



Defence Research and
Development Canada

Recherche et développement
pour la défense Canada



Interagency Governance

Lawrence McDonough

Royal Military College of Canada

Scientific Authority:

Paul Chouinard

DRDC Centre for Security Science

The scientific or technical validity of this Contract Report is entirely the responsibility of the Contractor and the contents do not necessarily have the approval or endorsement of Defence R&D Canada.

Defence R&D Canada – Centre for Security Science

Contractor Report

DRDC CSS CR 2012-024

December 2012

Canada¹

Scientific Authority

Dr. Paul Chouinard

DRDC Centre for Security Science

Operational Research

Approved by

Dr. Denis Bergeron

DRDC Centre for Security Science

Head Decision Support Section

Approved for release by

Dr. Mark Williamson

DRDC Centre for Security Science

Document Review Panel Chairman

© Her Majesty the Queen in Right of Canada, as represented by the Minister of National Defence, 2012

© Sa Majesté la Reine (en droit du Canada), telle que représentée par le ministre de la Défense nationale, 2012

Abstract

We argue that productive vertical and horizontal networks with collaborative decision making and a two sided mutually reinforcing command structure are required for effective interagency governance. An examination of fundamental characteristics of organizations from the perspectives of economic analysis (Team Theory and Transactions Costs), of public administration theory and of ICT networks analysis lead us to consider various transactions types, locations, hazards and mitigation strategies. The concept applies to highly centralized and organizationally large operations like NATO or UN missions, to more localized emergency responses.

Résumé

Nous alléguons que les réseaux de production verticaux et horizontaux, avec prise de décisions collaborative et structure de commandement en deux parties qui s'épaulent mutuellement, sont nécessaires pour une gouvernance interorganisationnelle efficace. Un examen des caractéristiques fondamentales des organisations, du point de vue de l'analyse économique (théorie des équipes et coûts des transactions), de la théorie de l'administration publique et de l'analyse des réseaux de technologie de l'information et des communications (TIC), nous amène à considérer divers types de transactions, de lieux, de risques et de stratégies d'atténuation des risques. Le concept s'applique tant aux grandes opérations centralisées, comme les missions de l'OTAN ou de l'ONU, qu'aux interventions d'urgence locales.

Executive summary

Interagency Governance

Lawrence McDonough; DRDC CSS CR 2012-024; DRDC CSS December 2012

Introduction: The purpose of this study is to investigate an appropriate form for interagency governance. We first move away from the voluminous literature that focuses narrowly on particular operations, those related to conflict (Afghanistan or Darfur for example), or those related to disasters (Hurricane Katrina), or to security activities (drug enforcement, Olympic security). While much of this literature is insightful in terms of institutional failures and implications for adaptation, its approach is to structure analysis from the specific to the general. The approach used here is to consider more general analysis to identify fundamental characteristics about institutions, their genesis, and performance using different conceptual frameworks. Our concept Interagency activity thus includes Whole of Government approaches in which multiple departments and agencies coordinate or integrate for an operation as well as Comprehensive Approach in which multiple agencies of various governments and non-government agencies may be coordinated. Operations may be short-term emergency response to longer term reconstruction and development.

Results: The analysis of interagency governance and operations has attracted a large literature from a number of disciplines. It is clear that each discipline adds to understanding in some dimensions. This paper has investigated the question of structure from an economics perspective and in particular two strains of economic thought, the Economic Theory of Teams and Transaction Cost Economics (TCE). Some discussion of fundamental institutional concepts from public administration and the contribution of ICT (Information and Communications Technology) to communications have also been considered as they condition the application of economic thought. The level of generality of this analysis is sufficient to make some recommendations, but cannot address other more specific or contextual issues.

While team theory sheds light on the various problems of information organization on decision making, and TCE provides a method of analysing institutional structure by appealing to the minimizing of costs of transactions, public administration has shown that a governance structure will exhibit some element of hierarchy which is reduced by strong group bonds within particular agencies. These horizontal bonds give rise to less rigid hierarchal control in the interagency governance structure. This structure is characterized by Mutuality. The immediate conclusion is that a strong highly centralized hierarchy is inconsistent with an effective interagency governance structure. Moreover, ICT considerations in terms of the richness of required information flows for decision management suggest a network view of interagency governance. This structure is predicted to be a hybrid; actions are not coordinated by direct command (an integrated hierarchy) nor are they individually contracted (markets). Actions are coordinated; they require relational contracts that can mitigate rent seeking hazards that would compromise the objectives of a corporate board.

It is possible to comment on certain features of the hierarchical interagency command structure. The potential for differing objectives of agencies in an interagency mission can be considered as a high level transaction hazard; there is rent to be allocated to each agency. The direct implication

is a corporate form of decision making; all agencies must be represented and require corporate agreement. This is an element of integration, from markets (independence) to hierarchy (single entity).

When informational asymmetries are considered as transaction hazards, the mitigation strategy requires both aligned objectives and a reward system from the agent's departmental (or agency) chain of command. Since dispute resolution within the interagency structure must permit appeal at that level, all levels of decision making must be corporate (represent all agencies that they command). Moreover, the perceived legitimacy of the interagency structure requires the support of the coordinated agencies since they remain implicated for rewards and sanctions. Hazards related to asset specificity reinforce the requirement for a corporate structure which sustains the legitimacy to command. Since each specific agency is implicated in the corporate decisions, any hold-up in actions must be explained to all decision makers at that level and must pass acceptance of both the home agency and the interagency board. Brand name specificity implies a degree of power or control by one agency. Mitigation of power struggles requires consistency in objectives and intent between the independent agencies and the interagency leadership and must be enforced by the highest level of authority, including the political leadership.

Expanding from bilateral transactions to multilateral settings implies an expansion in possibilities of mitigation (analogous to more buyers or sellers). In this setting, principles of network management become essential; connections among different levels, strong center of gravity for messaging within a level, and processes and procedures for the network to operate effectively. Thus planning and pre-staging for communications and coordination is essential for short duration emergencies where planned actions are more important to objectives than developing relational contracts.

Significance: The question of interagency governance structure has been largely answered by experience. Command and control, coordination with partners, communications and information in broader networks have been implicated at every turn. The argument of this paper is that productive vertical and horizontal networks with collaborative and consensual decision making and a two sided mutually reinforcing command structure are required for effective interagency governance.

Future plans: There remain important issues which cannot be addressed. Should specific training be required, or can experiential learning by doing suffice? Training incurs costs. There is now a wealth of lessons learned reports and studies of many operations. Those operations were not complete failures and both cultural differences and trust have been identified as hazards that can be endogenously mitigated. If silos within departments persist (presumably the costs of bridging silos is greater than the benefits), is there sufficient reason to train for bridging for the unknown interagency mission? Learning by doing when there is great variation in the operation and its objectives may be the most efficient approach, especially if the fundamental characteristics of interagency structures are common knowledge.

Sommaire

Gouvernance interorganisationnelle

Lawrence McDonough; DRDC CSS CR 2012-024; RDDC CSS Décembre 2012

Introduction: Le but de cette étude est d'étudier ce qui pourrait être une forme efficace de gouvernance interorganisationnelle. Tout d'abord, nous nous éloignons de la volumineuse littérature qui traite strictement d'opérations précises, celles liées à des conflits (en Afghanistan ou au Darfour, par exemple) ou à des désastres (l'ouragan Katrina) ou encore à des activités de sécurité (lutte anti-drogue, sécurité aux Jeux olympiques). Bien qu'une grande partie de cette littérature soit intéressante, en signalant les échecs institutionnels et les mesures d'adaptation à prendre, son approche consiste à présenter une analyse allant du particulier au général. L'approche utilisée dans le cas présent consiste à faire une analyse plus générale afin de déceler les caractéristiques fondamentales des institutions, leur origine et les résultats obtenus au moyen de différents cadres conceptuels. Notre conception de l'activité interorganisationnelle comprend donc des approches pangouvernementales, dans lesquelles plusieurs ministères et organismes coordonnent ou intègrent leur action pour mener une opération, ainsi qu'une approche globale dans laquelle plusieurs organismes gouvernementaux et organismes non gouvernementaux peuvent coordonner leur action. Les opérations peuvent être des interventions d'urgence à court terme ou des opérations de reconstruction et de développement à long terme.

Résultats : L'analyse de la gouvernance et des opérations interorganisationnelles a fait l'objet de nombreux articles dans plusieurs domaines. Il est clair que chaque discipline affine la compréhension de certains éléments. Le présent article fait suite à une étude de la question de la structure d'un point de vue économique, plus particulièrement deux courants de pensée économique, la théorie économique des équipes et l'aspect économique du coût des transactions (AECT). Certains concepts institutionnels fondamentaux, portant sur l'administration publique, la contribution de la TIC (technologie de l'information et des communications) et les communications, ont également été pris en considération puisqu'ils conditionnent l'application de la pensée économique. Cette analyse est suffisamment générale pour permettre quelques recommandations, mais elle ne peut s'appliquer à des questions plus précises ou contextuelles.

Bien que la théorie des équipes fasse la lumière sur les divers effets négatifs que peut avoir l'organisation de l'information sur la prise des décisions et que l'AECT fournisse une méthode d'analyse de la structure institutionnelle sous l'angle de la réduction des coûts de transactions, l'expérience de l'administration publique a démontré que toute structure de gouvernance comporte une certaine hiérarchie, dont la force est atténuée par les liens solides qui existent au sein du groupe dans certains organismes. Ces liens horizontaux ont pour effet d'assouplir le contrôle hiérarchique dans la structure de gouvernance interorganisationnelle. Cette structure se caractérise par la mutualité. La conclusion immédiate est qu'une hiérarchie forte très centralisée ne convient pas à une structure efficace de gouvernance interorganisationnelle. En outre, les considérations sur la TIC quant à la richesse de l'information requise pour gérer les décisions plaident en faveur d'une vision en réseau de la gouvernance interorganisationnelle. Cette structure serait probablement un hybride. Les actions ne sont pas coordonnées par commandement direct (hiérarchie intégrée) ni ne font l'objet d'ententes individuelles (marchés). Les actions sont coordonnées et nécessitent des ententes relationnelles pour atténuer les risques que certains

tendent de maximiser les avantages pour eux, compromettant ainsi les objectifs fixés par le conseil interorganisationnelle.

