NETWORK MASTER

&

THREE DIMENSIONS OF SUPPLY NETWORK COORDINATION:

AN INTRODUCTORY ESSAY

– Working Paper –

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Abstract

This paper proposes three different sets of coordination activities as requirements for coordinating flows across multiple tiers of supply networks: coordinating data sharing and information systems, coordinating logistics processes and operations, and coordinating financial and system tradeoffs. For each set of these coordination activities, the paper proposes the 'Network Master' as a potential entity for providing a high level of coordination: Information Systems Master, Logistics Network Master, and Financial Tradeoffs Master. These proposals suggest that business leaders attempting to coordinate across a network of strategically dependent companies could segment the coordination problem into three distinct layers of activities that could be coordinated independently. This would allow for focused 'Network Masters' in charge of coordination at each level, thus providing a more focused method for tackling the otherwise overly complex problem of coordinating across multiple tiers of the supply network.

1. Introduction, Motivation and Framework

Several recent developments have brought many product- and sequential manufacturing-based companies to consider developing new types of business-to-business relationships with companies in their respective supply networks:

- Frequent assertions in the literature that 'supply chains will compete against supply chains' in the future[1] rather than individual companies competing against each other. (Contrary to popular belief, supply chains will not compete against supply chains in the future, placing greater emphasis on individual firms to create internal capabilities through integrating capabilities from upstream and downstream firms.[2] Chrysler demonstrated this exceptionally well prior to the Daimler acquisition.[3])
- Information and communication technology (ICT, i.e., electronic commerce tools and capabilities, the Internet) and the proliferation of applications and software for companies to transact with other companies using the electronic and wireless media
- An increase in outsourcing (i.e., to third party operators) as a method for companies to focus on core competencies, creating 'virtual organizations'[4]via 'virtual

[1] The authors believe the assertions are not fully justified except in very narrowly defined circumstances. See "Supply Chain vs. Supply Chain: The Hype and the Reality, *Supply Chain Management Review*, September-October 2001 by Rice and Hoppe for a complete analysis.

[2] Rice, James B., Jr. and Hoppe, Richard M. "Supply Chain versus Supply Chain: The Hype & the Reality" *Supply Chain Management Review* Sept.-Oct. 2001

[3] Stallkamp, Thomas T. "Chrysler's Leap of Faith: Redefining the Supplier Relationship" *Supply Chain Management Review* Summer 1998

[4] Goldman, Steve, Roger Nagel, and Kenneth Preiss, *Agile Competitors and Virtual Organizations*, New York: Van Nostrand Reinhold, 1995.

integration' which are epitomized by the examples set by Dell and Cisco in recent years[5]

- A proliferation, in terms of numbers and offerings, of third party services providers able to provide increasingly sophisticated solutions (e.g., 3PLs, contract manufacturers, offshore vendors, back office processing companies)

Hence, as companies consider the current environment and assess how to leverage ICT, outsourcing and possibly virtual capabilities, the need to develop deep and different relationships – coordinate – with other companies from their supply chain takes on greater significance.

Taken all together, these trends raise important questions about how companies could coordinate their respective businesses in order to improve firm – and potentially supply network – performance. These questions revolve around how companies can govern and reap financial benefits from these new multi-tier relationships, what activities and functions need to be coordinated between the companies, and what entities, governance structures and processes are necessary to coordinate across several companies in different tiers of the supply network.

Coordination of the Supply Network

Definition of coordination

The literature on coordination does not directly address supply chain coordination in great detail, although the definition of coordination seems readily applicable to a supply chain environment. Malone and Crowston[6] define coordination at its highest level as follows:

> *"Coordination is managing dependencies between activities."*

Furthermore, Malone and Crowston's work identified these common dependencies between activities: shared resources, producer/consumer relationships, simultaneous constraints, and task/subtask. Of this set, 'producer/consumer' relationships encompasses the traditional dependencies found in a supply chain, yet there are clearly other dependencies (shared resources and simultaneous constraints) that describe some supply network relationships.

[5] The term 'virtual integration' was made popular by Joan Magretta in her interview with Michael Dell which was profiled in "The Power of Virtual Integration: An Interview with Dell Computer's Michael Dell, *Harvard Business Review*, March-April 1998.

[6] Malone, Thomas W., Crowston, Kevin "The Interdisciplinary Study of Coordination" ACM Computing Surveys, Vol. 26, No. 1, March 1994, p. 90.

Prevalent coordination approaches

Companies currently use a variety of approaches to coordinate the supply network. These include exercising power in relationships as a 'channel master,' developing collaborative relationships with selected companies in their supply network, and use of digital or web-based electronic environments.

