

SPECIFIC AND GENERAL KNOWLEDGE, AND ORGANIZATIONAL STRUCTURE

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Abstract

We analyze how the cost of transferring specific knowledge encourages the decentralization of decision rights and how this decentralization generates the rights assignment and control problems. Ignoring agency problems, assigning decisions rights to individuals who have the decision-relevant knowledge and abilities increases efficiency. Self interest on the part of individual decision-makers, however, requires a control system to motivate individuals to use their decision rights optimally. A capitalist economy solves the rights assignment and control problems by granting alienable decision rights to individuals.

Unlike markets, the decision rights assigned to individuals in organizations seldom include the right to alienate those rights. This inalienability of rights requires organizations to solve the rights assignment and control problems by alternative means. They solve these problems by establishing internal rules of the game that: 1) provide a system for partitioning decision rights among agents in the organization, and 2) create a control system that provides a performance measurement and evaluation system and a reward and punishment system. The inherent inefficiency of organizational control systems as compared to alienability means firms cannot survive unless they provide other offsetting advantages such as economies of scale, scope or riskbearing.

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1. Introduction

In this chapter we analyze the institutional devices through which decision-making rights are assigned in markets and within firms and the devices used to motivate agents to make proper decisions. We focus on how the costs of transferring information between agents influences the organization of markets and firms.

1.1 Specific and general knowledge

We define *specific knowledge* as knowledge that is costly to transfer among agents and *general knowledge* as knowledge that is inexpensive to transmit. Because it is costly to transfer, getting specific knowledge used in decision-making requires decentralizing many decision rights in both the economy and in firms. Such delegation, in turn, creates

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two problems: the rights assignment problem (determining who should exercise a decision right), and the control or agency problem (how to ensure that self-interested decision agents exercise their rights in a way that contributes to the organizational objective).

Capitalist economic systems solve the rights assignment and control problems by granting *alienability* of decision rights to decision agents. A right is alienable if its owner has the right to sell a right and capture the proceeds offered in the exchange. Indeed, we define ownership to mean possession of a decision right along with the right to alienate that right, and we believe that when people use the word ownership that is what is meant. This combination of a decision right with the right to alienate that right is also what is generally meant by the term property right so frequently used in economics (see, for example, Alchian and Allen 1983, p. 91; Coase 1960). In contrast to markets, organizations generally do not delegate both decision rights and the alienability of those rights to the agent. A machine operator might be delegated the rights to operate and maintain a machine, but not the rights to sell it and pocket the proceeds. In the absence of alienability, organizations must solve both the rights assignment and control problems by alternative systems and procedures. We discuss the critical role that alienability plays in the market system and some of the substitute control mechanisms used in firms.

1.2 Colocation of knowledge and decision authority

F. A. Hayek was an early proponent of the importance of knowledge and its distribution to a well-functioning economy. In his seminal article on “The use of knowledge in society,” Hayek (1945, pp. 519ff.) argues that most economists, as well as advocates of centralized planning, misunderstand the nature of the economic problem. “The economic problem of society is. . .not merely a problem of how to allocate ‘given’ resources—if ‘given’ is taken to mean given to a single mind . . . It is rather a problem of how to secure the best use of resources known to any of the members of society, . . . a

problem of the utilization of knowledge which is not given to anyone in its totality.” Hayek’s insight was that an organization’s performance depends on the collocation of decision-making authority with the knowledge important to those decisions.¹ He argues that the distribution of knowledge in society calls for decentralization.

If we . . . agree that the economic problem of society is mainly one of rapid adaptation to changes in the particular circumstances of time and place, . . . decisions must be left to the people who are familiar with these circumstances, who know directly of the relevant changes and of the resources immediately available to meet them. We cannot expect that this problem will be solved by first communicating all this knowledge to a central board which, after integrating all knowledge, issues its orders. We must solve it by some form of decentralization (Hayek 1945, p. 524).

