Governance of chains and networks: A research agenda

George W.J. Hendrikse
Erasmus University Rotterdam, Rotterdam School of Management, Office F3-51, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands, email: ghendrikse@fbk.eur.nl.

Abstract

Governance concerns the organization of transactions. Four research themes regarding the governance of chains and networks are identified: decision rights, income rights, alignment, and cognition.

> .....The range of economic activity that can be effectively coordinated across a complex multi-firm supply chain is just starting to be explored by companies and those who do research on these subjects. The boundaries of the firm, transaction costs, supply chain architecture and coordination, and outsourcing are all facets of a large mosaic in which incentives, communication and coordination, and the boundaries of the firm are worked out. The outsourcing extends to the employment relationship, where again the relative costs of in-house and the outsourced resources may have shifted. I hasten to add that these issues are far from being settled in the world of practice and the world of economic research.
>
> (Michael Spence, 2002, p. 456)

1. Introduction

Fiercer global competition, rapid technological change, and choosier customers are forcing firms to seek more efficient production and distribution structures. In recent years, industries have shown increasing collaboration on issues of product development, quality guarantee systems and improved logistics. Spot markets are being replaced by contract-production and systems of vertical coordination. More coordination and collaboration may lead to improved efficiency in production and distribution channels and to more product and market innovations. These vertical relationships can take many forms, like strategic alliances, long-term contracts, licensing, subcontracting, joint ventures, franchising, cooperatives, and networks. The importance of these developments is not only witnessed by the focus of this journal (Omta et al., 2001), but also by the above citation from a recent Nobel Prize lecture.

Many stakeholders are involved in chains and networks, like employers and employees in the various stages, consumers, capital providers, insurance companies, governmental agencies, and so on. They have conflicting as well as joint interests. Governance is about the organization of their transactions, while a governance structure consists of a collection of rules / institutions / constraints structuring the transactions between the various stakeholders. Examples include the allocation of property rights (chain and network directorship), the capital structure, the reward system, the board of directors, public codes and regulations, the pressure of large investors, the competition in the product and labor market, the organizational structure, the accounting system, and so on. These aspects of governance structure have a large impact on the flow of formal and informal information, the bringing to value of asymmetric information, and the structure and impact of formal (hard) and relational (soft) contracts.

Governance matters because contracts are in general incomplete. Contractual incompleteness is due to the impossibility to specify everything ex ante. There is only a role for a governance structure ex post, when it is costly to design contracts based on observable future variables. If certain aspects are therefore unspecified, then there will be ex post a quasi-surplus which has to be divided, and ex ante investment decisions will determine the size of the quasi-surplus. A governance structure affects the size of the surplus that will be generated by its effects on investments, the efficiency of bargaining, and risk-aversion (Zingales, 1998).

The aim of the research agenda 'Governance of Chains and Networks' is to describe and explain governance choices in chains and networks and how they affect the behavior of the parties involved. Four themes are distinguished in this article. Section 2 deals with the assignment of decision rights in the form of authority and responsibility, where decision rights concern all rights / rules regarding the deployment and use of assets (Hansmann, 1996). Section 3 addresses income rights by way of the remuneration of the various stakeholders in chains and networks, where income rights are rights to receive the benefits and obligations to pay the costs that are associated with the use of an asset. Research regarding these two themes entails investigating the trade-offs involved in changing governance structures with respect to the distribution of revenues and costs as well as the allocation of authority / power. Section 4 focuses on alignment. The distinction between the previous two research themes and alignment is that the former is concerned with issues regarding opposing interests, while the latter is focused on joint interests. Section 5 highlights limited cognitive capacities in relation to governance. The three previous themes have paid some attention to this theme, but this has hardly been made explicit. Section 6 provides a summary and conclusions.