Certaines caractéristiques de la structure hiérarchique de commandement interorganisationnelle peuvent être commentées. La possibilité que les organismes aient des objectifs différents dans une mission interorganisationnelle peut être considérée comme un grand risque transactionnel, chaque organisme devant y trouver son compte. Il en découle une forme collective de prise de décisions. Tous les organismes doivent être représentés et les décisions doivent être prises en commun. C'est là un élément de l'intégration, dans laquelle les différents marchés (indépendance) cèdent le pas à la hiérarchie (entité unique).

Lorsque les asymétries au niveau de l'information sont considérées comme des risques transactionnels, la stratégie d'atténuation des risques suppose que les objectifs sont harmonisés et qu'un système de récompenses attribuées par la chaîne de commandement du ministère (ou de l'organisme) de l'agent est mis en place. Comme le mécanisme de règlement des différends à l'intérieur de la structure interorganisationnelle doit prévoir un recours à ce niveau, les décisions à tous les niveaux doivent être prises en commun (tous les organismes commandés étant alors représentés). En outre, pour que la structure interorganisationnelle soit perçue comme légitime, elle doit être acceptée par les organismes coordonnés puisqu'ils demeurent exposés à des sanctions et susceptibles d'être récompensés. Une structure générale qui renforce la légitimité de commander est d'autant plus importante que la spécificité des ressources comporte un risque. Comme tous les organismes participent aux décisions du conseil, toute suspension de mesure doit être expliquée à tous les décideurs interorganisationnels et acceptée par l'organisme du pays en cause et le conseil interorganisationnel. Pour créer une image unique, un contrôle et un certain pouvoir doivent être dévolus à un seul organisme. Les pouvoirs supérieurs, y compris les dirigeants politiques, doivent prendre certaines mesures pour atténuer les luttes de pouvoir, notamment harmoniser les objectifs et le but visés par les organismes indépendants et les décideurs interorganisationnelles.

Le passage de transactions bilatérales à un contexte multilatéral suppose un élargissement des possibilités d'atténuation des risques (comme lorsqu'il y a plus d'acheteurs ou de vendeurs). Dans ce contexte, les principes de gestion de réseau deviennent incontournables : liens entre les différents niveaux, centre de gravité fort pour transmettre les messages au même niveau; processus et procédures assurant l'efficacité du réseau. Ainsi, la planification et la préparation des communications et de la coordination sont essentielles pour les urgences de courte durée, où les actions bien planifiées concourent plus à l'atteinte des objectifs que le développement d'ententes relationnelles.

Importance : L'expérience a fourni de nombreuses réponses à la question de la structure de gouvernance interorganisationnelle. Le commandement et contrôle, la coordination avec les partenaires, les communications et l'information dans des réseaux élargis ont été pris en compte à tout moment. L'argument de ce document est que les réseaux de production verticaux et horizontaux, avec prise de décisions collaborative et consensuelle et structure de commandement en deux parties qui s'épaulent mutuellement, sont nécessaires pour une gouvernance interorganisationnelle efficace.

Perspectives : Il reste des questions importantes auxquelles il est impossible de répondre. Une formation est-elle nécessaire ou apprendre par l'expérience suffit-il? La formation coûte quelque

chose. Il existe maintenant une foule de rapports sur les leçons retenues et d'études qui ont porté sur un grand nombre d'opérations. Ces opérations n'ont pas complètement échoué et tant les différences culturelles que la méfiance ont été considérées comme des risques pouvant être atténués de l'intérieur. Si les groupes travaillant isolément persistent au sein des ministères (on peut présumer que les avantages d'établir des ponts entre les groupes ne l'emportent pas sur le coût), serait-il justifié d'offrir une formation visant à établir des ponts en vue d'une éventuelle mission interorganisationnelle inconnue? L'apprentissage par l'expérience, lorsque les opérations et leurs objectifs varient beaucoup, pourrait être plus efficace, surtout si les caractéristiques fondamentales des structures interorganisationnelles sont bien connues.

Table of contents

Abstract	iii
Résumé	iii
Executive summary	iv
Sommaire	vi
Table of contents	ix
List of figures	x
1 Introduction.....	1
2 Conceptual Perspectives of Organizations.....	3
2.1 Economics Perspectives	3
2.1.1 Team Theory.....	3
2.1.2 Transaction Cost Economics	6
2.2 Public Administration.....	10
2.3 Networks and Information Processing	13
3 Transactions Issues in Interagency Operations.....	16
3.1 The Cultural Hazard	16
3.2 Dual Principals; Command and Control.....	16
3.3 Internal Transactional Hazards.....	18
3.4 Multilateral Hazards	19
3.5 Interagency uncertainty, coordination and integration	20
3.6 Summary of Transactions Hazards.....	21
4 Conclusions.....	23
References	25

List of figures

Figure 1: Governance Costs.	9
Figure 2: A Neo-Durkheimian Model.	12

1 Introduction

The purpose of this study is to investigate an appropriate form for interagency governance. We first move away from the voluminous literature that focuses narrowly on particular operations, those related to conflict (Afghanistan or Darfur for example), or those related to disasters (Hurricane Katrina), or to security activities (drug enforcement, Olympic security). While much of this literature is insightful in terms of institutional failures and implications for adaptation, its approach is to structure analysis from the specific to the general. The approach used here is to consider more general analysis to identify fundamental characteristics about institutions, their genesis, and performance using different conceptual frameworks. Our concept Interagency activity thus includes Whole of Government approaches in which multiple departments and agencies coordinate or integrate for an operation as well as Comprehensive Approach in which multiple agencies of various governments and non-government agencies may be coordinated. Operations may be short-term emergency response to longer term reconstruction and development.

We establish some fundamental features of organizational structures and then use analysis based on Transactions Cost Economics to identify properties of organizational governance structures which may be most appropriate to the task.

The rest of the paper is organized as follows. In the next section we consider some key observations in the economics literature that inform us about organizations. Jacob Marschak and Roy Radner (1972) give a simple, but powerful, device in which to articulate the relationships among decisions, information, uncertainty and outcomes in an organizational setting of at least two persons. Ronald Coase's (1937) transaction cost approach is a seminal piece in the economics of organization. In this view, the firm arises because alternate organizational forms are too costly. Transaction Cost Economics (TCE) largely built by Oliver Williamson (1975, 1996, 2002) gives a view of organizational governance that allows conceptual modelling of institutions from perfectly individualistic, completely contracted activities, to hybrid forms using both strictly market activities and relational or organizational activities, to the extreme of completely hierarchical structures populated with Marschak and Radner non-strategic rational agents.

Following these economics perspectives, we posit a public administration perspective of organizations at a very fundamental level. Perri 6 (2004) describes, in the context of a literature review, a Durkhiemian model that has much in common with both the economics perspective, both in typology and in changes from one type to another. More importantly, it allows for mixed types and overlaps in this dimension with hybrid governance structure from transactions cost economics.

All models of organizational structure are intimately related to communications, information flows, and interactions within groups but such models do not adequately address the pervasive enabling role of current information and communication technologies (ICT). There are two reasons to consider the potential for ICT to affect organizational choice. The first relates to the broad effects of changes in General Purpose Technologies, (GPT), (Elhanan Helpmen, 1998). Richard Harris (1998) makes the case that ICT developments are a new GPT and the deep structural changes (Richard Lipsey et. al. 1998) that these create will include how production is organized among other deep cultural changes. We discuss briefly how new organizational forms

are influenced by ICT and the importance of complexity in organizations. The issue is the extent to which ICT as a new information system may shape the choice of organizational structure.

The third section considers problems of interagency activities as they form in a transactional space. Mitigation strategies for transactions costs are discussed. The fourth section concludes by summarizing the mitigation strategies that define characteristics of a relevant organizational form for interagency operations.

First, a caution is in order. Proposing an Interagency approach to an operation must be recognized only one potential solution to a prior question; what should be done to handle this circumstance? To propose an interagency construct as a prior solution excludes thinking about other solution concepts. Ugurhan Berkok and Binyam Solomon (2010) consider a game theoretic approach to analyse which country of many might be subsidised to take on a peacekeeping mission based on the differences in defence cost structures. Jurgen Brauer (1999) discusses sub-contracting to private military companies. Military forces are frequently called to assist civilian authorities during emergencies, even localized emergencies. These are all examples in which do not invoke a formal interagency governance structure. There is a clear chain of command with sub-contracting of services. Lawrence McDonough (2005) further highlights the substantial potential for hybrid activities that use market solutions for defence activities. An important determinant in appraising solution concepts is extent to which specific National Interests or other interests are the output of interest. Military operations other than war and international emergencies allow more discretionary responses. In both cases, the extent to which an operation serves National Interests or altruistic motivations may help determine the contribution, direct financial aid, political support, contracted support or support for an interagency response. Other characteristics of such problems include the duality of risk and responsibility. Risks of failure (measured as lives lost or other poor outcomes) are reduced or hedged in many ways if third parties are significantly responsible for achieving objectives. However, claiming responsibility for success may add to a nation's (or a government's) political capital. Interagency responses may score high on risk and resource cost, but low on National Interests or political capital. In such cases, other solution concepts should be considered.

2 Conceptual Perspectives of Organizations

In this section we consider theoretical economic, administrative and ICT perspectives regarding the nature of organizations. Each will offer some fundamental perspectives about the features or characteristics of organizations within a multi-agency architecture.

2.1 Economics Perspectives

We consider two perspectives. The first is a highly stylized view of an organization and more particularly the environment of a representative agent and decision maker. In the second, we consider the central elements of TCE in relationship to the organizational structures that they can produce as an efficient choice.