Hayek’s pioneering work provides a point of departure for analyzing how the distribution of knowledge affects organizational structure and its critical role in the development of a theory of organization. Hayek presumes that markets automatically move decision rights to the agents with the relevant knowledge, and that those agents will use the decision rights properly. Unfortunately he never discusses how this occurs. We show how understanding this issue provides insights into the organizational and managerial problems of firms.

In section 2 we discuss the limits of human mental capacities and their implications for the costs of transferring knowledge. Section 3 defines the characteristics of decision rights and rights systems. Section 4 discusses the functions of alienability, its role in solving the rights assignment and control problems in markets, and the implications of the market solution for the internal problems faced by organizations that cannot use alienability to solve the rights assignment and control problem. Section 5 discusses the problems of the firm in collocating decision rights and specific knowledge, and section 6 discusses the technology for partitioning decision rights within the firm. Section 7 discusses internal control systems, and section 8 concludes the chapter.

¹ Harris et al. Harris, M. Kriebel, C.H. and Raviv, A. 1982. "Asymmetric Information, Incentives and Intrafirm Resource Allocation." *Management Science* 28, no. 6, pp. 604-620. also recognize this principle.

2. Knowledge

2.1 Limitations on human sensory and mental faculties

The opportunity set confronting an individual or a firm is a function of the individual's knowledge. Decision-makers have limited knowledge at two levels. "Technological feasibility" reflects currently limited human knowledge about physical laws. Economic analysis reflects this limitation in the statement that knowledge is given and depends on the state of technology at the time.

The second limitation on knowledge, and the one of more concern here, is due to physical limitations specific to each individual, what March and Simon (1958) labelled "bounded rationality" (see also Simon 1955; 1959). Humans have limited mental capability. The computers and sensory systems with which we are individually endowed are a scarce resource with limited storage and processing capability, as well as limited input and output channels. The limitations on human mental and sensory faculties mean that storing, processing, transmitting, and receiving knowledge are costly activities. This limited capacity of the brain means that knowledge possessed by any individual decision-maker or group of decision-makers is thereby limited to a minuscule subset of the knowledge known to humanity. While decision-makers seldom, if ever, possess all available knowledge, they are constantly creating new knowledge. In maximizing their objective functions, decision-makers deliberately seek out knowledge (including knowledge about what decisions to consider).

When knowledge is valuable in decision-making, there are benefits to collocating decision authority with the knowledge that is valuable to those decisions. There are two ways to collocate knowledge and decision rights. One is by moving the knowledge to those with the decision rights; the other is by moving the decision rights to those with the knowledge. The process for moving knowledge to those with decision rights has received much attention from researchers and designers of management information systems. But

the process for moving decision rights to those with the relevant knowledge has received relatively little attention in either economics or management.

In a market system, collocation of decision rights and knowledge occurs either when those with decision rights expend resources to acquire the knowledge or when those with knowledge buy the decision rights. When the cost of moving knowledge is higher than the cost of moving decision rights, knowledge holders will value the decision rights more highly and will purchase them. Therefore, optimizing behavior on the part of individuals causes the distribution of decision-making rights in the economy to reflect the limitations of human mental and sensory systems.

2.2 Knowledge and the cost of transfer

Although knowledge has many characteristics of potential interest, we concentrate here only on the cost of transferring knowledge between people. The cost of transferring knowledge depends on factors such as the nature of the knowledge, the organizational environment, and technology. We use the terms specific and general knowledge to distinguish between knowledge at the extremes of the continuum measuring transfer costs. The more costly knowledge is to transfer, the more specific it is, and the less costly the knowledge is to transfer the more general it is.

Transfer, as we use it, means effective transfer, not merely communication. The recipient of knowledge is presumed to understand the message well enough to act on it. The simple purchase of a physics book is not sufficient to transfer the knowledge to the purchaser (as evidenced by students who regularly pay thousands of dollars for help in acquiring such knowledge). Thus, transfer involves the use of storage and processing capacity as well as input/output channels of the human brain. Moreover, knowledge transfers are not instantaneous; it takes people time to absorb information. These delays are costly, and for some decisions such cost can be high, including even the complete loss of opportunities.