Coordinating via Channel Master

Currently, coordination of the supply network is typically enforced by the actions of what is commonly known as the 'channel master.' This term has been commonly used to describe the most powerful company of a supply chain, typically a downstream company adjacent to, or one tier removed from the end customer. The term has not been broadly used for network or supply chain-wide coordination, since it describes coordination efforts that are largely single-company-centric, regardless of the other companies in the supply network. The Gartner Group[7] defines a channel master as follows:

> *"A channel master is an enterprise within a supply chain that has compelling control over the sales of a product."*

Given this definition, the channel master exercises influence over the other companies in the supply network, often directing activities, technology, and behavior in the supply network.[8]

The 'channel master' power depends upon three assets: intimate customer knowledge, "ownership of the customer" through brand name, and ultimate demand creator for the entire supply chain.[9] In cases where the power in the supply chain is more evenly distributed, (or if the channel master takes a long-term perspective on building and coordinating its supply network), the more common coordination practice is typically based on collaboration.

Coordinating via Collaboration

The literature on supply chain collaboration is mainly focused on collaboration between two companies, typically point-to-point collaboration between companies in adjacent tiers of the supply chain rather than collaboration across 3 or more tiers of the network.

[7] Bruce Bond, "CEO and CIO Update: Automotive Supplier Exchange – A B2B Shot Heard Worldwide", InSide Gartner Group, ICG-03222000-01, March 22, 2000.

[8] Numerous examples of this are available in the popular press. One can infer the use of power by one party in the following examples: Dell Computer expects suppliers to deliver components in a JIT fashion and locate operations adjacent to Dell facilities; GM and Ford expect their suppliers to utilize Covisint as a buying marketplace, and prior to Covisint each company had placed expectations on the suppliers to support their respective company-sponsored web-based purchasing environments.

Much of the literature surfaces in trade magazines and features the selection and initial implementation of software that intends to provide utility and transparency to companies in a supply chain (customer and supplier). Many of the applications focus on coordinating the demand planning activities (e.g., forecasting methods, replenishment rules/signals) of upstream and downstream companies.

Collaboration is a popular topic today, and the term is somewhat abused in its use, as collaboration has been widely misused and applied freely to many relationships that may not satisfy a discriminating definition. Per Merriam Webster, collaboration definition is 'to work jointly with others' and 'to cooperate with' (historically, the term had a strong connotation of working with the enemy although that interpretation is no longer the primary interpretation or the most common use). For the purposes of this work, we use the term to describe 'when firms actively work together' (often towards a common objective but not always). Ultimately, we consider collaboration as a type of coordination as proposed by Malone and Crowston.[10]

Collaboration represents a broad range of potential relationships that could be used by organizations to coordinate across the supply network[11] – basically, a set of hybrids that may be used as alternatives in between the extremes of market transactions and hierarchies for coordination defined by Williamson.[12] These hybrids are presented as alliances, where the alliances could be focused on three distinct areas consistent with the required coordination activities. Applying the concept of Network Masters to this work suggests that Network Masters represent one high level method of coordinating within each of these alliances. Hybrid coordination options represent a broad set of alternatives, with low level alliances entailing passive information sharing, middle level alliances entailing active coordination of logistics, and high level alliances entailing intimate sharing or information, knowledge, and resources, along with cross-investments and joint long-term planning. (See Figure 1)[13]

[10] Ibid.
[11] Rice, James B. Jr., Ronchi, Dr. Stefano "Straategic Partnerships: Collaboration, Alliances and the Coordination Spectrum" *Logistics Solutions* Issue 1, 2002
[12] Oliver Williamson, "Markets and Hierchies: Analysis and Antitrust Inplications", New York, NY: Free Press, 1975.
[13] Rice, James B. Jr., Ronchi, Dr. Stefano "Straategic Partnerships: Collaboration, Alliances and the Coordination Spectrum" *Logistics Solutions* Issue 1, 2002

Coordination Descriptions

Markets				**Hierarchies**	
Trans-actional	**Alliances**			**Partnerships**	**Vertical Integration**
	Info Sharing Alliance	Collaborative Logistics/ Operations Alliance	Collaborative Network Alliance		
Buy and Sell Products & Services	Buy and Sell Prods & Svcs, Passive info sharing	Buy & Sell Prods/Svcs, Share info, Active coord & plan, Common plng sys & processes	Long-term contracts, Share key info, Active coord, Mutual investments & risk	Run the Business with other Part Owners (Partners)	Run the Business as Owner

Figure 1 - Coordination Alternatives: Markets, Hybrids, Hierarchies

Although hybrids offer new possibilities, practitioners are not well versed in the options that exist for coordination, and the rapid development of many new web-based entities with broad and unclear offerings has served to confuse practitioners about the options and tradeoffs for each option. This represents an area of improvement as we are challenged to articulate a vision of the future and what is possible for solutions in such a way that practitioners can consume and apply the learnings real-time.