2. Governance and decision rights

Coase (1937) asked the question: 'What is a firm?' This question is not trivial because everything that can be produced in the entire society can in principle also be produced by one centrally planned organization. Coase proposed a distinction between transaction modes that are 'internal' and 'external' to the firm. There are costs in maintaining a continuous presence in markets and engaging in spot transactions, while internal transactions entail bureaucratic costs. Alchian and Demsetz (1972) have challenged this distinction by questioning whether there is a difference between a customer firing his grocer and an employer firing an employee. Subsequent developments, like Jensen and Meckling (1976) and Hart and Moore (1990), have mainly taken this route in analyzing governance structure choice. Empirical support for the importance of property rights is provided by Johnson et al. (2002). The next subtheme formulates research questions along this line of inquiry. The distinction between 'internal' and 'external' transaction modes has been carried forward by Simon (1951) and Williamson (1985). The next two subthemes build on this distinction.

Formal versus real authority

An incomplete contract is completed by allocating authority to somebody. This person decides, according to his own interest, what is most desirable in the prevailing circumstances. A central issue regarding governance is therefore the 'make or not-make' decision. The theory of the firm, e.g. transaction costs economics and property rights theory, is concerned with intermediate products, i.e. vertical relationships. The 'make-or-not-make' decision boils down to the 'make-or-buy' decision. An important issue in organizing the firm is therefore the allocation of control and authority, i.e. chain directorship. This allocation involves inevitable trade-offs in the choice of governance structure, because moving authority downward in a chain or network entails taking power away upstream (Hendrikse and Bijman, 2002a). Related issues arise regarding the allocation of decision rights in joint ventures and public-private partnerships.

There are a number of other research questions. Standard incomplete contracting indicates that the employee should be the owner of the assets when the relationship-specific investments of the employee are most important (Hart and Moore, 1990). However, this seems to be at odds with a basic feature of the firm. Crucial to the notion of the firm is the centralization of decision making power; i.e. the employer, not the employee, is the owner of the firm. This seems problematic from an efficiency perspective when the relationship-specific investments of the employee are most important. Rajan and Zingales (1998) have formulated a solution by distinguishing ownership and access to assets, where ownership resides at the top and access to an agent is allowed or not. The efficient design of access to and in chains and networks is a major challenge.

Another way out of this problem (of the centralization of formal authority) is to view ownership as more than a simple (non-contingent) long-term contract allocating decision rights. Formal authority does not preclude that control is delegated to another party, e.g. the employee or a professional management. Formal authority resides at the top, whereas informal authority can be either centralized or decentralized. So, the efficiency of a relationship may be enhanced by giving up some control, i.e. giving real authority away, even though the formal control stays at the top (Aghion and Tirole, 1997; Baker, et al., 1999, 2002). These ideas regarding contingent decision rights are not only implemented in function and task design, but also in the allocation of decision authority in the design of financial instruments (Aghion and Bolton, 1992).

Relational contracts

Relationships within firms are rarely mediated by explicit contacts alone. The incompleteness of contracts implies that formal authority can only be allocated to a limited extent. Informal aspects of organizations have to be considered together with the formal aspects in the design of governance structures. Informal means of enforcing contracts are therefore also needed, like implicit contracts. The role of implicit / relational contracts is to utilize the parties' detailed knowledge of their situation to adapt to new contingencies as they arise.

The rules embedding transactions can therefore be formal as well as informal. The formal rules are represented by the (allocation of) decision rights of an incomplete contract, while the informal rules are captured by an implicit / relational contract. The performance of formal organizational structures and institutions depends importantly on the informal relationships that these structures and institutions facilitate, where the informal rules serve to complete the incomplete contract. Implicit /

relational contracts, i.e. credible informal agreements, have to be designed in such a way that the reputation of each party is sufficiently important to adhere to the informal agreement in order to bring detailed knowledge to value. The allocation of formal rights determines not only the identity of the party developing a reputation, but also the costs and benefits of adhering to an informal contract.
Hybrid organizations, like networks, franchises, partnerships, intermediaries, sub-contracting, distribution channels, collective trademarks, and alliances, are often described as long-term relationships involving trust. The implicit implication is that trust seems to be occurring only in these governance structures. However, relationships in vertically integrated structures are usually also characterized by a long-term relationship. Trust plays therefore an important feature in the employer - employee relationship as well. The asymmetric treatment of long-term relationships seems therefore ad hoc; i.e. the difference between trust in 'internal' versus 'external' transaction modes is not well understood.