Hayek (1945) takes the distribution of knowledge in the economy as given and thus never mentions the cost of transferring or producing knowledge even though it is logically the foundation of his analysis.² Writing during the 1940s British debate over central planning, he attacks central planners on grounds that they will make bad decisions because they will not (indeed cannot) have knowledge of “particular circumstances of time and place.” As examples of such knowledge he cites a not-fully-employed machine, someone’s particular skills, surplus stock, empty or half-filled freighters, temporary opportunities in real estate, and commodity price differences. Hayek points out that conveying knowledge of particular circumstances to a central authority in statistical form is impossible. Aggregating or lumping together items such as location or quality destroys their usefulness for specific decisions. Adding up the quantity of empty spaces in steamers or logs in widely scattered wood piles, for example, eliminates the time and location information that is so valuable in periods of transportation or energy shortages.

Specific knowledge, of which idiosyncratic knowledge of particular circumstances is an example, is often acquired jointly with the production of other goods. When knowledge is a by-product of activities that will be performed anyway, the cost of that knowledge to the acquirer is nil. Idiosyncratic knowledge includes knowledge of specific skills or preferences of individuals, or the peculiarities of specific machines, knowledge of particular unemployed resources or inventories, and knowledge of arbitrage opportunities. Such knowledge, almost by definition, is difficult or impossible to aggregate and summarize.

² Like Hayek, economists have generally taken the costs of information transfer to be prohibitively large, and, therefore, taken the distribution of knowledge as given. They have analyzed extensively the effects of “information asymmetry” (as it is known in the principal/agent literature) on contracting relations. Williamson Williamson, Oliver E. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: Free Press. in his study of institutions defines the concept of “information impactedness” to deal with the organizational implications of transactions where information is “known to one or more parties but cannot be costlessly discerned by or displayed for others” (p. 31). Explicitly recognizing the costs of transferring knowledge is more useful analytically.

While the initial acquisition cost of idiosyncratic knowledge tends to be modest, transfer costs are likely to be high relative to the benefits. Because time is often important in taking advantage of opportunities for arbitrage or for exploiting knowledge of unemployed resources, delays in actions are costly. Uncertainty about what specific piece of idiosyncratic knowledge is valuable enlarges transfer costs in a subtle way. After the fact, it is often obvious that a specific piece of knowledge critical to a decision could have been transferred at low cost (for example, particular quirks of an organization, person, legal rule, or custom). But transferring this specific piece of knowledge in advance requires knowing in advance that it will be critical. Without such clairvoyance, transfer of the fact must occur as part of a larger and more costly to transfer body of knowledge, most of which will never be used. The expected cost of transferring that larger body of data, not the particular fact, is the relevant transfer cost.

Although knowledge of particular circumstances of time and place and idiosyncratic knowledge cannot be summarized in statistics, they can be transmitted to other locations in the decision-making structure. The question is not *whether* knowledge can be transferred, but at *what cost* it can be transferred, and whether it is worth it to do so. Transfers yield benefits when the additional knowledge enables the decision-maker to make better choices. The issue is whether decisions will be improved enough to warrant the transfer costs.

Quantities and prices are good examples of general knowledge. Unlike idiosyncratic or other specific knowledge, quantities are easily aggregated and transferred among agents at low cost. Prices, which are also easily communicated among agents, are signals that communicate a large amount of information inexpensively. When a price rises people know it is appropriate to conserve the commodity, and they need not know why its relative supply has shrunk.

Even though it is costly, we do observe situations in which collocation is achieved by transferring knowledge. Formal educational programs and the collection, analysis, and

dissemination of data are obvious examples. Some firms, such as United and American Airlines, achieved a major competitive advantage with computerized reservation and pricing systems that reduce the cost of transferring knowledge about prices, empty seats, and schedules (see Copeland and McKenney 1990). Particularly challenging information transfer problems arise in situations where optimal decision-making requires integration of specific knowledge located in widely separate individuals. Integrating the specific knowledge of marketing, manufacturing, and R&D personnel to design and bring a new product to the market is an example.