Many of the electronic environments[14] that have surfaced recently represent electronic variations of existing tools and collaboration enablers. These can potentially enhance existing methods of collaboration by enabling wider use and access, by providing broader and potentially real-time information sharing, and therefore enabling faster (and more responsive) group decision-making and planning. The environments supplement existing collaboration and relationships, and do not represent wholesale replacement of existing relationships or collaboration efforts. Many software providers and hosting services will likely take issue with this assertion. This warrants a lengthier discussion which this paper does not intend to capture or represent.

[14] These include electronic marketplaces for buying and selling, various auction environments and processes, and hosted web environments developed for exchanging information and planning for specific supply networks.

Strategic Supply Network[15]

If we apply the principles of network optimization to a supply network, in principle we can develop a set of potential benefits just as one would achieve increased benefits from optimizing internal company operations.[16] There are some key differences however. An internal company environment entails a single economic entity with common financial goals, whereas the supply network entails multiple economic entities with independent (although influential) economic goals. But even in a single company environments there often are misaligned goals and objectives between business units/business functions that complicate internal coordination.[17] Achieving the benefits across independent economic entities is likely magnitudes more difficult than internal coordination because these entities do not share a tangible and common P&L. This represents a significant obstacle for coordinating financial flows and risk across multiple tiers.

Given the large number of customers and suppliers that comprise any given supply network it is neither economical nor feasible to attempt coordinating with all customers and suppliers. Therefore, we propose that the highest leverage will come from coordinating with a selected subset of strategically *dependent* supply network participants. We refer to this selected subset of companies as the 'strategic supply network' and we propose that the companies comprising this subset would have the following characteristics:

- Share sensitive business information
- Are mutually dependent, and information-dependent
- Have relationships that are irreplaceable (in the short term) and/or meaningful (likely high-volume of transactions and strategic inputs)

We introduce the concept of the *strategic supply network* to define the environment for applying supply network coordination and to make the coordination tasks more realistic in application. Figure 2 illustrates, conceptually, one possible variation of a strategic supply network from an OEM's perspective. In this case, the strategic supply network includes one Tier 1 supplier, two Tier 2 suppliers, and two customers. Other combinations are likely, dependent upon which subset of suppliers and customers meet the aforementioned characteristics.

[15] We define the strategic supply network as a collection of firms that are mutually dependent with strategic relationships within the supply chain; these participants share proprietary information and make joint decisions in order to better coordinate and synchronize demand fulfillment to the customer.

[16] Optimizing purchasing, warehousing, and transportation as a system rather than optimizing as individual functions will provide higher levels of performance because the overall system is not sub-optimized as it is when individual functions are optimized on a stand-alone basis.

[17] Prof. J. Sussman, based on an airline operations example, explains that typically the objective of operation department is to operate at low cost, in a hub and spoke network while on the other hand the objective of the marketing department is to offer attractive, direct, flights, that are usually high cost and do not fit the hub and spoke model. See Joe Sussman, "Introduction to Transportation Systems", Boston, MA: Artech House: 2000, pp. 24-25.