2.1.1 Team Theory

How can we think about the problem of organizing the activities of multiple agencies to achieve a desired effect? An economist's perspective would include the notion of a firm. In a larger firm, there are multiple agents organized under different decision makers with different information and decision sets for each. There are common objectives and risk and uncertainties are significant. Jacob Marschak and Roy Radner's (1972, hereafter M&R) construct a simple but useful model capturing these characteristics. At the risk of oversimplification, consider the following representation of the model. There are n levels of decision makers, each with their own range of information and possible actions.

$$\begin{aligned}U_0 &= U_0[c(\pi); x, A, I] \\U_{1,j} &= U_{1,j}[c(\pi); x, a_{1,j}, i_{1,j}] \\&\dots \\U_{n,k} &= U_{n,k}[c(\pi); x, a_{n,k}, i_{n,k}]\end{aligned}$$

The nominal head, or principal, of the organization wishes to maximize her own welfare, U_0 and sets the firm's objective to maximize profit, $c(\pi)$. There are a number of states of the world that may occur but which would not be observed by all agents. The set of all of these states is denoted by x . Each agent has access to some information which is less than the full information set I but some information may be shared by different agents. Thus the information of agent 4 in level 2, $i_{2,4}$ may contain some part of some other agents' information. Each agent also has a set of actions that can be taken. The set of all possible actions over all agents is denoted by A . The action of each individual together with the realized state of the period determines the outcome for the firm.

In this problem, the utility function for each agent is aligned with that of the owner, profit is the sole objective of all agents, hence team theory. In this structure, optimality requires the design of an information system and decision rules which maximize profit under conditions of uncertainty. All actions will be aligned to generating the maximal profit. M&R are not oblivious to less than perfect alignment of all agents' motivations with the principal's objective. To include these strategic considerations leads to game theory rather than Team Theory.

We are interested in the description of Team theory because it highlights several design issues that are independent of strategic behaviour. We consider the information system and decision making: M&R define that to be the "*organizational form*" (M&R, p 49; italics in original). Ceteris Paribus, costs of an information system increase as the number of agents increase, or as the set of decisions required by an individual agent increases. In either case, the information to be transferred or gathered must be appropriately screened and filtered to the appropriate agent with due regard for excess information ("garbling" Ch 2.8, M&R, 1972). At the margin, the cost of adding another agent with requisite information must be weighed against the marginal cost of a given agent making one more decision with requisite information. The loss of information, with additional nodes in a system also contributes to decision inefficiency. Of course there are two problems with an information rule that requires all agents have all information, the direct cost of information provision and the costs of agents reducing that quantity of information to the relevant set. In general, the cost of information gathering and distribution is not costless so that a system that seeks perfect information is not optimal, the marginal cost of seeking and processing more information should equal the marginal revenue that it will provide.

In addition to garbling (excess information that may affect decisions) information may also be "noisy", not inaccurate or untruthful, but insufficiently accurate. Finally, an information system becomes better and better with repeated observations: the more frequently we observe signals (information) from states of the world the more precise our information set becomes. This is an application of the Law of Large numbers; moments of distributions become more accurately defined.

Communication and information costs constitute organizational costs. A centralized team differs from a decentralized team in that all agents of the former have the same information structure while in the latter they do not. Decentralized decision making organizations in the sense of Team Theory are those in which there is some specialization of labour in decision making and in individual agent information sets. Because of these specializations, optimal team rules (the optimal actions that should be taken by each agent) are contingent upon the information structure. Moreover, actions must be coordinated to achieve the optimal team rule. M&R construct a number of examples to illustrate optimal team decision rule and information system combination but of more critical concern is the case where sequential actions affect the information system. This is described as a "network" case.

The network concept can be most easily thought of as the case in which an action, $a_{i,j}$ has an effect on nature, x . An agent observes nature and given the information set computes an appropriate action at a moment in time. That action becomes a part of nature which can be observed by some other agent and thus become part of the information system. Note that both the input to the action and the output from the action contains some stochastic element. A number of principles are derived.

Consider a simple case in which a signal from nature results in a decision from unit A that contributes directly to the organizational objective and also enters the information system of unit B. B receives its own signal from nature and the signal from A and makes a decision. In selecting sequencing decisions, the one with greatest normalized impact on the objective should be communicated more quickly. By normalized, we mean adjusted for the cost of having acted upon an imperfect signal. The greater the value of the interaction between the decisions the more important becomes the choice of sequencing.

Other principles derived are that additional processing of signals add only noise and do not improve the team decision rule and that information pooling will not decrease the value of the team decision rule if no additional noise is introduced. The first follows from the meaning of processing; a direct message of unit A based on observation of the state to agent C is further processed if agent B picks up unit A's message and directly passes on a message that has not been informed by more information about the environment to C. C may receive more noise, but B has no more information than does A and cannot pass on more information. Pooling messages without adding noise can never decrease the payoff since all actions that could have been generated with the unpooled messages can still be generated with pooling. Pooled information results in a finer information system. There is an implicit constraint, if moving from unpooled to pooled messages has an effect of changing an agent's role so that actions taken in the unpooled system cannot be replicated by the pooled system, then pooling can be efficiency decreasing.

We can summarize several characteristics of organizations that are general to organizations of any type independent of interpersonal strategic issues.

1. Organizations exist because there are costs to information systems and decision making such that specialization becomes efficient.
2. Information system costs increase with additional decision makers.
3. The state of the environment is always imperfectly known.
4. Information systems are subject to noise.
5. The choice of optimal decision making systems and information systems must match one with the other.
6. A decision rule is the coordinated set of decisions by all agents.
7. Sequential decision making (or interdependence) defines a network structure.
8. In network structures pooled information can result in a finer information system.
9. In network structures, ill defined decision making systems can add noise to the information system.
10. The M&R network team is close in spirit to the current notion of a complex system. There is interaction among the parts and an important property of the system, the objective of the principal, may not be observed in any particular part.

In the next section we examine a different path of analysis that stems from costs of information and decision systems.

2.1.2 Transaction Cost Economics

The Economic Theory of Teams focuses attention on the nature of information, communication, and decision making in an organization, taking for granted that there are costs to gathering and communicating information and to decision making. The analysis examines transactions of agents not including strategic actions. In this section we consider the costs of strategic interaction in rather more detail to examine the genesis of organizations as a function of those costs. The economic analysis of organizations and the firm typically start with Ronald Coases's (1937) seminal paper which argues that firms exist because they are more efficient than markets. This is not because firms are efficient, merely that they arise because they are more efficient than markets. Similarly, public sector agencies must be interpreted as being more efficient than markets or private organizations in delivering their services. Organizations need not be models of Weberian bureaucratic efficiency. They are not "black box" production functions. But their survival suggests that they are the most efficient form of organization to deliver those particular goods and services. Transaction Cost Economics (TCE) considers different governance structures to be the economically efficient adaptation responses of agents to transactions costs. Governance structure in this literature refers to the institutional construct around sets of transactions from completely individualistic to organizations which capture any number of transactions as a group to maximize rent; thus Oliver Williamson's (1973) seminal article and then book (1975) *From Markets to Hierarchies*.¹

Consider a simple market exchange. Agent A goes to a market to buy an apple. Agent B sells apples. An exchange which is mutually beneficial to both is possible. A pays for an apple which he observes to appear to be of good quality and takes a bite. It is sour. The potential for conflict is realized. How is it resolved? It may be a market in which "buyers beware" rules. The exchange is efficient, there is a complete contract since there exists a settlement mechanism for all conflicts. In a world of complete contracts, all actions for all states of the world would be specified, although in more complex exchanges more complicated contracts would be required which would be an added cost. This would be a transaction cost. A transaction has three components; there is a mutual benefit, there is a potential for conflict, and there is a conflict resolution mechanism.²

Transaction Cost Economics appeals to bounded rationality (March and Simon, 1958) and maintains that complete contracts are difficult to create, are costly, and may be impossible to design for complex (because of uncertainty) transactions. Bounded rationality requires decisions be made with a lack of complete information and such uncertainty includes consequences or states of the world in which a conflict may arise requiring a resolution mechanism to restore order. The organizational question that arises concerns the most efficient choice of resolution mechanisms, an external mechanism such as the legal system, or a resolution mechanism internal

¹ Oliver Williamson is most responsible for developing TCE. *Markets and Hierarchies* (1973, 1975) lays out the TCE framework and characteristics of transactions, hazards, and adaptation. Williamson (1999) extends the analysis to public sector bureaucracies. Williamson (2002) analyses hybrid forms mixing markets and bureaucracies.

²John Commons (1932) uses mutuality, conflict and order to define a transaction.

to the transacting parties. TCE terminology would phrase this as ‘markets adapt autonomously to hazards, while organizations (or bureaucracies) adapt cooperatively’.

Opportunism (the possibility of extracting rent by one agent) must be coupled with small numbers (so rent cannot be dissipated by competition) to give rise to transaction cost. Repeated transactions reduce anonymity and may give rise to an effectively small numbers market in which opportunism becomes possible.³ Boundedly rational decision makers face two types of uncertainty: there is objective uncertainty in the sense of M&R in which the state of the world is never perfectly known and there is subjective uncertainty in which an information signal may contain false information (opportunism). Additional information processing in M&R may produce more noise, but it does not change the information set. In transactions analysis, information can be conditioned by strategic behaviour so that opportunism can be a product of exploiting asymmetric information.

The problem of asymmetric information has received considerable attention in the literature. Since George Akerloff’s (1970) “Market for Lemons”, economic solutions involve additional contracts (or sub-contracts) such as warranties or incentive compatible contracts (to solve the principal agent problem). These contracting solutions are costly of themselves and do not imply complete contracts since, at the margin, the cost of designing and implementing a solution must be equal to the benefits of so doing.