While the general applicability of scientific knowledge distinguishes it from idiosyncratic knowledge, it is costly to transfer between agents and, therefore, also falls in the category of specific knowledge. Science creates order out of chaos by excising particulars and providing general rules of cause and effect relations. Scientific knowledge is an essential ingredient in decisions, because it provides the basis for predicting the outcomes of alternative courses of action. At the level of the firm, scientific knowledge plays a central role in the resolution of the key questions that economists address—what to produce and how to produce it. For example, the design and development of products from machinery and buildings to household appliances and drugs depends critically on scientific knowledge.

In addition to scientific and idiosyncratic knowledge, knowledge produced by assembling and analyzing knowledge of particular circumstances (through time and/or across circumstances such as location, income, education, age) is a significant input to decision-making. For example, the entrepreneur who wants to capitalize on a particular half-filled freighter must be able to identify the freighter, its location, its cargo capability, etc. On the other hand, someone deciding whether to become an agent to increase the utilization of freighters will want to assemble knowledge about how many partially filled freighters there are, what routes they follow, what kinds of cargo capacity they have, and so on—knowledge that abstracts from the particular circumstances crucial to utilizing

fully a particular freighter. Assembled knowledge includes, but is not limited to, that generated by formal statistical methods.

Assembled knowledge also includes knowledge gleaned from experience. The exercise of skills such as machine operation, writing, mathematics, or statistics are examples. Knowledge of law, of accounting practices, of contracting practices, of the rules that govern the operation of organized exchanges, etc., is also an important input to decision-making. Assembled knowledge can be either general (as is likely to be true of the output of statistical manipulation of basic data) or specific (as is likely to be true of experiential knowledge).

3. Rights Systems

A decision right is the right to decide on and to take an action. Decision rights are the basis for saying that individuals have the “power” to make decisions and to take actions with resources. Power means that a decision made by a party will be operative. In modern societies the ultimate source of this power is the police powers—the threat of physical violence by the state. An entity has the right to take an action with a specific object, if the police powers of the state will be used to help ensure its ability to take the action. The right to choose what action will be taken is an important part of possessing a right. The word “right” in this context has no normative content.

In any developed social system the right to take actions with specific physical objects, including our persons, is assigned to specific individuals or organizations. In a private property capitalist system most of these rights are assigned to private individuals or organizations. In a socialist or communist system most of these rights are assigned to the state or the governing party.

Although it is not commonly emphasized,³ the usual economic analysis of the price system is founded on the existence of a system of privately “owned” rights. There are two actions of special importance that are an integral part of ownership of a right in a resource: the right to sell the resource (more accurately, to sell rights in the resource) and the right to capture the proceeds of the sale.⁴ Thus, the objects of exchange in markets are not physical articles *per se*, but bundles of rights attached to those articles.⁵ It is this system of *alienable rights* (almost universally characterized erroneously in our profession as “the price system”) that extends the efficient utilization of resources beyond the capacity of any single mind. It provides incentives to make individuals take appropriate actions without anyone having to direct them.⁶ This is what Adam Smith (1776) called the “invisible hand,” and his point was that control of human behavior is inherent in markets.

The assignment of decision-making rights in modern societies is largely a matter of law.⁷ But once assigned, rights are regularly reshuffled by contracts, by purchase and sale, and by managerial assignment within firms. In the case of the United States, the

³ See, for example, Arrow Arrow, Kenneth J. 1971. *Control in Large Organizations: Essays in the Theory of Risk-Bearing*: Markham Publishing Co.. An excellent counterexample is Alchian and Allen (1983, and earlier editions dating back to 1969).

⁴ Including the right to sell the rights in output that an individual or firm creates with the resource.

⁵ It follows that the values established in exchanges are values of bundles of rights, not prices of physical objects. Property whose use is restricted by regulatory constraints or private covenants will sell at different prices from identical property with full use rights. Goods are sometimes alienated illegally, e.g. theft, black markets, drugs and prostitution. When the police powers are not 100 percent effective, rights are not 100 percent secure, and the lower value of such rights will reflect the probability that the rights will be taken (either illegally, or legally through political action such as confiscation or nationalization).