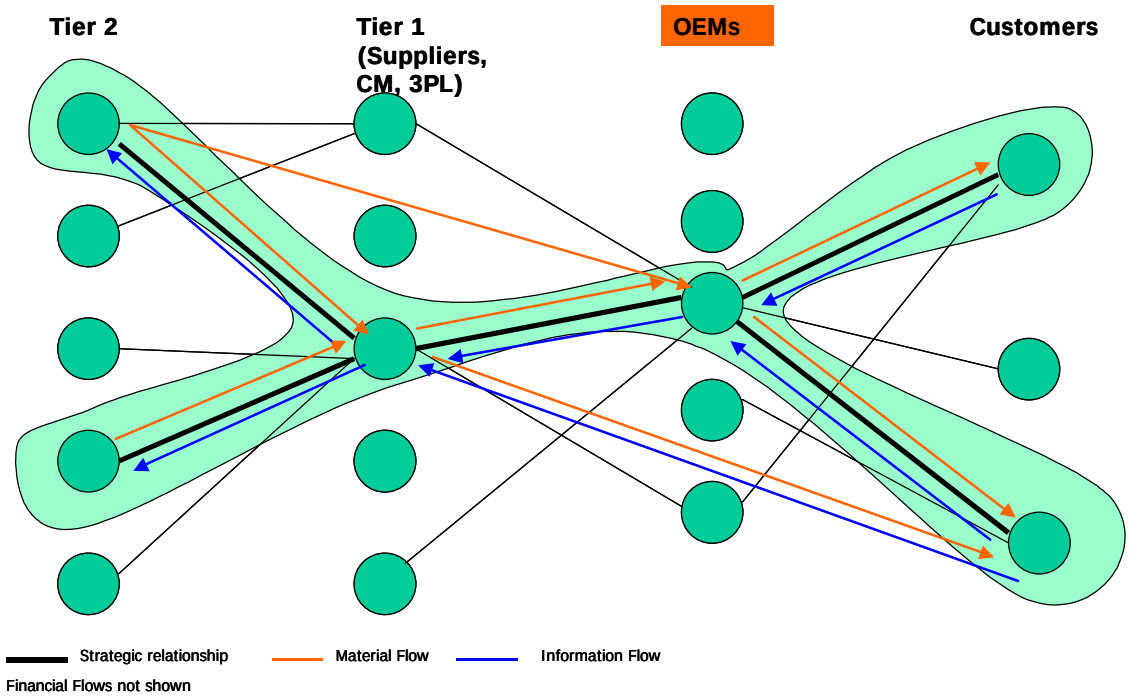

Figure 2. Sample Strategic Supply Network

Such a strategic supply network may operate more efficiently and effectively if the group could coordinate their investments and operations. Coordinating the necessary investments in materials and capacity, and balancing the benefits and costs across each member of the supply network may enable reducing operating expenses and working capital requirements, increasing response time and ultimately provide a competitive advantage.

As an example, the network may perform at a higher level of performance (lower cost, reduced working capital requirements, faster response time) if an upstream Tier 2 supplier carried more raw materials and if the downstream assembler carried less finished goods inventory and more converting capacity. The group would need to make investments in the network (higher raw material inventory at Tier 2 supplier, additional capacity at OEM) and balance the benefits, costs, and risks of their collective operations. This calls for coordinating various activities among the respective organizations.[18]

However, unless there is a predetermined mechanism to identify and act on such insights, the natural equilibrium will always lead the individual companies in the group to take actions to optimize their respective operations only. This entails some inefficiency, as many companies in the supply network must carry raw and finished goods inventory – which is ultimately redundant – and converting capacity in order to protect the individual company against uncertainties. This entails real costs that are passed along the entire

[18] Dell is slowly tying to attempt this by offering financial incentives to buy remaining/excess inventory from its tier 1 suppliers that carry "more than necessary" inventory while Dell has excess converting capacity.

supply network and potentially on to the end customer, which either may have a limiting affect on demand or shift some of the demand away from that firm towards other competitors in the supply network.

2. Strategic Supply Network Coordination: Three Requirements

If coordination can generally be defined as managing dependencies between activities, then *what* exactly are the activities that need to be coordinated in a multi-tiered supply network?

As noted in the previous section, we suggest that the important scope for coordination is the strategic supply network rather than the entire supply network. Based on a preliminary synthesis of data collected[19], we propose that there are, at a minimum, **three distinct coordination activities** required for coordinating across multiple tiers of the strategic supply network as follows:

1. Coordinating data sharing and information systems that provide information visibility of information across the supply network
2. Coordinating logistics process and operations coordination across the supply network
3. Coordinating financial and system tradeoffs, balancing financial commitments and risks among the companies in the network

The first two coordination activities noted can be considered more operational and tactical, whereas the third activity is more strategic in nature.

An initial observation is that these three activities potentially represent sequential activities across a time continuum. The data indicates that information sharing is typically the first coordination efforts made by companies. This initial effort often leads to more in depth coordination of the logistics, operations, and organizations. It is conceivable that one may consider information as a near-term coordination activity with logistics coordination as a mid-term coordination activity, although information sharing takes on long-term aspects when capital investments are required to coordinate information systems. Coordinating financial tradeoffs falls in at the long-term end of the time continuum.

[19] Data collected as part of a 2001 Delphi study initiated by Rice on behalf of the ISCM Program sponsors to understand the potential methods for coordinating across multiple tiers of the supply network.