Opportunism has a number of other sources. The classical example considers two agents operating independently to produce a final product. Agent A requires a fixed investment in a specific asset to produce output which is sold to Agent B to further process and sell to market. The agents can formulate a contract for A’s goods. After A makes the fixed capital investment, it becomes a sunk cost and Agent B can bargain to claim a larger share of the total rent by claiming that B’s market is smaller than expected. One solution to the problem is to vertically integrate; the governance structure is an adaptation to the transaction costs of such a hold-up. There exist a number of types of asset specificity, all of which can lead to the hold-up problem. They include physical and human capital, temporal specificity, dedicated assets, brand name, informational asymmetry and intangible assets (critical process or experiential expertise).⁴

In each case, a hold-up occurs because one of the agents can use a unique property of the exchange to their own advantage. Temporal specificity implies a value at a particular time but not at others (fire trucks when there is a fire). A hold-up can arise from either agent to a contract; the asset owner (the seller in the contract) can claim unforeseen cost, timing or other issues. Small numbers is crucial since it restricts outside options. Finally, the choice of governance structure depends upon repeated transactions. For single transactions, or even a small number of transactions, a change in governance structure may not be cost efficient.

Transactions costs present agents with a choice of governance structures; the set of transactions can be governed internally or externally through informal or formal dispute resolution systems. Between pure market governance, formal and external (contracts are formal and require the

³ This should be recognized as the standard procurement problem of national defence systems.

⁴ See Williamson (1996). Intangible Assets are discussed in Subramani and Henderson (1999). These refer to creative and conceptual capacities that build systems, process and procedures as well as planning and executive decision making competencies. These may be considered as attributes of specific human capital which require a particular history of experience as well a formal education or training.

external legal system) and pure hierarchy governance, internal and informal, a broad spectrum of “hybrid” possibilities exists⁵. These include franchises, distributorships and other network forms of organisation (Grandori and Sado, 1995). Governance structure need not move from market towards hierarchy. “Contracting out” and “sticking to our core business” are business strategies that remove functional areas and move from hierarchical structures to hybrids.⁶ These hybrids require some form of governance structure to resolve or reduce the hazards of opportunism. These would include some degree of coordination, information sharing, and cooperative processes. Such relational contracts provide internalize dispute resolution between otherwise independent rent seeking agents without integrating the agents.⁷ These relationships must be acquired at some resource cost. Some of those costs are related to aligning incentives, sometimes characterized as principal agent problems in which agent’s utility function is not identical to the principal (and in M&R construct, game theory).

Williamson (1996, Ch. 3 and Ch. 4) develops the conceptual premise for choosing among types of organizational structures. The cost of a governance structure increases in the degree of dispute internalization; atomized transactions have the least governance cost while hierarchies which include all transactions in a governance unit have the highest costs. It is the possible costs of hazards associated with the degree of asset specificity that give rise to a move from market to hierarchy. Consider a governance cost function that depends on capital specificity; $G(k)$. Higher capital specificity implies a higher cost associated with transactions hazards. There are fixed costs with instituting any particular governance structure and the costs increase as capital specificity increases; the greater the hazards to be relieved, the greater the cost. There will be some level of capital specificity for which the cost to the firm is very high; there is a point where vertical integration becomes efficient for the upstream firm. Thus the governance cost function is increasing and convex in capital specificity. Figure 1⁸ below illustrates.

⁵ Williamson (1991, 1996, 2002)

⁶ See Menard (2002) for a review and discussion of hybrid organizations and their empirical regularities.

⁷ Supply chains are an example of highly coordinated but not integrated forms of hybrids.

⁸ Williamson (1996) Ch 4, pg 108.

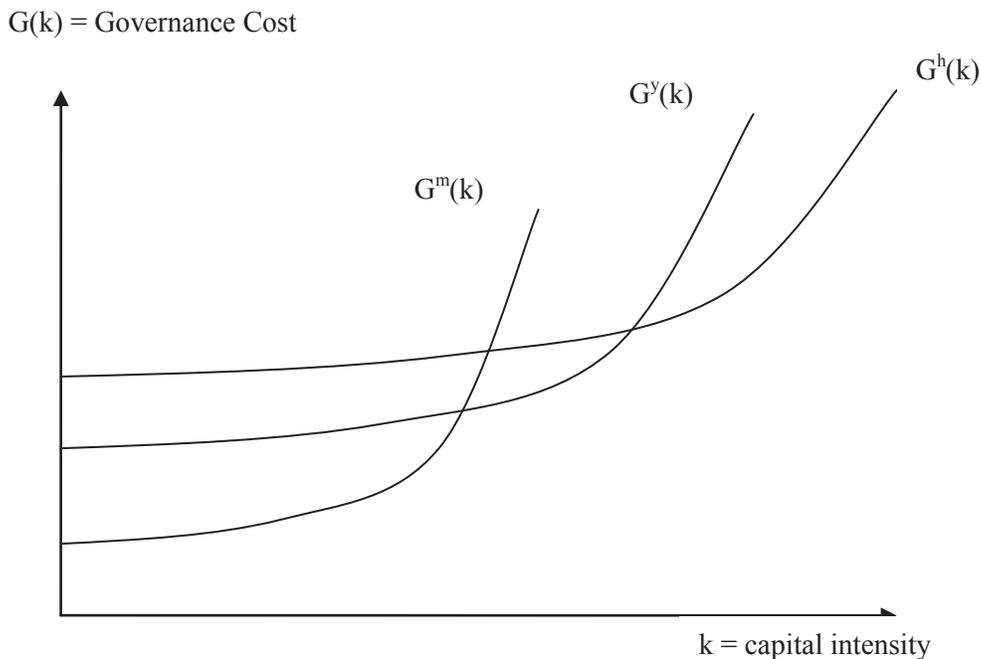


Figure 1: Governance Costs.

Where capital intensity is low, the governance structure is less detailed and comprehensive since contract hazards are low. Higher capital intensity risks a higher cost of hazard and a more inclusive governance strategy becomes efficient. A hierarchy consolidates all transactions internally. Such a strategy may be more costly in delivering less capital intensive products than a market governance system, but is less costly for sufficiently high capital intensity. Alternative structures between market and hierarchy, hybrids, may also exist. In principle, a firm can consider the profit maximization problem for each possible governance structure and choose the maximal element of that set.

Interagency activities include public sector institutions by definition. TCE extends naturally to the public sector in many instances, but there are added elements to be considered. Oliver Williamson (1999) summarizes some of the literature on the efficiency or otherwise of government institutions but the significant point to recognize is that economic efficiency is not necessarily a goal that should be attributed great weight. Elements of taxation, regulation and service provision may well be inefficient, but their purpose may be to redistribute income in worlds where lump sum taxation is not feasible. The government also organizes sovereign transactions; foreign affairs, national defence, a legal system, and national economic policy.

Given some sovereign transactions, the TCE approach must be to consider forms in which incentives are best aligned. Additional hazards to be considered are human capital specificity and probity. Probity would include accurate information flows vertically to the highest level of political power and horizontally among departments, adherence to the mission and lack of ‘zeal’ or ‘adventurousness’; “what distinguishes “probity transactions” are their needs for loyalty....”⁹. The hazard of probity can be mitigated by low powered incentives, secure employment, and an emphasis on administrative controls and processes. These address the information and individuality aspects of probity. The ability of the head of state to appoint or remove leadership of departments and agencies may address the problem of adherence to the mission and the alignment of preferences¹⁰.

At the risk of oversimplification, we can summarize some particular aspects of TCE that can inform the issue of interagency governance structure. Transactions are at risk to the extent that asset specificity leads to hold-up and renegotiation of rent. Specificities of probable concern are informational asymmetry, location, temporal specifics, and human capital (including intangible characteristics). Government bureaucracies need not be efficient; they need to produce politically determined goods and services which include income redistribution. Governments also produce sovereign goods and services. Transactions in this sphere require probity, an alignment of preferences, loyalty, and appropriate communications. Both private and public sector governance structures can be viewed along a continuum from market to hierarchy in the private sector, and along a continuum of controls, processes and independence of individual choices that might be permitted within an organization. That is even within a hierarchical structure such as a national public administration, there is room for more or less centralization.

Of course, governance structures including public administration are the domain of considerable research in sociology. We consider next, a particular line of that research.

2.2 Public Administration

Interagency governance has been an exercise in building a social construct of governance from a set of weakly overlapping social relations – a multi cultural structure. It is the interaction of individuals in this context that distinguishes the nature of the problems faced and the solutions attempted. In a Durkheimian perspective, it is the social characteristics of the individuals that should be studied to understand the structure that they create. Perri 6 (2006) offers a review of literature on the institutions of government particularly the dynamics at play as institutions change. He then constructs a model allowing movement between more hierarchical and centralized – holistic, and more decentralized or joined-up forms.¹¹ There are a number of explanations for institutions that Perri 6 considers. These include path dependency (constraints of the past condition change in the future), the powerful influence of constitutions explicitly or implicitly, the influence of national cultures, and path dependency with feedback. None of these asserts 6, can explain changes in structures across time or geography¹². While they may explain

⁹ Williamson (1999), pg 323.

¹⁰ Williamson (1999), pg 338.

¹¹ The discussion that follows is based on 6 (2006) since it is both a considerable survey and it addresses the very issues that are of interest in interagency governance. It is complementary to the economic framework considered in the economic perspectives.

¹² 6 (2006), pp 109-112.

some adaptations, they are too specific and do not address deeper more fundamental forces that shape changing institutional structures. Thus Perri 6 examines the forces that generate particular governance structures.

Perri 6 clarifies the differences between holistic and joined-up governance in the dimensions of activities, coordination, and integration. In the holistic structure, activities of different agencies are designed to reinforce each other as opposed to joined up in which activities are consistent in objectives and means with each other. Coordination refers to the method of approaching possible interagency problems. Holistic organizations seek to create internal resolution mechanisms rather than accepting that some effort may be required to overcome frictions as separate lines of responsibility come into conflict. Integration refers to the execution of action. Holistic organizations build seamless programs while allowing agencies to progress other work separately. This is a unified team approach. The joined up approach seeks to eliminate negative externalities and conflict between agencies when pursuing a particular mission. In a broad sense, joined-up governance expects stovepipe organisations to work together as required to accomplish missions. Holistic governance seeks to eliminate stovepipe behaviour by creating processes and teams.