Conflict resolution

Compensating for the incompleteness of contracts, a governance structure is designed to foster efficiency in transacting by deterring one party from appropriating the other, coordinating exchange, and resolving disputes which are due to differences in judgments (partly motivated by differences in objectives). In the absence of well-functioning legal institutions or vertical integration, other means of enforcing contracts are needed, either formal or informal. The standard modelling of relational contracts uses the Folk theorem of the theory of repeated games. Relational contracts are sustained by reciprocity; i.e. bad behaviour today will be punished tomorrow by ending the relationship. However, are punishments as unforgiving as depicted by this approach? Are there other means of enforcing relational contracts which support the stability of these governance structures? Empirical work by McMillan and Woodruff (1999) suggests that a much richer variety of means is used to sustain relational contracts, where network features play an important role.

3. Governance and income rights

The desirability and stability of a chain or network is determined by its participants and the incentives for good performance facing them. There are many causes (and solutions) for possible frictions in these organizations. A party becomes a member of a certain chain or network when it is in its own interests, which is determined by the other participants, the possible choices, the available information, and the distribution of costs and revenue schemes. This raises issues regarding optimal cost-sharing schemes, monitoring rules, self-selection devices, and enforcement considerations in chains and networks. Payments are structured in a way to reduce the conflict of interests between the parties, and extra information is gathered and used to reduce the information asymmetry. The costs of asymmetric information are for example dealt with by other payoff schemes, or another allocation of tasks. A complete contracting perspective seems to be most appropriate in order to deal with conflicting interests and asymmetric information (Hendrikse, 2003).

More than two parties

Traditional analysis of vertical relationships usually only considers two parties. A chain consists of at least three parties; i.e. there is at least one party in the middle. This party is a buyer of the upstream product / service, while being a seller to the downstream party at the same time. A network is even more complicated because it consists of a chain together with the interdependent relationships surrounding it. This multi-party nature of chains and networks raises several issues which are absent in a two-party relationship, e.g. the power of the party in the middle, the fact that the party in the middle is agent as well as principal at the same time, the stability of contractual arrangements between two adjacent parties (Tirole, 1986), and the intensity of incentives (Dixit, 1997).

Competition

Standard economic theory predicts the convergence of governance structures over time; i.e. the selection process of the market winnows out the efficient governance structure. However, many sectors exhibit a variety of governance structures over substantial periods of time, e.g. co-operatives as well as stock-listed companies have substantial market shares in many agricultural markets (Hendrikse, 1998). Does the market not perform its selection function well, or are certain value-enhancing services / functions provided by the competition between various governance structures at the same time? Hendrikse and Bijman (2002b) address the forces of self-selection and countervailing power, while Rajan and Zingales (2000) focus on building sustainable competitive advantage by building a network of complementarities with limited access for outside parties. Each stage in the production chain is also part of a specific sector / industry, i.e. horizontal considerations have an impact on the chain. The 'make-or-not-make' decision boils down to the 'make-or-compete' decision. The field of industrial organization focuses on this topic, with considerations like economies of scale, barriers to entry, innovation, and the intensity of the competitive process.

4. Governance and alignment

People / firms take specific courses of action in order to do specialized work and use tools that are geared towards their task. This is attractive from a productivity perspective, but specialization also entails problems, like providing the right incentives and establishing coordination. This may frustrate the potential productivity gains. Specialization has to be accompanied by alignment in order to establish coordination and complementarity between chain and network activities.

Coordination

Chain and network parties are regularly confronted with exceptional or unclear situations, in which the desirable course of action is not immediately clear from the perspective of the whole chain or network. Coordination problems are situations in which one does not know which decision aligns best with other decisions in the chain or network.