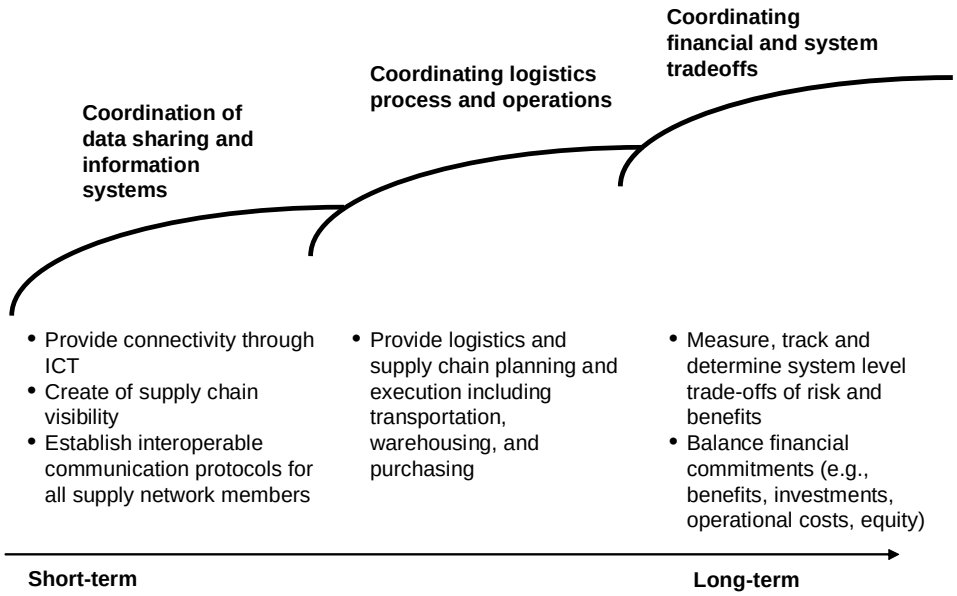

Figure 3. Three Levels of Coordination

One way of thinking about coordination is to analyze the coordination into different types of dependencies. Malone and Crowston's[20] introduced a framework and methodology for managing common dependencies (see figure below showing four distinct dependencies): shared resources, producer/consumer relationships, simultaneity constraints, and task/subtask.

[20] Malone and Crowston, 1994 p. 91 "If coordination is defined as *managing dependencies*, then further progress should be possible by *characterizing different kinds of dependencies and identifying the coordination processes that can be used to manage them*."

Dependency	Examples of Coordination Processes for Managing Dependency	Supply Network Coordination Activity	Potential Logistics Coordination Processes
Shared resources – Task assignments	"First come/first serve", Priority order, Budgets, Managerial decision, Market-like bidding	Financial and system level tradeoffs; costs, benefits, risks	Budgets, Managerial decision, Decision rules
Producer/consumer relationships – Prerequisite constraints, Transfer	Notification, sequencing, tracking; Inventory management (e.g., "Just-In-Time", "Economic Order Quantity"); Standardization, ask users, participatory design; Concurrent engineering	Coordinating logistics processes and operations across the supply network	Inventory management, JIT, Sequencing, Tracking of material flows across the supply network
Simultaneity constraints	Scheduling, synchronization	Coordinating logistics processes and operations into and out of one organization	Scheduling, synchronization across parties supplying to or buying from one entity
Producer/consumer relationships – Usability		Coordinating connected information and information systems	Standardization, Participatory Design
Task/subtask	NA	NA	NA

Source: Malone and Crowston[21]

We can map the three coordination activities proposed to the common dependencies to illustrate that these proposed required coordination activities are consistent with the existing framework, as they represent a subset of the common dependencies suggested by Malone and Crowston. The fourth dependency, task/subtask, does not readily apply to the narrowly focused supply chain context

Starting with each of the different dependencies in the left column and the coordination processes and activities in the center columns, we note several different potential coordination processes represented in the right column.

In the case of coordinating connected information systems, the nature of the dependency is that of producer/consumer usability, meaning that the receiver (consumer) of the information is dependent upon the sender (producer) of the information for its usability.

[21] Malone and Crowston

This suggests that important aspects of the coordination process should be standardization and participatory design.

Applying this to coordinating logistics processes and operations materials flows, the nature of the dependency is that of a producer/consumer transfer, meaning that the receiver (consumer) of the material flows is dependent upon the sender (producer) of the materials for the transfer of the materials from one location to the next. This suggests that important aspects of this coordination process should be sequencing, tracking flows, managing inventories and potential use of progressive materials flows coordination techniques such as Just In Time.

Applying the framework to coordinating financial flows and tradeoffs, the nature of the dependency is that of a shared resource, meaning that the parties need to coordinate sharing the resource in some fashion. Often, budgets, managerial decision-making and decision rules serve as some of the structure to coordinate the flows.

As one considers providing coordination for a supply network, this analysis illustrates the challenge for any one organization to provide coordination for the three different coordination tasks. This further reinforces the assertion that multiple entities will likely provide coordination for a supply network, and continuing with the logic, there will likely be different entities best suited to performing the different coordination activities.

