requiring the need for "networking." Hal Richman (2001) goes further and suggests that:

Collaboration is the right thing to do and does not need to be justified using standard metrics of value. People have need to be curious, to explore, to search, give and receive feedback and to commune with others.

In other words, through the “networking” provided by the World Wide Web, people will do what comes naturally – that is, collaborate.

It would be worthwhile to explore further the nature of each of the components of Himmelman’s hierarchy. It may be that, while collaboration is complex and involves networking, coordination and cooperation, these other, so-called “sub-elements” have their own different complex characteristics. If so, this would imply that these are multiple dimensions of a relationship “space” and these factors are not merely elements along a linear hierarchy. Describing the state of a relationship would then require description of the “networking,” “coordination,” and “cooperation” values of the relationship as well as the degree of “collaboration.”

The above discussion on “collaboration” has been drawn from the public administration and organisational literature. It’s far from clear if that the theory is extensible to all of human collaborative activity, which it must be in order to be applicable to the broad range of activities found in complex situations such as stability operations. However, the theory may be a reasonable starting point for the development of one applicable to “stability” and other so-called JIMP operations, as well as domestic security or emergency response operations.

DECISION-MAKING

Hal Richman (2001) states that collaboration “can encompass a variety of behaviours, attitudes and results, including communication, information sharing, coordination, cooperation, problem solving and negotiation.” These are activities associated with “command and control” or “decision making.” Disregarding for the moment that difficult problems, such as “finding a sustainable peace” in places like Afghanistan, probably cannot be solved in the classical sense; if the problem to be solved is a complex one requiring the involvement of many functionally, jurisdictionally and culturally diverse organisations then the individual decisions made by each organisation will likely have an affect on the others whether or not those organisations collaborate. Thus “decision making” can be seen as related to but distinct from “collaboration.”

An analogy, albeit a limited one, is to equate the individual organisations to the parts of a brain and the state of “collaboration” with how well the parts of that brain work together. While even a “well collaborating” brain can make mistakes, the dysfunction of a “poorly collaborating” brain can be all too evident. The predictable after-action review (e.g., Mansager, 2006; Hales and Miller, 2008) calling for better coordination illustrates the appropriateness of the analogy. Extending the analogy, just as a brain dominated by one component is no substitute for a “well collaborating” one, in a JIMP operation it is not possible for one organisation to assume total decision-making authority. Typically only dictators or autocrats attempt this and they are hardly noted for their effective governance across the broad range of activities within a society. Success for them is the degree of the control and not the well-being of the ruled society. However, within well-functioning and

well-off societies, as noted by Werther above, the decision-making is shared through continual negotiation.

The need for shared decision-making has long been recognized within JIMP or domestic emergency response operations. In the latter case, the “incident command structure” (ICS) is intended to be a scalable, shared decision-making environment (National Incident Management System, 2007 draft, Department of Homeland Security). The ICS concept also states that within the ICS “no agency’s legal authorities will be compromised or neglected” and stresses the importance of maintaining authority, responsibility and accountability (ARA), as it must in normal, civil society. This would be fine if the ARA were clear in every circumstance. However, this is often not so and there is much evidence from even a cursory survey of complex, JIMP-type operations. For example, the aforementioned after-action reviews that stress the need for better “coordination” (e.g., Mansager, 2006; Hales and Miller, 2008).

What is also not clear is whether or not the structures created for “shared decision making” contain the “right” organisations to address a complex social problem, such as “finding a sustainable peace” in, for example, Afghanistan. The likelihood of a trained professional unilaterally making the “right” decision in a tactical crisis, such as when fighting a house fire, is high. However, the odds of making a “right” decision are much less when a limited group, selected not for its knowledge, but its political influence, decides on the course of action to “find a sustainable peace,” recover from a natural disaster or prevent a natural disaster. The experience of Hurricane Katrina provides lessons of the latter two instances (Hales and Miller, 2008).