⁶ In the absence of externalities or monopoly, of course. But externalities are themselves a result of an incomplete definition and assignment of rights. See Coase Coase, Ronald H. 1960. "The Problem of Social Cost." *Journal of Law and Economics* 3, no. October, pp. 1-44..

⁷ Customs and mores, not embodied in law, also confer decision-making powers and constraints on individuals or groups, especially in primitive societies. The social sanctions imposed on those who take actions in violation of social or group norms can have substantial impact on the decision rights of individuals, which is separate from formal legal sanctions of the state. Alternatively, individuals sometimes possess decision-making powers without having legal rights in those resources, e.g. possessors of stolen goods. Those engaged in illegal activities themselves employ threats of physical violence to preserve powers.

body of law that spells out the assignment of rights is the product of hundreds of years of law-making of three sorts: court decisions (common law), legislative enactments (statutory law, including constitutions), and administrative decrees (administrative law).

The private-property capitalist mechanism is the product of thousands of years of evolution. It is highly complex and embraces a multitude of actions, objects, and individuals. Most importantly, however, it functions as a free-standing system. It is automatic; there is no central direction. With minor exceptions, rights to take almost all conceivable actions with virtually all physical objects are fixed on identifiable individuals or firms at every instant of time. The books are kept up to date despite the burden imposed by dynamic forces, such as births and deaths, dissolutions, and new technology. Disputes arise, but evolution has provided a sophisticated arbitration service, the courts, to deal with that problem as well. The extent to which the legal system enforces property rights (the security of decision rights and the right to alienate them) is a major determinant of the effectiveness of markets.

The failure of socialist and communist economies (whose distinguishing characteristic is the absence of private rights) is now the topic of headlines throughout the world. The difficulties that Eastern bloc countries are having in attempting to establish capitalist market systems to replace their failed systems is testimony to the complexity and value of market systems.⁸ These economies provide vivid evidence on the inefficiency and poverty that result from the waste of specific knowledge and the lack of control in the absence of alienable decision rights. Without the assignment of private alienable rights there can be no true market system. Thus, given their failure to establish alienable private rights in resources, it is not surprising that many of these countries are failing in their attempt to create effective market systems.

⁸ See Crook Crook, C. 1990. Perestroika: And Now for the Hard Part. *The Economist*, April 28, pp. 1-22. for an excellent survey.

4. The Functions of Alienability

The alienability of rights deserves special attention in analyzing both markets and organizations because understanding the function of alienability in markets clarifies several critical functions that must be performed in organizations. The analysis thereby focuses attention on the critical issues to be resolved by scholars and practicing managers in their efforts to understand and manage organizations.

Alienability is the effective combination of two rights: the right to sell or transfer rights and the right to capture the proceeds of exchange.⁹ Alienability is not only a necessary condition to exchange, it is the foundation of markets and the institutional device through which markets colocate knowledge with decision rights and control decision-makers.

Alienability solves the rights assignment problem. When decision rights are alienable, voluntary exchange creates a process in which the purchase and sale of rights by maximizing individuals collocates knowledge and decision rights. It does so by conveying decision rights to the site of knowledge. In a market system, decision rights are acquired through exchange by those who have knowledge. Voluntary exchange ensures that decision rights will tend to be acquired by those who value them most highly, and this will be those who have specific knowledge and abilities that are most valuable to the exercise of the right.

Control is the process and rules governing the measures of performance, and the rewards and punishments meted out in response to individual actions. Control and knowledge are complements in the analysis of organizations. Knowledge and the decision rights possessed by the individual, and the state of the world define the opportunity set from which individual decision-makers can choose. The control system plays a major role in determining which choices individuals make from their opportunity sets.

⁹ Alienability includes the right to sell or transfer alienability itself.

Alienability solves the control problem. By collocating decision rights with rights to their capital value, alienability provides both a measure of performance for individual decision-makers and rewards and punishments to motivate them to use those decision rights efficiently. Market prices for alienable rights reveal the value of assets in alternative uses to current rights holders as well as to potential rights holders. Where resources produce future flows of revenue or consumption services, and rights to those flows are alienable, prices represent the present value of claims to those future flows. These capitalized values perform two important functions in controlling human behavior:

1. They provide a measure of the performance of the parties who have the rights to decide how the asset or assets will be used.
2. They provide the reward or punishment that accrues to the owners of the rights as a result of their decisions.