Coordination and integration form the basis of 6's model of the dynamic forces that act upon structure. The neo-Durkheimian model posits institutions as rules that define styles of organization. The rules reflect the frame of mind of those with greatest influence. Those least favoured by the rules are opposed to the organization which creates a model of dynamic disequilibrium.¹³ The more ideal a type becomes, the more powerful the countervailing forces and the more probable will be a reversal. The model considers the outcomes on coordination and integration of two continuums of forces. Figure 2 below is a simplification of 6's Figure 1 (2004).

¹³ This model is not unlike the predator-prey model wherein nature evolves favouring one type then the other endogenously. There may be fixed point solutions to such systems, but in the Durkheimian construct shocks are sufficient to perpetuate the dynamics.

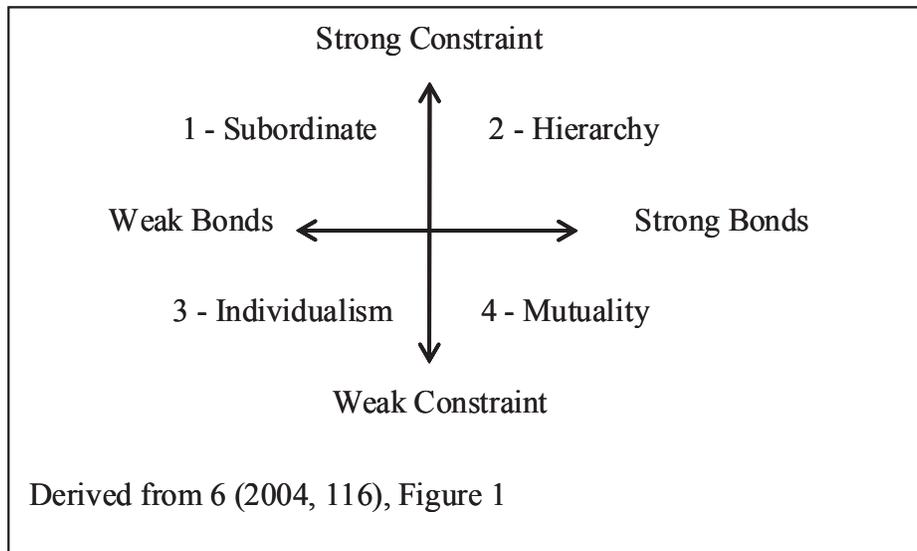


Figure 2: A Neo-Durkheimian Model.

On the one hand, there may be strong constraints on the roles of individuals and processes or weaker constraints which allow considerable individual freedom of voluntary action. The other dimension is the accountability (bonds) of individuals to the relevant group. For example in a very hierarchical structure (holistic governance) stems from defined roles ascribed to certain individuals, prescribed processes (strong constraints) and a high degree of accountability of the individual to the organizational group (strong bonds). There may be little explicit concern for coordination since processes exist that solves the externalities of top down directives. Adherence to the hierarchy is expected. If one supposes strong constraints (actions are defined by processes) on individuals with little or no adherence to the group, (very weak bonds) then only by chance would there be much coordinated action.

The polar opposite of Hierarchy in the model is Individualism; the constraints imposed by rules and roles are weak, and the accountability bonds within the group are weak. We can consider this to characterize different departments (as individuals) within a national government. This is consistent with departments as stovepipes and the observation that departments only interact to further their own objectives on a case by case basis. The transition to a whole of government approach could well be achieved by creating an impetus for the departments to want to coordinate and be responsible to the group for their actions. In the model, this is termed Mutuality. The discerning interest that generates strong bonds could be the common desire for resolution of a significant problem, perhaps a response to an emergency. A precipitating force is the power of the national government to impose¹⁴ a coordinated response. Mutuality better defines a community of practice in which members freely share common interest and expertise. To the extent that other non-government entities can be accommodated without imposing a set of common rules and processes, it is a Mutual form. It should also be noted that the integrated form of governance would add common rules and processes for all to follow; it would then be a hierarchy.

¹⁴ If we change the word “impose” to “allow”, the whole of government approach would be consistent with Mutuality.

We conclude from this discussion that an interagency structure will be either hierarchy or a mutual form of governance. If it is hierarchal, it may be pre-existing (a department created specifically to respond to operation with multiple partners), or it may be a natural evolution from a coordinated mutual form. A particular interagency question is to determine the form which best serves particular requirements, or if there is a single structure to meet all requirements.

Team theory, TCE, and neo-Durkheimian theory have a number of commonalities. In particular are the repeated references to information flows that agents must be gathering and transmitting, and the groups, formal or informal, flexible or inflexible, that make decisions. Networks and information systems are discussed in the next section.

2.3 Networks and Information Processing

As noted in the introduction, the development of Information and Communications Technologies (ICT) can be considered as a new general purpose technology with potential implications for all manner of institutions. It has already been implicated with hybrid forms of governance for the public sector consistent with TCE particularly as it concerns contracting out and the emergence of relational contracting with the private sector¹⁵. The purpose of this study is slightly different. ICT reduces the marginal cost of information acquisition, storage and recall¹⁶ and thus allows more complete information flows and more interaction among members of a group which enhances relational contracting relative to contracting as it eliminates hazards. But the business of designing ICT systems is built on more definitive architectures of the information functions to be supported. In doing so, they help define the structure of the interagency problems by situating informational transactions.

There is no lack of research and opinion regarding the Incident Command System (ICS) utilized by the Department of Homeland Security. While it is regarded as a hierarchical structure, Donald Moynihan (2009) analyses the ICS using case studies to highlight its network properties. The diversity of the network to be coordinated varied from low (thousands of responders, but limited geographically and functionally) to very large. The diversity and size of the Hurricane Katrina network was such that it was never completely coordinated. Moynihan reports issues within responder networks as well as among networks as they attacked different problems.

Moynihan notes a number of problems of emerging networks in a crisis. Part of the role of the ICS is to identify various actors and networks and their communications requirements. However emerging networks were characterized by agents with different cultures and perspectives which hindered coordination. Moreover, there becomes a trade-off between the costs of coordinating new members and the benefits of resources that they may bring. Moynihan also considers the hierarchical command structure that ICS was meant to deliver and finds it wanting. Authority was not always clear, it was shifting and it was shared.¹⁷ That the ICS acts as a coordinating entity in a network with sometimes blurred authorities, suggests that hierarchy and networks are not opposites and finds support in the notion that networks governance can be led by strong leaders,

¹⁵ Bertelli and Smith (2005) link contracting out through TCE and relational contracting. McDonough (2005) uses TCE to examine the general shift from hierarchy to hybrid in National Defence.

¹⁶ They also reduce the transactions costs of information exchange over distances. See Harris (1998).

¹⁷ The outcomes of the interaction of agents in the network are consistent with the learning and changing roles of members of a community of practice.

or by a Network Administrative Organization (NAO).¹⁸ NAO's would also seem to be better suited to generate the trust that is required in the network. "...trust remains a critical complement to authority for the ICS."¹⁹

In general, internal adjustments occur in networks, relational contracts are made, authority is supplemented with trust, and network objectives become established. Transactions in networks are subject to all of the problems encountered in other organizations but the nature of the group interaction can serve to mediate disputes and encourage cooperation and learning.

Networks as defined by decision support systems, establish different functional subsystems that are linked by related transactions, informational requirements and procedures. We use the Heiner Micko and Johannes Leitner (2006) elaboration of network system in support of civil emergency management to illustrate the location of transactions as well as the hybrid nature of these information structures. They construct a network model for a lead organization to support the logistics of getting donor nations support to an emergency area. The structure leaves participating nations without major changes in their organizations. They identify six such centers; Know How Center, Coordination of Intent Center, Resources center, Capability Center, Action Center, and Media Center.

The centers are not necessarily linked sequentially and they may be complex with actions taken in one center having effects in other centers. As an organizational structure, this takes the form of a network. There are transactions within each center and among the centers. There may be a lead in the Intent Center, but in this particular case it was not a top down hierarchical structure since a main task of the lead was to negotiate contracts with suppliers and transporters. The same structure could however be relevant for a very hierarchically controlled supply system. One could imagine a security issue and staff the centers with the military. The democratizing or decentralizing effect of networks is typically increased by the number and variety of actors, but the same networks can also be, through design, thoroughly holistic and hierarchical. Freedom to join or leave (experienced in the Hurricane Katrina example above) is a force that generates relational contracting and a move towards hybrids and market structures, or towards mutuality or individualism in the neo-Durkheimian model.

Describing networks is tantamount to describing information flows. But not all information flows are noteworthy. "As we showed in the case of Twitter, most of the links declared within Twitter were meaningless from an interaction point of view."²⁰ Collaborative networks exist among competing firms and within terrorist organizations.²¹ Measures of centrality are most frequently used to discern the important underlying features of network structure. These measures seek to uncover centers of gravity, the nodes that receive or emit most messages. Networks can exhibit hierarchal control (in some terrorist organizations) or horizontal collaboration (with competing firms). In the Meiko and Leitner model discussed above, the architecture of the communications and information system could serve either a collaborative and coordinated interagency structure

¹⁸ McGuire (2001) suggests that network and hierarchical managers both require the same skills. Problems arise when different actors in a network have different measures of success but managers must shape the structure to the task in both institutional settings. Provan and Kenis (2008) are also cited for their treatment of NAO's and trust.

¹⁹ Moynihan (2007), pg 27.

²⁰ Huberman, Romero, and Wu (2009).

²¹ Schilling and Phelps (2007) and Fellman (2008).

or a very hierarchical structure. What may change is not the design, but the number of messages between and among nodes.