Various solutions for coordination problems have been formulated in a two-party context, like setting prices or quantities (income rights), organization / centralization (decision rights), regular meetings, installing information and communication technologies. Coordination problems are much more challenging when three or more parties are involved. It seems that especially the performance on the criteria robustness and simplicity (Milgrom and Roberts, 1992) will be affected in a major way by the change to three or more parties, which will probably have implications for the desirability of the various coordination devices.

Complementarity

The transformation of chains and networks has implications for work practices, strategy, products and services, supplier and customer relationships. The fit between organizational, accounting, communication, financial, production, logistics and marketing attributes of chains and networks becomes important. Increasing synergies between production, distribution and marketing among firms will have an impact on the investment decisions of each party. Investments in one tier of the chain or network must be coordinated with investments in other tiers to obtain optimal performance. As there are complementarities among the activities of different chain participants, the governance of these relationships matters.

Issues in governance have traditionally been concerned with the provision of investment incentives and the resolution of hold-up problems. However, the allocation of authority is not only determined by the need to provide investment incentives, and incentives for investment are provided by a variety of means, of which ownership is just one. A richer approach considers various instruments, which requires a system of attributes view (Milgrom and Roberts, 1990). The crucial concept regarding the relationship between the various instruments is complementarity. It gears the attention towards the interdependencies between these various attributes of chains and networks, and results in the identification of combinations of these attributes which are viable. This raises a number of issues.

First, the contracting externalities between the various instruments guiding these attributes have to be considered (Holmström and Roberts, 1991, 1994). This breaks the symmetric treatment of intra- and inter-organizational relationships; i.e. internal organizations are a world on their own. Chains and networks have therefore probably their own logic. Second, system innovation becomes a major issue. Solow (1987) observed with regard to the introduction of new information technologies that 'You can see the computer age everywhere except in the productivity statistics'. Brynjolfsson and Hitt (2000) show that substantial productivity increases emerge once the adoption of new information technologies is accompanied by changes in supplier relationships, customer relationships, work practices, strategy, and products and services.

Third, a complementarity perspective has implications for the pace of change. It advocates 'all-or-nothing' (Big Bang) change, but gradual change is often observed. It is not clear what is most desirable (Dewatripont and Roland, 1992). Finally, although all attributes of a chain or network matter, it is usually a specific attribute, e.g. transparency, complexity or governance, that drives the choice of the other attributes in order to bring the various complementarities in the system to value. The specific chain / network has to indicate which of these aspects is most important. For example, the specificity of investments seems to be the driving attribute in the organization of fruit and vegetable chains, whereas it is not in the organization of the flower chain.

5. Governance and cognition

The impact of cognitive capabilities and perceptions of the various chain and network participants on the choice of governance structure are highlighted in the following subsections.

Complexity

Transaction costs economics has stressed the role of governance structures in alleviating the ex ante as well as ex post problems associated with asset specificity. Incomplete contracting theory focuses on ex ante investment incentives because almost all ex post problems are anticipated; i.e.

contractual incompleteness is not endogenous in the theory. The problems associated with asset specificity are driving the analysis. However, many problems are so complex that only a limited number of problems and choices can be anticipated ex ante. Complexity rather than asset specificity may therefore guide the choice of governance structure. A shift in attention towards ex post instead of ex ante incentive problems will have repercussions for the efficient choice of governance structure (Bajari and Tadelis, 2001).

A second complexity issue regarding governance concerns the classic 'make or not-make' decision. Many organizations are involved in activities which have very limited vertical or horizontal interactions with the activities of a specific network. The 'make-or-not-make' decision boils down to the 'make-or-abandon' decision. This is the topic of diversification. Diversification or divestiture decisions entail that somehow a new internal organizational equilibrium is preferred above the current one. However, the considerations driving these decisions have not been formulated in a coherent framework which addresses the efficient scope of the organization, and therefore the chain and network.

Third, traditional analysis of vertical relationships usually only considers two parties. Chain and network analyses are geared towards situations consisting of at least three parties. The number of possible interactions increases exponentially when the number of parties increases, which raises issues regarding the span of control, decay in quality of information transmission when more parties are involved, and the efficient boundaries of a network.