The collocation of decision rights with rights to their capital value accomplished by alienability thus both measures the performance of individuals and capitalizes the wealth consequences of an individual's decisions upon that person. The decision-maker who chooses an action that lowers the value of rights assigned to him or her bears the costs. When the decision-maker chooses actions that enhance the value of the rights, he or she captures the increased value. The major problems with the market control system occur when the legal or technological environments create externalities by not allowing for the definition and assignment of rights that cause an individual to bear the full costs or to capture the full rewards of his or her actions. Pollution or non-patentable inventions are good examples of situations in which decision-makers do not bear the full costs or benefits of their actions.

The problems that arose in organizing in Eastern bloc countries without alienability highlight the significance of alienability to organizational structure and efficiency. But the internal organization of the capitalist firm is also an instance of the absence of alienable decision rights. Indeed, we distinguish activities within the firm from

activities between the firm and the rest of the world by whether alienability is transferred to agents along with the decision rights. In this view transfers of decision rights without the right to alienate those rights are intra-firm transactions. While firms can sell assets, workers in firms generally do not receive the rights to alienate their positions or any other assets or decision rights under their control. They cannot pocket the proceeds. This means there is no automatic decentralized process which tends to ensure that decision rights in the firm migrate to the agents that have the specific knowledge relevant to their exercise, and that there is no automatic performance measurement and reward system that motivates agents to use their decision rights in the interest of the organization. Explicit managerial direction and the creation of mechanisms to substitute for alienability is required.

4.1 The existence of firms

Pushed to its logical extreme, our focus on specific knowledge implies more or less complete atomization of the economy. There is no room for the firm. Firms as we know them would not exist if alienability of all decision rights were granted to each agent along with the rights. There would be nothing left over for the residual claimants in the enterprise, be they entrepreneurs, partners, or stockholders.

Firms must obtain advantages from the suppression of alienability that are large enough to offset the costs associated with its absence, or they could not survive open competition with independent agents. Such advantages could come from economies of scale or scope, or the reduction of transaction costs that could not be obtained by independent contracting agents.

Knowledge considerations are one cause for the emergence of firms. Indeed, Demsetz (1988, p. 159) argues that “conservation of expenditures on knowledge” determines the vertical boundaries of the firm. Bringing diverse knowledge together to bear on decisions significantly expands the opportunity set because no one person is

likely to possess the set of knowledge relevant to a particular decision. In principle, an entrepreneur could assemble the relevant knowledge by individual exchanges, and knowledge transfer on a *quid pro quo* basis is not an uncommon phenomenon. Consulting and legal services provide obvious examples and so do the network organizations growing in the United States that contract out most internal functions common to organizations (see Kensinger and Martin 1991).

Where the production, transfer, and application of knowledge are the primary goods being offered, however, exchanges tend to take the form of long-term relationships, and the most common of these is employment contracts. Such contracts tend to be general in nature—the contents of the exchange are not precisely specified—and they seldom are alienable. The transaction costs emphasized by Coase (1937) and Williamson (1975) are one reason such contracts emerge. Single proprietors who contract on a case-by-case basis for production and application of all knowledge would soon find themselves swamped by transaction costs in all but the smallest-scale firms.

The value of proprietary knowledge to competitors or potential competitors is another reason for long-term employment relationships. Longer-term contracts reduce the costs of restricting the flow of valuable knowledge to outsiders. Finally, longer-run relationships encourage individual participants to invest in firm-specific knowledge that has little or no value except within the particular organization

The suppression of alienability, while required for the existence of a firm, does impose costs, and we believe that those costs can be reduced by thorough understanding and analysis of the functions performed by alienability.