We conclude that an appropriate architecture design of a communication and information system can be created for any interagency operation and is largely independent of the institutional structure of the agencies involved in the sense that templates of decision making centers can be anticipated and articulated and hence a communications strategy outlined.

We have considered four perspectives on governance structures that have relevance for interagency governance. We now consider a transactions approach in more detail.

3 Transactions Issues in Interagency Operations

3.1 The Cultural Hazard

At any intersection of two individuals under different reporting lines there is a cultural issue; intra-organizationally these are referred to as stovepipes or silos. These occur even within sub-units of a department which are physically proximate. The fundamental issue is lack of information sharing, the lack of full information for decision making, and the use of individualized versions of the real state of the world; many of the fundamental issues discussed in team theory.²² The hazard is the power or value (rent) that knowledge may confer on one individual (or silo) in the organization.

In terms of a M&R decision-maker, the set of possible actions $\{a_{ij}\}$ could be broken into two subsets, one set of actions is optimal from a clearly objective hierarchical perspective and the other from the culturally biased silo perceived of the optimal action, say $\{b_{ij}\}$. Eliminating bias implies that the actions $\{b_{ij}\}$ approach $\{a_{ij}\}$ under the same information sets.

Cultural bias can be severe. Organizations form under functional, spatial or other frameworks to take advantage of specialization of labour that reduces or eliminates horizontal information flows. In addition, the framework of specialization creates views of the local objectives and intent of actions. The finance and production divisions each know that they are critical to the firm, and that their own perspective is different than the other. Within those functional silos there may also be sub-units which may also be silos in communication and local objectives. However efficient a hierarchy might be, with functional lines as silos and intra-functional silos, inefficiencies in information, communication, and decisions do occur. These become manifest in greater degree between departments and among departments in a whole of government construct. Clearly, these communication and perspective problems are amplified as a broader interagency structure is contemplated. Thus problems described as cultural differences; differences in languages, motivations and beliefs may well signify that the governance structure is inappropriate. Such issues represent transaction hazards which can be examined in the rubric of TCE and asymmetric information considered below.

3.2 Dual Principals; Command and Control

The benefit of a transaction is the rent that can be generated. Competition between individual agents can dissipate the rent rather than benefit the global objective. As noted in the theory of teams, perfect alignment of preferences of agents with the owner is required to generate optimal decisions. For our purposes, individuals are “personnel who are primarily dedicated to their own agency rather than to the interagency community”²³ Note that this is simply a principal agent problem in which rents have to be allocated, but here the principal is not well defined! There are at least two principals; the principal that evaluates performance and controls the individual reward system and the principal that is defining the objectives of the interagency operation. The simple

²² These governance structures with ‘silos’ may well be efficient if additional horizontal communication channels cannot add sufficiently to decision values.

²³ Desai (2005), p2.

answer to this hazard is to properly define the interagency command and control hierarchy. Individuals within agencies know about their own agency objectives, budgets, revenues, and costs. Those individuals in a particular agency that are allocated to an interagency operation represent the agency in that operation. We consider both agencies and individuals' interests.

Consider for example the non-profit sector. Jessica Sowa (2009) identifies three predominant drivers and objectives for non-profits to collaborate. Budget or revenue concerns will motivate collaboration where the agency objective is survival. Institutional pressures, to be included in policy frameworks or to be consulted or asked to participate can induce collaboration to show institutional legitimacy. Finally, agencies may have to show that they are a center of expertise giving incentive to be a leading agency and collaboration is a vehicle for showing competitive advantage.²⁴ Individuals, as part of such organizations recognize the importance of the demand for their services and the support that they can generate for the agency. Hold-up occurs if agents from different agencies use their agency perspective rather than the interagency perspective. They take actions that benefit themselves the most.

The solution to this transactional hold-up is to align preferences to the interagency preference structure. Significantly, this requires more than interagency intent, command and control; it requires the specific agency to have a command and control system that speaks to the primacy of the interagency objectives. Clear articulation from the strategic level down to the individual within each agency should emphasize the overriding success for the individual and the agency in the success of the interagency activity. Explicit reward for successful interagency activity by the individual is warranted.

While it may be easy to understand altruistic motivations in the non-profit sector; they have to be seen to provide valuable services, to be appreciated as an institution and to be able to raise funds. The same conceptual umbrella applies to government departments. Individuals in departments cannot take for granted that their allocation to an interagency operation will be anything more than being on leave (unrecognized contribution, a revenue consideration) and thus performance within the interagency activity must be seen as a departmental benefit consistent with departmental objectives. Once again, the leadership of the department must be held responsible for aligning its members' preferences to the interagency objectives.

The analysis extends to national contributions in international operations. Thus different countries choose different roles according to the benefits (National Interests are the rents to be allocated) they expect to derive. In some operations, national interests do not perfectly align among countries, and limited coordination takes place among some countries (in Afghanistan for example). Often there is better alignment; many NATO operations have displayed coordination and unity of purpose that are strongly emphasized by participants.

One can extend the argument to any agency that participates in an interagency operation. The leadership of each agency must make clear to all its members that the interagency operation is the unquestioned priority. As a principal – agent construct, the reward system must be structured within the specific department or agency. The leadership of the interagency operation cannot be presumed to generate this level of alignment of preferences. Implicit in the exercise of leadership in the interagency construct is a corporate decision-making approach in which every member of

²⁴ See Sowa (2009), Figure 2 and related discussion pg 1015.

the highest decision making body articulates the same message to each of their specific departments and agencies. A corporate decision making structure implies unity of direction; it is in TCE terms, the integration of independent firms – a hierarchy.

3.3 Internal Transactional Hazards

In this section, we give examples of the transactional hazards listed previously. These are hazards that give rise to ‘selfish’ behaviour, $\{b_{ij}\}$, rather than team behaviour, $\{a_{ij}\}$. The primary mitigating strategy for these hazards is the strategic direction and reward structure discussed in the previous section. Below, we consider the types of hazards that are likely to be encountered and their possible remedies. These hazards include informational asymmetries, asset specificity, and brand names.

Informational asymmetry exists when one party has information that the other does not and can use the information to get a larger share of the benefits of the transaction. Note that the team goal suffers and explicit contracts are not feasible. However repeated instances of this behaviour will be self-revealing and a resolution mechanism must be developed. To situate the problem, suppose that a person from Department A tends not to reveal the true nature of their assets (quantity, quality, availability) in order to forward their own perceived agenda. The least costly mitigation mechanism is more thorough horizontal communication between the parties or with mediation by other concerned parties. Failing that, the next mechanism involves a different authority. Here there are at least two possibilities. Let the issue be between departments A and B and call the interagency chain of command IC. Note that agents in the operation also have access to their own department outside of the IC. The complainant belonging to B may appeal to the IC at the appropriate level or to decision makers in B itself. In either case, true resolution requires more than an IC resolution; it requires both departments, A and B to confirm the IC resolution lest the agents from A or B to the operation reject the leadership of the IC as incompatible with their own departmental beliefs. The implication is a requirement for a collaborative corporate decision making structure within the interagency operation as well as alignment with the individual departments outside of the operation. This does not imply two chains of command; merely that a departmental point of contact outside the IC can be very effective in aligning support for the IC. In the long term agents in operations are still rewarded by their departments. In effect, the outside department serves as a ‘warranty’ in verifying information claims. The analysis is unaffected whether the hold-up occurs wilfully (genuine personal rent seeking) or by cultural misunderstanding.

Ownership of physical assets, dedicated assets, human capital, and process or expertise specificity all confer a degree of monopoly power in that the quantity to be used is a choice of the ‘owner’. There being no outside markets (by assumption), then the hazard to be resolved is a hold-up of activity by the monopolist to extract some rent. This differs from asymmetric information in that it limits the quantity of anticipated collaboration. In this case, B, the offended, has no useful recourse to a higher authority in B since B has no expertise in the operational mix of activities specific to that mission. That expertise resides in their representation in the IC. Again corporate decision making is the key factor. If the representatives of A and B in the IC cannot agree, this

issue must move higher in the IC until corporate unity can be restored.²⁵ Anything less than a unified message tends to implicitly support at least one party and it reduces the incentive to align preferences to those stated by the IC.

Brand names²⁶ have value because they reduce uncertainty about characteristics of a good or service. In an interagency context, a brand name can be associated with a history of success for a particular department. To cooperate and coordinate actions with a highly competent partner in business is to create synergies! A hazard is that such brand reputation may give rise to assumed leadership or presumed power. In this case, offended B may look to the IC for resolution. The IC can resolve the issue only if it has more power of authority than A. This power may not be within the IC but external to the IC. The US military has such potential power in any interagency operation (as do national forces generally). Resolution of this hazard implicates the level of authority that sanctioned the IC as well as the leadership of department A external to the IC. To follow the military analogy, the Armed Forces will be the de facto authority unless the Commander in Chief indicates otherwise. Thus even outside of the interagency operation there is a significant role for direct support at the highest strategic levels.

3.4 Multilateral Hazards

Bi-lateral hazards are instructive, but interagency operations are typically characterized by multiple agents transacting at different levels of decision making. This ushers in alternate ways to view resolution. Each hazard is a special case of a difference of opinion, whether self-serving or simply misunderstanding is not crucial. Introducing more agents to the disagreement is similar to discovering more markets in which to buy (or sell) the specialized good at the root of the hazard. They can bring more information, more perspectives and balance to disputes. To the extent that the interagency operation engages multiple agents among multiple agencies, a network is created. Common goals, common interests and complementary expertise is almost a perfect community of practice (common expertise is the third characteristic but we argue that they share interagency expertise). It is the strength of these bonds which gives the interagency operation its special nature, these are strong bonds of Mutuality in the institutional model.