Wheeler (2002) provides a summary of command and control or decision-making structures, which are:

1. Centralised with subcategories of:
 - a. Fully centralised through the absolute consolidation of power in a single body;
 - b. Centralised veto with monitored activities subject to the veto of a central authority; and
 - c. Pool joint assets with centralisation only over pooled resources.
2. Decentralised with subcategories:
 - a. Decentralised execution with the power to use resources and exercise authority in line with higher guidance; and
 - b. Parallel command, which is a federated system with authority invested in multiple bodies maintaining unity of purpose through central coordination.
3. Distributed with subcategories:
 - a. Devolved command and control with the distribution of authority to the lowest practical level and reach back to operational support centres; and

- b. Swarming networks, which are fully autonomous systems with ad hoc learning and emergency command and control structures.
4. Collective with subcategories:
- a. Egalitarian communitarianism with governance via consensus through communal discussion and debate; and
 - b. Contractual arbitration, with command and control through negotiation in a self-regulating environment and arbitration for socially binding contracts.

This list illustrates a wide diversity of options. Participants in a multi-organisational enterprise will each have varying affinities due to different cultures and experiences with these different styles of command and control. Predictably there will be clashes when, for example, a police service, which is used to working in a distributed, devolved command and control environment, works with a military force more used to working in either a centralised option or, in the case of allied military forces, a decentralised option. Neither will fully grasp the nuances of contractual arbitration that will be familiar to a commercial business. More research is required to understand the influences of culture on decision making styles and the preferences for decision making structures, as well as the benefits and risks associated with each decision making structure in a given operational environment.

THE “NETWORK CENTRIC” SOLUTION

Alberts and Hayes (2003) have proposed that a highly networked organisation has greatly improved effectiveness through improved information sharing, shared sense-making, self-synchronisation, and greater collaboration. The benefits articulated by Alberts and Hayes are illustrated in Figure 1 (Elrick, Wheeler, Long, and Nicols, 2007).

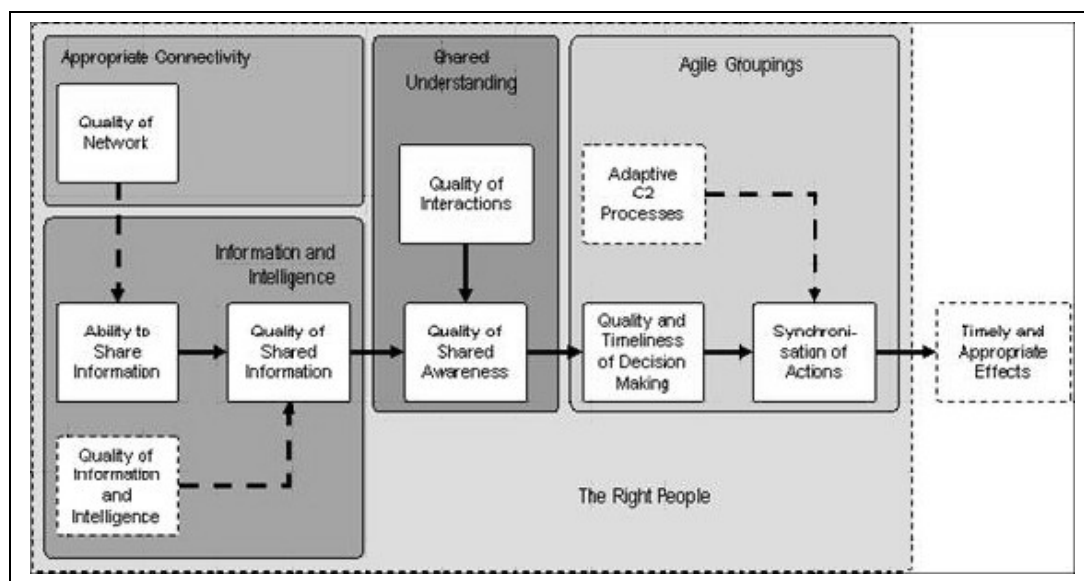


Figure 1: The Benefits of a Networked Organisation.

The “timely and appropriate effects” include greater agility in decision making and re-organisation, robustness, resilience, responsiveness, flexibility, innovation and adaptation. However, Alberts and Hayes are careful to explain that achieving the status of a networked or “edge” organisation requires more than merely electronically connecting members of an organisation. It also requires a high degree of training, trust, intra-group knowledge, shared concepts, and so forth. Figure 1 shows the supposed benefits, but looked at in reverse it shows the potential impediments to achieving a fully networked or “edge” organisation. The right people may not be a part of the “network.” Different participants may understand information differently. There may not be sufficient trust to allow the re-organisation (agile groupings) or the synchronisation of tasks or activities. Of course, there may also be technical, procedural, and legal impediments to sharing information.