Form follows function

A well-known insight from evolutionary biology is that 'form follows function'; i.e. the design of a species evolves in such a way that it is fit for the environment in which it has to survive (Cosmides and Tooby, 1994). An example in the field of management is the observation by Chandler (1962) that 'structure follows strategy', inspired by the evolution of the multi-divisional form at General Motors. However, a lot of research takes as its starting point the reverse sequence; i.e. the governance structure is chosen first, and investment decisions are taken subsequently. The same topic is relevant for the governance of chains and networks.

Inertia regarding change

Organizational change is a recurring phenomenon. Popular press accounts report frequently about mergers, divestitures, replacements of CEOs, organizational restructuring, and so on. A puzzling feature of these organizational changes is the timing of their implementation. In many situations considerable delay occurs in actually implementing a desirable organizational change. Another puzzling aspect regarding organizational and governance change is that often all the involved parties acknowledge after the implementation that everybody knew already that something had to be changed. A third aspect of organizational change is that the involved parties may have vested interests. It boils down to questions like: Are certain governance structures more inert to change than others?, Is there a life cycle of a governance structure?, and so on.

Problems of cognition and learning play an important role in these inertial aspects of the change of governance structure. Governance structures regarding chains and networks channel the data perceived and the way they are made meaningful by agents. This buffers and constrains the diverse and variable actions of many agents (Hodgson, 1998). The relevance of these considerations is reflected in the switch from so-called 'supply chain management' to 'demand-oriented chains and networks'.

6. Summary and conclusions

The research agenda presented in this article has formulated the relevance of governance for the emerging field of Chain and Network Science. It has also distinguished the themes of decision rights, income rights, alignment and cognition which entails research questions such as:

- How does efficient chain directorship reflect technological and demand developments?
- Is detailed local knowledge best brought to value by granting access or by delegating authority?
- How are relational contracts enforced?
- Does the intensity of incentives decrease when the number of chain and network participants increases?
- Why do different governance structures coexist in the same industry?
- Which coordination mechanisms are used in chains and networks, and why?
- Which principle drives the coherence in chains and networks?
- Is Big-Bang system innovation desirable?
- Does complexity or asset specificity drive the choice of governance structure?
- Are governance aspects the driving force behind change in chains and networks?
- Are there path dependencies in the choice of governance structure?

Making progress regarding these themes and research questions entails establishing a number of insights which may turn CNS into a scientific field of inquiry, with its own concepts and tools. This requires not only developing these concepts with input disciplines like economics and management, social sciences, information sciences, technological sciences, cognitive sciences, and law, but also developing chain- and network-specific methodologies and tools together with chain and network parties. Developing concepts jointly with enterprises is potentially very fruitful, as was already recognized as early as 1957 by Koopmans (1957, p145) when he wrote 'The task of linking concepts with observations demands a great deal of detailed knowledge of the realities of economic life'.

References

Aghion, P. and P. Bolton, An Incomplete Contracts Approach to Financial Contracting, Review of Economic Studies, 1992, 59, 473-494.

Aghion, P. and J. Tirole, Formal versus Real Authority, Journal of Political Economy, 1997, 105(1), 1-29.

Alchian, A. and H. Demsetz, Production, Information Costs, and Economic Organization, American Economic Review, 1972, 62(5), 777-95.

Bajari, P. and S. Tadelis, Incentives versus Transaction Costs: a Theory of Procurement Contracts, RAND Journal of Economics, 2001, 32(3), 387-407.

Baker, G., R. Gibbons and K.J. Murphy, Informal Authority in Organizations, The Journal of Law, Economics, & Organization, 1999, 15(1), 56-73.

Baker, G., R. Gibbons and K.J. Murphy, Relational Contracts and the Theory of the Firm, Quarterly Journal of Economics, 2002, 117(1), 39-84.

Brynjolfsson, E. and L.M. Hitt, Beyond Computation: Information Technology, Organizational Transformation and Business Performance, Journal of Economic Perspectives, 2000, 14(4), 23-48.

Chandler, A.D., Strategy and Structure, MIT Press, Cambridge, 1962.