3. Strategic Supply Network Coordination

Prior to this point in time, the concept of coordination in the supply network was rooted in the thought that there would be one entity conducting all coordination activities. Third party logistics providers (3PL) have recently moved towards amassing broad sets of skills and capabilities and are trying to position themselves as the entity in the single coordinator role.[22] Similarly, consulting firms have expanded their service offering into the coordination domain by offering 4PL services.[23] Users have been complicit in the assumption that one entity would provide all coordination, as many companies seeking outsourcing solutions have searched in vain for one-stop-shopping where all their outsourcing needs (coordination and other) would be satisfied by one organization.

The three activities or 'requirements' represent new and potentially useful ways to understand coordination when applied to the supply network domain. Some of the powerful aspects of defining supply network coordination can be grouped into the following three categories: new coordination insights, tradeoff coordination, coordinating by network master.

[22] FedEx, ConWay, UPS each have expanded their service offering through acquisition or internal development.

[23] Most notably Accenture with their 4PL services which entails coordinating broad operations including 3PL providers for a company.

New Coordination Insights

- Each of the three coordination activities may be coordinated independently from the other activities, although coordination of long-term activities may be affected by the choices selected for the short-term activities
- Each of the three coordination activities may be coordinated by different entities and using different coordination mechanisms
- There may be several different sequences for coordinating these three activities (it may not be necessary to have the activities coordinated sequentially or even in the order being presented)

Recognizing that coordination activities may be performed by separate entities opens up many new options for coordination, both in terms of entities that would perform the coordination activity as well as the type of coordination process that would be used.[24] Ultimately, this translates into a broader set of choices for supply network design, greater control over selected elements of the supply network not previously imagined, and the potential for creating competitive advantage through unique supply network design.

Financial Benefits Coordination (Trade-off Coordination)

The third level of coordination – financial benefits coordination – is the coordination and balancing of the network financial flows and investments, risks, costs and benefits. Several organizations coordinating their collective system investments may enjoy higher levels of system performance than each individual company would be able to achieve if they were performing and making decisions by themselves. Given this, an important activity to coordinate would be balancing investments, risks, costs, and benefits across the companies of a supply network.

This is a new type of coordination from the practitioner's perspective, in that we know of no definite examples where system-level financial and risk balancing has been coordinated among a supply network. To date, these activities exist solely between two parties with most arrangements fairly informal.[25] At best, we have seen risk sharing agreements on very narrowly targeted business process outsourcing deals (BPO), such is the case of the Accenture-AT&T, or contract manufacturers and OEMs, such as Cisco and Solectron, but not in a setting of 3 or more companies at the supply network level in manufacturing supply chains.

[24] This paper does not address the variety of processes that are possible for coordination. Alternatives for coordination generally range from market mechanisms (purchasing on the open market, individual buy-sell transactions) to hierarchies (range of ownership) as presented by Oliver Williamson, *Markets and Hierarchies: Analysis and Antitrust Implications*, New York, NY: Free Press, 1975.

[25] "Creating Lasting Value Through Supply Chain Collaboration" study conducted by Rice 2001-2002 identified numerous instances of dyadic coordination including cross-investments made between P&G and various customers and suppliers.

Coordinating by Network Master

One further refinement and proposal is the Network Master. Currently, there is some measure of self-interested supply network coordination occurring on a gross level, and 'channel masters' are providing that coordination as has been discussed. Based on the current state-of-art, 'channel masters' provide coordination mainly in downstream distribution channels and operate with limited scope and narrow economic self interest. We propose that an entity or entities we call Network Master(s) would coordinate the three levels across multiple tiers. Consistent with the potential of coordinating different dependencies with different processes and by different entities as we have suggested, the Network Master could take many different forms ranging from a single individual, to a single business entity, to a governing body comprised of representatives of the supply network companies, among others.

Instead of there being one 'channel master,' there could be multiple Network Masters: an Information Systems Master, a Logistics Master, and a Financial Tradeoff Master.

There is evidence that this is starting to occur in the information systems environment as there is a great deal of effort is being focused on coordinating connected information systems among companies.[26] The broad range of information coordination offerings includes connecting ERP systems, using Internet-based sites (as an information repository or a common information sharing platform), and developing information sharing standards for Internet use by different groups.[27] One could argue that 3PL providers are similarly focusing on logistics, although that would be inconsistent with the trend for 3PLs to amass a broad skill set and offerings including information systems. Similarly, one may argue that 4PL providers are evolving to potentially perform the financial and risk coordination role although their efforts to date have been more as a single one-stop solution provider.