There is some linkage between the networked or “edge” organisational concepts proposed by Alberts and Hayes and the current military emphasis on an “effects-based operations” (EBO). Atkinson and Moffat (2005) identified six aspects of EBO:

1. EBO is a method of planning an operation, which links the overall strategic goals to tasks to be undertaken.
2. EBO is a method for analyzing alternative targets on the basis of the effect attacking such targets will have on the enemy, analyzed as a total interlinked and networked system.
3. EBO is the application of all of the levers of national power, including the Diplomatic, Military, and Economic, to address all elements of the adversary’s national power.
4. EBO is the use of rapid, simultaneous, and parallel attacks in order to achieve the rapid collapse of the adversary system.
5. EBO focuses on the interaction between the operational commander and other key actors in order to deal with a complex and adaptive adversary.
6. EBO is a consideration of warfare as a clash between Complex Adaptive Systems, with nonlinear interactions between means and will, and the cascading of effects in the physical and psychological domains.

With perhaps, the exception of the more purely military aspects (no. 2 and 4, above) these aspects capture many of the complexities of JIMP operations. In particular, one should note that the JIMP operational environment does resemble a clash of a “complex adaptive systems.” Whether or not an “edge” organisation is achievable in a multi-agency JIMP operation is debatable. What is less debatable is the need for the multi-agency to be responsive, agile, robust, and so forth, which are the qualities claimed for an “edge” organisation.

In considering EBO, it’s important to remember that the operational environment may often border on the chaotic and uncontrollable. However, it may be possible to influence it in a predetermined direction if approached properly through “change management” approaches, as described by Werther. This will require effective collaborative problem solving on the part of “partnering” organisations, despite the difficulties in collaborating, for which their

“common goal” is more accurately a commonality of elements which bind them together in collective action. As it is generally the intent of these “partnering” organisations to retain their autonomy while “joining forces” to achieve shared goals, the resulting tensions between autonomy and partnering must be reconciled in order to achieve both individual and shared objectives. Participants will be pushed into activities that are beyond their traditional areas of competence and they will be stressed when encouraged simultaneously to build linkages with other organisations and to protect their own organisation’s autonomy. In these instances, both cooperative and competitive behaviour will likely be observed. In this light, the “complex adaptive structure” is adapting not only to adversaries and the environment but also to internal dynamics and stresses.

THE RESEARCH AGENDA

A study commissioned by the US Army (Committee on Network Science for Future Army Applications, 2005) to examine the state of network science, of which collaborative networks are an important example, came to three major conclusions:

1. Networks, biological, physical, and social, had a pervasive influence and were indispensable to the workings of the global economy and the defence of the United States;
2. The fundamental knowledge needed to predict the properties of large networks and vital social networks is primitive; and
3. In spite of the need and high interest, funding policies and practices are not focussed on accumulating fundamental knowledge and research is fragmented.

While there have been considerable advances in theory concerning collaboration and the resulting partnerships amongst organisations, no general theory, with a common language and framework across any set of human endeavours, exists. Due to the fuzzy boundaries of meta-problems, the distinctiveness of meta-organisational structures (note: the term “meta-organisation” refers to the domain above organisations, so a meta-organisational structure consists of multi-organisations, their relationships and key environmental factors) cannot be not sufficiently defined. Much theory tends to view organisations as unitary actors and hence the organisation as the unit of analysis. *A priori* perspectives downplay important issues, such as power and trust, affecting success, which are between partners and not contained within the *a priori* nature of either partner. Faced with a large number of potential partners, even deciding with whom an organisation should relate and, once that is decided, how to achieve a successful relationship are challenging issues. More work is required to understand the mechanisms for overcoming barriers, social, cognitive, and technological, and for promoting rapid and adaptive collaborative relationships.