Coase, R.H., The Nature of the Firm, Economica, 1937, 4(6), 386-405.

Cosmides, L. and J. Tooby, Better than Rational: Evolutionary Psychology and the Invisible Hand, American Economic Review, 1994, 84(2), 327-332.

Dewatripont, M. and G. Roland, The Virtues of Gradualism and Legitimacy in the Transition to a Market Economy, Economic Journal, 1992, 102(411), 291-300.

Dixit, A.K., Power of Incentives in Private versus Public Organizations, American Economic Review, 1997, 87(2), 378-382.

Hansmann, H., The Ownership of Enterprise, Belknap Press, Cambridge, 1996.

Hart, O. and J. Moore, Property Rights and the Nature of the Firm, Journal of Political Economy, 1990, 98(6), 1119-1158.

Hendrikse G.W.J., Screening, Competition and the Choice of Marketing Cooperative as an Organizational Form, Journal of Agricultural Economics, 1998, 49(2), 202-217.

Hendrikse, G.W.J., Economics & Management of Organizations, McGrawHill, 2003.

Hendrikse G.W.J. and W.J.J. Bijman, Ownership Structure in Agrifood Chains: The Marketing Cooperative, American Journal of Agricultural Economics, 2002a, 84(1), 104-119.

Hendrikse G.W.J. and W.J.J. Bijman; On the Emergence of New Grower s' Associations: Self-Selection versus Countervailing Power, European Review of Agricultural Economics, 2002b, 29(2), 255-269.

Hodgson, G.M., The Approach of Institutional Economics, Journal of Economic Literature, 1998, 36(1), 166-192.

Holmström, B.R. and P. Milgrom, Multitask Principal-Agent Analysis: Incentive Contracts, Asset Ownership, and Job Design, Journal of Law, Economics, and Organization, 1991, 7, S24-52.

Holmström, B.R. and P. Milgrom, The Firm as an Incentive System, *American Economic Review*, 1994, 84(4), 972-991.

Jensen, M. and W. Meckling, Theory of the Firm: Managerial Behavior, Agency Costs and Capital Structure, Journal of Financial Economics, 1976, 3, 305-360.

Johnson, S., J. McMillan, and C. Woodruff, Property Rights and Finance, American Economic Review, 2002, 92(5), 1335-1356.

Koopmans, T.C., Three Essays on the State of Economic Science, McGrawHill, 1957.

McMillan, J., and C. Woodruff, Dispute Prevention without the Courts, Journal of Law, Economics, and Organization, 1999, 15(3), 637-660.

Milgrom, P. and J. Roberts, The Economics of Modern Manufacturing: Technology, Strategy, and Organization, American Economic Review, 1990, 80(3), 511-528.

Milgrom, P. and J. Roberts, Economics, Organization and Management, Prentice Hall, 1992.

Omta, S.W.F., J.H. Trienekens, and G. Beers, Chain and Network Science, A Research Framework, Journal of Chain and Network Science, 2001, 1(1), 1-6.

Rajan, R. and L. Zingales, Power in a Theory of the Firm, Quarterly Journal of Economics, 1998, 113, 387-432.

Rajan, R.G. and L. Zingales, The Governance of the New Enterprise, in X. Vives, Corporate Governance, Theoretical and Empirical Perspectives, Cambridge University Press, 2000.

Simon, H.A., A Formal Theory of the Employment Relation, Econometrica, 1951, 19(3), 293-305.

Solow, R.M., We'd Better Watch Out, New York Times Book Review, 1987, july 12, 36.

Spence, M, Signaling in Retrospect and the Informational Structure of Markets, American Economic Review, 2002, 92(3), 434-459.

Tirole, J., Hierarchies and Bureaucracies: On the Role of Collusion in Organisations, Journal of Law, Economics and Organization, 1986, 2(2), 181-214.

Williamson, O.E., The Economic Institutions of Capitalism, Free Press, New York, 1985.

Zingales, L., Corporate Governance, in J. Eatwell (ed.), The New Palgrave, MacMillan, London, 1998.