From both the TCE and Team theory perspectives, information is a crucial determinant of institutional efficiency. Where the state of the world is only partially revealed and where many nodes can increase error, there is much greater probability of hazards occurring between agents. Shared information among many agents increases the fineness of information and shared decision making increases the bonds within a group and enhances decision making.²⁷ This is not without cost. The transactions cost for decision making in a network increases with membership, through the time cost of consensus building. This temporal factor of decisions is perhaps the more interesting issue (we assume the technical cost of information sharing to be small in a relative sense).

²⁵ We do not ascribe oppositional behaviour to any real persons engaged in any interagency operations. The hazards exist even when well intentioned persons have different perspectives on the relative merits of different courses of action.

²⁶ Teo and Yu (2005) examine brand names and transactions costs on online markets.

²⁷ In M&R, full information shared by all will yield optimal decisions. In conditions of uncertainty, even perfect information sharing does not ensure optimal decisions.

There is a trade-off between quick decision making and waiting to make a decision. Under conditions of uncertainty, waiting provides the benefits of receiving new information and further analysis. In the interagency context, one must include the increased effectiveness of using multiple sources of expertise. Moreover, there exists an independent additional benefit; consensus decision making demonstrates unity of purpose and action.

Network analysis yields many insights into the effectiveness of similar network structures. Bertelli and Smith (2005) consider a number of issues in public sector contracting and expose the role of relational contracting. Relationships form even in the presence of formal contracting. Relational contracts take formal contracts informal and they include implicit or explicit rules and processes to mitigate hazards and reduce conflict resolution. Efficient network structures establish trust in the long run by repeated hazards resolution. These generate embedded processes and practices in the relationship that establish communications between and among levels of authority, and that create a strong center of gravity (representing three fundamental measures of network efficiency: embeddedness, multi-complexity, and centrality)²⁸. The center of gravity is required to push information to and pull information from others in the network to establish not just trust but joint ownership and joint respect. It is this level of interaction that is required to effectively coordinate several individuals or groups.

A short term interagency operation could be defined as one in which there is insufficient time to build trust through repeated conflict resolution. Clearly, mitigation requires minimizing conflict, or more appropriately, minimizing conflict which disrupts coordination. In this case decision support systems that are pre-planned and contain highly defined specific actions and responsibilities would have considerable merit. Johannes Leitner and Heiner Micko (2006) describe a systematic way to describe who and how to act. Together with ICT analysis to design the communications architecture, governance hazards can be mitigated. There can be no doubt that the predisposition of all agents in a sudden time sensitive operation is to offer any assistance possible. Conflict resolution processes are not created in the short run, but trust might be pre-planned to some degree (cross departmental courses, exercises and exchanges). In protracted events, network management, as noted above, can lead to conflict resolution mechanisms.

3.5 Interagency uncertainty, coordination and integration

Perhaps the most significant transactions hazard is the uncertainty of the particular activity that might require genesis of an interagency response. The analysis of this study is sufficiently general to be applied to local emergencies, state or provincial civil emergencies, national emergencies including security emergencies and ongoing operations, and international emergencies or longer-term operations. It should be clear that a single agency cannot be designed to respond to all operations.

The wide variety of circumstances for which an interagency operation might be considered a viable solution recommends a flexible response customized to the event. A high degree of planning, both a communications architecture and an action plan, should be specified in great detail for predictable operations with unpredictable timing; typically, emergency operations. In these cases, well planned and coordinated actions are immediately critical. In the aftermath,

²⁸ Bertelli and Smith (2005) pp22-24. Here, we use the term center of gravity rather than ‘broker’ (pg 24)

reconstruction activities will require trust and relational contracts that evolve over time. That is, in the very short run, an informed hierarchal approach with direct command and control, pre-defined processes and responsibilities which support rapid response and decision making may be the appropriate governance structure. In the longer run, where complexity dominates decision making, the transactions analysis suggests interagency governance characterized by the dual chain of command and consensual decision making.

Integration implies a single chain of command, common processes and procedures; work proceeds as a single department. The governance structure is clearly hierarchy. Coordination implies a continuing and defining membership in a home organization, but specific skills and capacities being allocated to a temporary interagency mission. The interagency chain of command may develop, in time, its own internal procedures and processes that have the effect of integrating rather than merely coordinating resources and skills into responses. However, as long as agencies are free to exit, effective coordination and not integration can be claimed.

Interagency operations cannot be about a single department. The US Department of Homeland Security is a department that is tasked to plan, to train, to prepare for all manner of calamity and to and initiate and coordinate interagency operations. The necessity of an chain of command and the requirements of supporting departmental chains of command have been shown. Hence the term integrated interagency operations is always a misnomer. The issue may be whether a specific department should be created for the purpose of enabling interagency operations. Our analysis suggests that should such a department assume leadership, should it assume that it is the single authority, it will incur transactions hazards that it alone cannot resolve (the brand name hazard). The relevant department must be involved to lend legitimacy to the interagency authority. Indeed, many departments could well be included in various simultaneous interagency operations so that the rigidity of fully integrated interagency operations is inconsistent with the many roles that might be assigned to individual departments.

3.6 Summary of Transactions Hazards

The relationship between an individual agent and the interagency operation to which they are assigned, and their relationship to their own agency or department is examined. We observe that some hazards, such as cultural differences, are a special case of informational asymmetries in the TCE perspective. We also observe that each agent in an interagency mission belongs to two different hierarchies. We show that hazards thus created require a corporate command and control system in which interagency requirements are reinforced by the agent's own department.

Three general bilateral transaction types (informational asymmetry, asset specificity, and brand names) were considered. Mitigation strategies called for a corporate command and control structure for the interagency operation and an external supportive command and control within each participating agency. Mitigation of specific transactions hazards thus reinforces the agent – multi-principal resolution. Extending the hazard space to include multi-agent transactions introduces the principles of network management where command and control requires significant communications networks and more consensual decision making. Pre-planning and considerable detail in network communications, task requirements, and task allocations are required for emergency type operations. In longer term operations, trust can be built partially

through planning, partially through alignment of the interagency and departmental command and control objectives, and partially endogenously through practice.

The uncertainty surrounding the potential for the next interagency mission implies that the governance structure can only be pre-planned to a certain extent and that flexibility to evolve strong bonds enabling trust, conflict resolution and Mutuality is required.

4 Conclusions

The analysis of interagency governance and operations has attracted a large literature from a number of disciplines. It is clear that each discipline adds to understanding in some dimensions. This paper has investigated the question of structure from an economics perspective and in particular two strains of economic thought, the Economic Theory of Teams and Transaction Cost Economics. Some discussion of fundamental institutional concepts from public administration and the contribution of ICT to communications have also been considered as they condition the application of economic thought. The level of generality of this analysis is sufficient to make some recommendations, but cannot address other more specific or contextual issues.

While team theory sheds light on the various problems of information organization on decision making, and TCE provides a method of analysing institutional structure by appealing to the minimizing of costs of transactions, public administration has shown that a governance structure will exhibit some element of hierarchy which is reduced by strong group bonds within particular agencies. These horizontal bonds give rise to less rigid hierarchal control in the interagency governance structure. This structure is characterized by Mutuality. The immediate conclusion is that a strong highly centralized hierarchy is inconsistent with an effective interagency governance structure. Moreover, ICT considerations in terms of the richness of required information flows for decision management suggest a network view of interagency governance. This structure is predicted to be a hybrid; actions are not coordinated by direct command (an integrated hierarchy) nor are they individually contracted (markets). Actions are coordinated; they require the relational contracts that can mitigate rent seeking hazards that would compromise the objectives of a corporate board.

It is possible to comment on certain features of the hierarchical interagency command structure. The potential for differing objectives of agencies in an interagency mission can be considered as a high level transaction hazard; there is rent to be allocated to each agency. The direct implication is a corporate form of decision making; all agencies must be represented and require corporate agreement. This is an element of integration, from markets (independence) to hierarchy (single entity).

When informational asymmetries are considered as transactions hazards, the mitigation strategy requires both aligned objectives and a reward system from the agent's departmental (or agency) chain of command. Since dispute resolution within the interagency structure must permit appeal at that level, all levels of decision making must be corporate (represent all agencies that they command). Moreover, the perceived legitimacy of the interagency structure requires the support of the coordinated agencies since they remain implicated for rewards and sanctions. Hazards related to asset specificity reinforce the requirement for a corporate structure which sustains the legitimacy to command. Since each specific agency is implicated in the corporate decisions, any hold-up in actions must be explained to all decision makers at that level and must pass acceptance of both the home agency and the interagency board. Brand name specificity implies a degree of power or control by one agency. Mitigation of power struggles requires consistency in objectives and intent between the independent agencies and the interagency leadership and must be enforced by the highest level of authority, including the political leadership.

Expanding from bilateral transactions to multilateral settings implies an expansion in possibilities of mitigation (analogous to more buyers or sellers). In this setting, principles of network management become essential; connections among different levels, strong center of gravity for messaging within a level, and processes and procedures for the network to operate effectively. Thus planning and pre-staging for communications and coordination is essential for short duration emergencies where planned actions are more important to objectives than developing relational contracts.

There remain important issues which cannot be addressed. Should specific training be required, or can experiential learning by doing suffice? Training incurs costs. There is now a wealth of lessons learned reports and studies of many operations. Those operations were not complete failures and both cultural differences and trust have been identified as hazards that can be endogenously mitigated. If silos within departments persist (presumably the costs of bridging silos is greater than the benefits), is there sufficient reason to train for bridging for the unknown interagency mission? Learning by doing when there is great variation in the operation and its objectives may be the most efficient approach, especially if the fundamental characteristics of interagency structures are common knowledge.

The question of interagency governance structure has been largely answered by experience. Command and control, coordination with partners, communications and information in broader networks have been implicated at every turn. The argument of this paper is that productive vertical and horizontal networks with collaborative and consensual decision making and a two sided mutually reinforcing command structure are required for effective interagency governance.