The Committee on Network Science for Future Army Applications (2005) identified a number of research areas of relevance to a future “networked” US military. A few are specific to combat operations, but most are also relevant to the “multi-agency.” These areas include:

- Modelling, simulating, testing and prototyping of very large networks.
- Command and control of joint or combined networked forces.
- Impact of network structure on organisational behaviour.
- Security and information assurance of networks.
- Relationship of network structure to scalability and reliability
- Managing network complexity.
- Improving shared situational awareness of networked elements.
- Enhanced network-centric mission effectiveness.

The “primitive” state of the science, as noted by the Committee, when combined with the complexity of the subject provides a considerable challenge to developing a research agenda. Nonetheless, the Canadian Defence Research and Development Corporation (DRDC) has supported the development of just such a research agenda. The proposed research course of action was to conduct preliminary investigations across a wide range of related topics rather than to attempt to “drill down” into a narrower, specific issue. The risk of the latter was a greater probability of failure due to the inherent challenges of the subject or the lack of progress in understanding related issues. Of course, the challenge of the broad approach lies in the fact that the approach is itself an example of a complex collaborative effort and will, therefore, place greater demands on the investigators. The benefit, however, is that there is a greater chance of partial success through progress on at least some issues. DRDC approved the research agenda with funding of activities to begin in April 2008.

The components of the supported research as drawn from the “benefits of a networked organisation” are:

1. The extension of current theory on collaboration and cause-based partnerships in the public security meta-organisational context; and the empirical testing of these theories through the examination of on-going or past public security operations using analytical tools, such as social network analysis. This work will be conducted by researchers at the DRDC Centre for Security Science and the Centre for Operational Research and Analysis in collaboration with:
 - a. Information technology researchers at the National Research Council, who will exploit data mining techniques to develop social network maps of collaborating organisations in real operations;
 - b. Economists at the Royal Military College who will explore the “economics” of multi-agency collaboration through transaction cost and principle agent theory; and
 - c. Sociologists at the Canadian Staff College, who will develop analytical frameworks based on institutional theories, such as Werther’s.

2. The development of multi-level, psycho-social conceptual models of decision making that captures the effects of team and organisational factors. These models will be tested through empirical data collected from surveys, focus groups, interviews and *in vivo* simulations of shared decision-making structures, such as the Incident Command Structure. This research will be conducted by DRDC Toronto and through academia.
3. The exploitation of complexity theory and effects-based analysis to develop models or simulations of multi-organisational collaboration and decision making and the effects upon goal achievement. This work, to be conducted by academia, will incorporate or aggregate the results of theory development and empirical research of the other activities.
4. The identification, theoretical exploration and empirical testing of mechanisms to overcome social and cognitive barriers. The mechanisms to be tested include:
 - a. The utility of a public security domain profession in establishing trust relationships. This work will be conducted by psychologists at the Royal Military College; and
 - b. The value of cognitive psychological theories in the area of geospatial data representation in improving shared understanding amongst collaborating organisations. This work will be done through academia.

At the minimum the research will seek to provide a “best practice” guide in order to further better multi-organisational coordination, cooperation and collaboration towards the more effective achievement of both individual organisational and collective goals. However, it is the possibility for success that makes this an exciting and ambitious research agenda.

Alberts and Hayes (2003) also proposed a research agenda that included “exploring the meaning of a ‘robustly networked force,’ examining mechanisms by which information sharing and collaboration improve the quality of information, understanding how sense making works in robustly networked or “edge” organisations, exploring the educational, training and doctrinal implications of adopting “edge” principles, developing modeling and simulation tools that represent the full range of command and control approaches” Their research agenda has to a great extent influenced the agenda of the one presented here. Success in any of these areas would be a notable contribution to the science and technology of collaboration and shared decision-making. Indeed, conceptual and empirical knowledge related to multi-organisational communication, coordination, collaboration and distributed leadership remain among the biggest gaps in the science and technology related to complex social issues.

As well, the US Army-commissioned report on “network sciences” (2005), noted the pervasive influence of networks in all aspects of life and concluded that networks are indispensable to the workings of the global economy and to the defence of the United States. However, the fundamental knowledge needed to predict the properties of large infrastructure networks and vital social networks is primitive. The reports stated that the current US military development of network centric concepts for operations is “like trying to build a modern combat jet aircraft without resorting to the science of fluid dynamics.” It is hoped

that this research agenda will play its part in the scientific journey of building the required knowledge base.

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