Three Network Masters

The three types of Network Masters proposed as potential coordination solutions parallel the aforementioned three distinct coordination activities.

Coordination Required	Network Master Coordination Alternative
Information sharing and information systems	Information Systems Master
Logistics, physical movements, operations	Logistics Network Master
Investments, risks, benefits, costs, tradeoffs	Financial Tradeoffs Master

[26] Connecting internal information systems is a core benefit proposed by enterprise resource planning (ERP) systems vendors such as SAP, JD Edwards and Peoplesoft.
[27] RosettaNet (electronics industry), Transora (CPG), Covisint (automotive) among others each offer some measure of information standardization for their respective industries.

This provides an expanded definition for each Network Master:

1. **Information Systems Masters** would coordinate connected information and information systems that provide information visibility of information across the supply network (supply network visibility). These parties would be tasked with coordinating the transfer of data and information to upstream and downstream parties. This would not include the manual process of applying the data, interpreting it (converting data and information to knowledge), or using the knowledge in the business.

2. **Logistics Network Masters** would coordinate the material flows and logistics processes across the supply network. These parties include organizations such as third party logistics providers that handle material flows and transportation as well as light assembly and materials handling services (3PL), third party information systems providers that provide environments for supply networks to consolidate information and conduct collaborative activities (design, planning, problem solving), fourth party providers (4PL)[28] referring to separate entities that provide coordination for all the other 3PL providers and companies within the supply network. While the Logistics Network Master certainly needs information flows to be coordinated, it may depend on the Information Network Master to provide the information coordination.

3. **Financial Tradeoffs Masters** would coordinate network-level decisions that entail the tradeoffs required to improve network performance. These decisions involve allocation and reallocation of investments, risk and risk mediation, allocation of costs and benefits among the organizations in the network. Currently, these entities don't exist except within the realm of dyadic or customer-supplier relationships, where as an example a customer may provide a supplier with capital to expand capacity in order to have a more dependable and consistent source which may also simplify system coordination. The Financial Tradeoff Network Master would likely draw information and intelligence from both the Information Network Master and the Logistics Network Master.

In our analysis and observation, within any supply network it is possible to have multiple Network Masters coordinating their respective flows. We do not believe it is a requirement to have three separate entities providing the coordination, instead we believe the coordination used and deployment of Network Masters will be a function of the motivation of specific supply networks. Conceivably it is possible to have an Information Network Master and a Logistics Network Master providing coordination to the dominant party in the supply network, where the dominant party was using its power to coordinate at tradeoffs and investments. We have not studied the dynamics enough to make many claims except to say that there are no obvious obstacles to utilizing Network

[28] 4th Party providers refers to the terminology developed by Accenture.

Masters aside from the increase in coordination efforts required with each additional entity.

Comparison of Network Masters vs. Channel Masters

The previous section referenced the potential of utilizing independent entities (Network Masters) to provide coordination of different flows along the supply network. Specifically three generic sets of flows or activities that need coordination were identified, and three potentially separate entities are proposed to provide these specific types of coordination. In total, these coordinators are referred to as 'Network Masters' because they provide coordination of a specific activity for the network, and their objective and interest is in coordinating the specific network aspect (information, materials/logistics, tradeoffs/finances).

The 'network master' can be differentiated from the 'channel master'[29] because the 'channel master' typically refers to the party in the supply network with the most (or dominant) power in the supply network.[30] The 'channel master' operates on its own narrow economic self-interest, using variants of power (often coercive), as opposed to mutually beneficial close collaboration in order to coordinate activities. The 'channel master' typically coordinates materials flows, although increasingly 'channel masters' are attempting to force some coordination of information flows and common technology choices (with limited success to date). Currently, 'channel masters' provide some measure of self-interested supply network coordination on a gross level.

The benefits of using the Network Master directly address some of the shortcomings and weaknesses of coordination by 'channel masters' since they:

- Act largely in own self-interest whereas the 'Network Masters' objective is to coordinate the network. (This will require development of infrastructure and governance methods for the Network Master to have the appropriate incentives and rewards to act in the best interest of the network)
- Typically focus on downstream flows whereas the 'Network Master' is concerned with the upstream and downstream flows across the supply network
- Rely on using power to force the desired coordination whereas the 'Network Masters' would likely rely on non-power-based solutions efforts
- Likely have lower levels of coordination skills compared to 'Network Masters' that would likely have higher levels of coordination skills. The higher skill levels anticipated within the 'Network Masters' could be attributed to the probable specialization that a 'Network Master' would develop and the need for the Network Master to identify non-power-based methods of coordination
- Do not allow for a layered approach to coordinating dependencies (i.e., different entities coordinating different dependencies). Such approach has the benefit of

[29] See Appendix A for treatment of 'channel masters' in detail.