References

6, Perri (2004); *Joined-Up Government in the Western World in Comparative Perspective: A Preliminary Literature Review and Exploration*, Journal of Public Administration Research and Theory **14** (1), Oxford University Press, 103-138

Akerlof, George (1970); *The Market for "Lemons": Quality Uncertainty and the Market Mechanism*; The Quarterly Journal of Economics **84** (3), 488-500

Berkok, U. and Solomon, B. (2011); Peacekeeping, private benefits and common agency, in **Handbook on the Economics of Conflict** (Derrick Bradden and Keith Hartley eds.), Edward Elgar Publishing, 265-292

Bertelli, A. and Smith, C. (2005); *Relational Contracting and Managing Networks: New Public Management and the Search for Gains from Repeated Interaction*, Presentation for the Biannual Meeting of the Public Management Research Association, Los Angeles, CA (October)

Bertelli, A. and Smith, C. (2010); *Relational Contracting and Network Management*; Journal of Public Administration Research and Theory **20** (Supplement), i20-i40.

Brauer, Jurgen (1999); *An Economic Perspective on Mercenaries, Military Companies, and the Privatisation of Force*; Cambridge Review of International Affairs, Vol **13** (1), 130-146

Coase, Ronald (1937); *The Nature of the Firm*, *Economica* **4** (16), 386-405

Commons, John (1934); **Institutional Economics: It's Place in Political Economy**, New York, MacMillan

Desai, S. (2005); *Solving the Interagency Puzzle*; Policy Review **129** (February), accessed at <http://www.hoover.org/publications/policy-review/article/7108> .

Fellman, P. (2008); *The Complexity of Terrorist Networks; Unifying Themes in Complex Systems*, Proceedings of the 6th International Conference on Complex Systems, p. 162-169

Grandori, A. and Sado, G. (1995); *Inter-firm Networks: Antecedents, Mechanisms and Forms*; Organization Studies **16** (2), 183-214

Harris, Richard G. (1998); *The internet as a GPT: Factor Market Implications*, in **General Purpose Technologies and Economic Growth** (E. Helpman ed.), Cambridge, The MIT Press, p.145-166

Micko, H. and Leitner, J. (2006); *Network Enabled Decision Support for Civil Emergency Management*; Journal of Decision Systems **15** (2-3): 287-308

Helpman, Elhanan (1998); Editor, **General Purpose Technologies and Economic Growth**, Cambridge, The MIT Press

- Huberman, B., Romero, D. and Wu, F. (2009); *Social Networks that Matter: Twitter Under the Microscope*; First Monday **14** (1), www.firstmonday.org
- Huberman, B., Romero, D. and Wu, F. (2009); *Crowdsourcing, Attention and Productivity*; Journal of Information Sciences **35** (6); 758-765
- Lipsey, Richard; Bekar, Cliff; Carlaw, Kenneth (1998); *The consequences of changes in GPTs*; in **General Purpose Technologies and Economic Growth** (E. Helpman ed.), Cambridge, The MIT Press, p. 193-218
- March, J. and Simon, H. (1958); **Organizations**, John Wiley
- Marschak, Jacob and Radner, Roy (1972), **The Economic Theory of Teams**, Yale University Press, New Haven and London
- McDonough, Lawrence (2005); *The industrial structure of National Defence and transaction costs*; Defence and Peace Economics **16** (3), 247-262
- McGuire, M. (2002); *Managing Networks: Propositions on What Managers Do and Why They Do It*; Public Administration Review **62** (5); 599-609
- Menard, C. (2004); *The Economics of Hybrid Organizations*; Journal of Institutional and Theoretical Economics **160** (3), 345-376
- Moynihan, D. P. (2007), *Incident Command Systems for Organizing Crisis Response*, The Business of Government, **Spring**, 64-70
- Moynihan, D. P. (2009); *The Network Governance of Crisis Response: Case Studies of Incident Command Systems*; Journal of Public Administration Research and Theory **19** (4); 895-915
- Provan, K.G., and Kenis, P.N. (2008); *Modes of network governance: Structure, management, and effectiveness*; Journal of Public Administration Research and Theory, **18** (2), 229-252
- Schilling, M. and Phelps, C. (2007); *Interfirm collaboration networks: The impact of large-scale network structure on firm innovation*; Management Science **53** (7), 1113-1126
- Sowa, J. (2009); *The Collaboration Decision in Nonprofit Organizations: Views from the Front Line*; Nonprofit and Voluntary Sector Quarterly **38** (6); 1003-1025
- Subramani, M. R., and Henderson, J. C. (1999); *The Shifting Ground Between Markets and Hierarchies: Managing a Portfolio of Relationships*; **The Administrative Evolution**, S. C. Rush and R. N. Katz, Eds. New York: Anker Publishing
- Teo, T. and Yu, Y. (2005); Online buying behaviour: a transaction cost economics perspective; The International Journal of Management Science, Omega **33**, 451-465

Williamson, Oliver (1973); *Markets and Hierarchies: Some Elementary Considerations*; The American Economic Review **63** (2), Papers and Proceedings of the Eighty-fifth Annual Meeting of the American Economic Association (May, 1973), 316-325

Williamson, Oliver (1975); **Markets and Hierarchies: Analysis and Antitrust Implications**, Free Press

Williamson, Oliver (1996); **The Mechanisms of Governance**, Oxford University Press

Williamson, Oliver (2002); *The Theory of the Firm as Governance Structure: From Choice to Contract*, Journal of Economic Perspectives **16** (3): 171-195

DOCUMENT CONTROL DATA		
(Security classification of title, body of abstract and indexing annotation must be entered when the overall document is classified)		
<p>1. ORIGINATOR (The name and address of the organization preparing the document. Organizations for whom the document was prepared, e.g. Centre sponsoring a contractor's report, or tasking agency, are entered in section 8.)</p> <p>Royal Military College for DRDC Centre for Security Science</p>	<p>2. SECURITY CLASSIFICATION (Overall security classification of the document including special warning terms if applicable.)</p> <p>UNCLASSIFIED (NON-CONTROLLED GOODS) DMC A REVIEW: GCEC 2010</p>	
<p>3. TITLE (The complete document title as indicated on the title page. Its classification should be indicated by the appropriate abbreviation (S, C or U) in parentheses after the title.)</p> <p>Interagency Governance</p>		
<p>4. AUTHORS (last name, followed by initials – ranks, titles, etc. not to be used)</p> <p>McDonough, L.</p>		
<p>5. DATE OF PUBLICATION (Month and year of publication of document.)</p> <p>December 2012</p>	<p>6a. NO. OF PAGES (Total containing information, including Annexes, Appendices, etc.)</p> <p style="text-align: center;">39</p>	<p>6b. NO. OF REFS (Total cited in document.)</p> <p style="text-align: center;">33</p>
<p>7. DESCRIPTIVE NOTES (The category of the document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of report, e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.)</p> <p>Contractor Report</p>		
<p>8. SPONSORING ACTIVITY (The name of the department project office or laboratory sponsoring the research and development – include address.)</p>		
<p>9a. PROJECT OR GRANT NO. (If appropriate, the applicable research and development project or grant number under which the document was written. Please specify whether project or grant.)</p> <p>TIF Project 10af</p>	<p>9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.)</p> <p>SLA with RMC</p>	
<p>10a. ORIGINATOR'S DOCUMENT NUMBER (The official document number by which the document is identified by the originating activity. This number must be unique to this document.)</p> <p>DRDC CSS CR 2012-024</p>	<p>10b. OTHER DOCUMENT NO(s). (Any other numbers which may be assigned this document either by the originator or by the sponsor.)</p>	
<p>11. DOCUMENT AVAILABILITY (Any limitations on further dissemination of the document, other than those imposed by security classification.)</p> <p>Unclassified</p>		
<p>12. DOCUMENT ANNOUNCEMENT (Any limitation to the bibliographic announcement of this document. This will normally correspond to the Document Availability (11). However, where further distribution (beyond the audience specified in (11) is possible, a wider announcement audience may be selected.)</p> <p>Unlimited</p>		

13. **ABSTRACT** (A brief and factual summary of the document. It may also appear elsewhere in the body of the document itself. It is highly desirable that the abstract of classified documents be unclassified. Each paragraph of the abstract shall begin with an indication of the security classification of the information in the paragraph (unless the document itself is unclassified) represented as (S), (C), (R), or (U). It is not necessary to include here abstracts in both official languages unless the text is bilingual.)

We argue that productive vertical and horizontal networks with collaborative decision making and a two sided mutually reinforcing command structure are required for effective interagency governance. An examination of fundamental characteristics of organizations from the perspectives of economic analysis (Team Theory and Transactions Costs), of public administration theory and of ICT networks analysis lead us to consider various transactions types, locations, hazards and mitigation strategies. The concept applies to highly centralized and organizationally large operations like NATO or UN missions, to more localized emergency responses.

Nous alléguons que les réseaux de production verticaux et horizontaux, avec prise de décisions collaborative et structure de commandement en deux parties qui s'épaulent mutuellement, sont nécessaires pour une gouvernance interorganisationnelle efficace. Un examen des caractéristiques fondamentales des organisations, du point de vue de l'analyse économique (théorie des équipes et coûts des transactions), de la théorie de l'administration publique et de l'analyse des réseaux de technologie de l'information et des communications (TIC), nous amène à considérer divers types de transactions, de lieux, de risques et de stratégies d'atténuation des risques. Le concept s'applique tant aux grandes opérations centralisées, comme les missions de l'OTAN ou de l'ONU, qu'aux interventions d'urgence locales.

14. **KEYWORDS, DESCRIPTORS or IDENTIFIERS** (Technically meaningful terms or short phrases that characterize a document and could be helpful in cataloguing the document. They should be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location may also be included. If possible keywords should be selected from a published thesaurus, e.g. Thesaurus of Engineering and Scientific Terms (TEST) and that thesaurus identified. If it is not possible to select indexing terms which are Unclassified, the classification of each should be indicated as with the title.)

Organizations; interagency; governance; whole of government; comprehensive approach; economics; transaction cost economics; information processing; public administration; decision making; team theory; coordination; principal-agent problem; networks; transactional hazards