[30] Dominant power in the supply network does not equate to dominant power in the market. The dominant power in the supply network may be a relatively small organization with little market power but with dominant power within the supply network by virtue of being the sole provider of a critical material or resource.

reducing the complexity of the coordination into pieces and would allow for easy interchangeability of entities at each layer since these semi autonomous

Additionally, there may be advantages available from having multiple entities coordinate the different dependencies:

- The overall supply network coordination problem may be too complex for one entity/department to coordinate all activities and processes across the supply network.
- A layered and multi-party approach is more flexible when changing procedures at the various coordination layers.[31]

Other Coordination Methods

The three basic supply network flows – information, materials, funds/resources – can each be coordinated by a variety of methods. In this paper, we propose some new alternatives – Network Masters – but also recognize these are but one of many alternatives. Practitioners have many alternatives that will be detailed in a subsequent work. Here we briefly suggest that the Coordination Spectrum[32] may be a useful way to characterize many of these alternatives.

Summary

Summarizing, this section proposed the potential of utilizing independent entities (Network Masters) to provide coordination of different flows along the supply network. Specifically three generic sets of flows or activities that need coordination were identified, and three potentially separate entities are proposed to provide these specific types of coordination. In total, these coordinators are referred to as 'Network Masters' because they provide coordination of a specific activity for the network, and their objective and interest is in coordinating the specific network aspect (information, materials/logistics, tradeoffs/finances).

5. Summary and Next Steps

In this introductory paper, the authors proposed some concepts to build upon:

- Three requirements exist for coordinating across the supply network:
  - Connected information systems across the strategic supply network that provide information visibility (supply network visibility),

[31] This concept is best explained with an analogy from the ISO 7 layer Internet communications model. An individual layer can be changed without all the procedures for all the other ones having to be re-written. For example, if one was to change the type of cable (10 base T) that is used (Layer 1), it does not necessarily mean that either the protocol (TCP/IP) (Layer 3) or the web-browser used (Layer 7) needs to changed, because all layers operate semi-independently.

[32] Rice, James B. Jr., Ronchi, Dr. Stefano "Straategic Partnerships: Collaboration, Alliances and the Coordination Spectrum" *Logistics Solutions* Issue 1, 2002

  - Logistics process and operations coordination across the strategic supply network, and
  - Financial and system tradeoffs coordination across the supply network, coordinating network-level decision-making among parties, designing governance structures that facilitate coordination of network-level investments and sharing of costs, benefits, and risks appropriately among parties.

- Supply Network Coordination Insights. The three activities to be coordinated may be coordinated independently, leading to new potential entities and coordination methods. Coordinating financial and system tradeoffs may represent a new coordination activity that also provides potential for improved supply network performance.

- The Strategic Supply Network defines the environment for applying supply network coordination, and is comprised of the selected subset of all suppliers and customers that include:
  - Companies that share sensitive business information,
  - Companies which are mutually dependent, and information-dependent, and
  - Companies where the relationship is irreplaceable (in the short term) and/or meaningful (likely high-volume of transactions and strategic inputs).

- Coordination of the Supply Network. Currently, coordination across the supply network is most commonly accomplished when the most powerful party in the supply network coerces the other supply network parties to modify their respective information, materials, and financial flows. This is commonly referred to as the 'channel master.' See Appendix A for the treatment of this topic as presented in the paper "Network Master & Three Dimensions of Supply Network Coordination – An Introductory Essay" by Rice and Hoppe.

- Network Masters. The concept of new entities that would provide coordination for each of the three required activities was introduced as "Network Masters.' The Network Master could possibly take different forms including a single individual, a single business entity independent of the supply network companies, a governing body comprised of representatives of the supply network companies, among others.

In this paper, we have proposed some new alternatives but we do not suggest that the Network Master is the 'best' coordination method for all cases, but only a new concept that may provide higher levels of performance and a broader set of benefits. This has yet to be financially proven and documented.

While these contributions have helped refine coordination alternatives and options, they have raised new questions to be addressed and resolved. Some of these include:

- How does a channel master compare to a network master for supply network coordination?
- How can organizations create these network masters?

- How can companies govern these new relationships?
- What entities, governance structures and processes are necessary to coordinate across several companies in different tiers of the supply network?
- Testing assertions about the three coordination dimensions made in this paper
- Explore barriers to implementation, especially as related to channel masters unwilling to give up control in the supply network