The franchise organization, a rapidly growing sector of the American economy, is a good example of a mixture of firm and market systems that uses alienability of rights as part of the control system. A franchise contract sells the right to manage a divisional profit center to a manager for a franchise fee. The manager receives the capital value right to the residual cash flows, subject to an annual royalty payment and contractual

provisions limiting his decision rights in various areas.¹⁰ Most importantly for our purposes, the manager receives the right to alienate the franchise contract by sale to others. The contract often restricts alienation rights in various ways, for example by the right of the franchiser to approve the purchaser. Alienability's advantage as a control device is that it rewards and punishes agents by imposing on them the capitalized value of the future costs and benefits of their decisions. In the absence of arm's length transactions this is difficult to implement inside a firm. Nevertheless, mechanisms do exist to provide the functions that alienability normally provides in markets. We turn now to a discussion of these substitute mechanisms and how they help to solve the organizational problems of the firm.

5. The Organizational Problems of the Firm: The Trade-offs between Costs Owing to Poor Information and Agency Costs

We have seen how alienability solves the rights assignment and control problems in the economy. Recognizing that firms, by definition, can make relatively little internal use of alienability enables us to see clearly the problems faced by every firm in constructing substitute mechanisms. The assignment and enforcement of decision rights in organizations are a matter of organizational policy and practice, not voluntary exchange among agents. In principle the modern corporation vests all decision rights in the board of directors and the chief executive's office. Decision rights are partitioned out to individuals and to organizational units by the rules established by top-level management and the board of directors. The chief executive's office enforces the rules by rewarding and punishing those who follow or violate the rules. These assignment and

¹⁰ See Rubin Rubin, Paul H. 1978. "The Theory of the Firm and the Structure of the Franchise Contract." *Journal of Law and Economics* 21, no. April, pp. 223-33. for a description and analysis of the nature of the franchise contract. Like so much of the literature on franchises, this analysis ignores the critical role of alienability in the functioning of this organizational form.

enforcement powers are constrained in important ways by the laws and regulations of the state and by social custom.

Every chief executive officer (CEO), including a benevolent despot with the power to direct the economy, confronts the rights assignment and control problems of organizational structure discussed above. The limitations of his or her own mental and communication abilities make it impossible for the CEO to gather the requisite information to make every detailed decision personally. Any CEO attempting to do so in a large complex organization will commit major errors. In delegating authority to maximize survival, the CEO wants to partition the decision rights out among agents in the organization so as to maximize their aggregate value. Ideally this means colocating decision responsibility with the knowledge that is valuable in making particular decisions. This requires consideration of the costs of generating and transferring knowledge in the organization, and how the assignment of decision rights influences incentives to acquire information.

In assigning decision rights, the CEO confronts a second problem. Because they are ultimately self-interested, the agents to whom the CEO delegates authority have objective functions that diverge from his or her own. The costs resulting from such conflicts of interest in cooperative behavior are commonly called agency costs. Because agency costs inevitably result from the delegation of decision rights, the CEO must devise a control system (a set of rules) that fosters desirable behavior. It is, however, generally impossible to structure an incentive and control system that will cause agents to behave exactly as the CEO wishes. In addition, control and incentive systems are costly to design and implement. Agency costs are the sum of the costs of designing, implementing, and maintaining appropriate incentive and control systems and the residual loss resulting from the difficulty of solving these problems completely (see Jensen and Meckling 1976).

Figure 1 provides an intuitive way to think about the trade-offs associated with assigning a particular decision right to different levels in the organization's hierarchy.

The vertical axis measures costs and the horizontal axis measures the distance of the decision right from the CEO's office (measured by levels of hierarchy) in a simple hierarchically structured organization. For simplicity, figure 1 abstracts from the decision regarding where the right is assigned within a given level of the hierarchy,¹¹ and thus deals with the age-old centralization/decentralization debate in organizations.

Determining the optimal level of decentralization requires balancing the costs of bad decisions owing to poor information and those owing to inconsistent objectives. The costs owing to poor information plotted in figure 1 measure the costs of acquiring information plus the costs of poor decisions made because it is too expensive to acquire all relevant information. In the extreme case of a completely centralized organization (located at the origin on the horizontal axis) the costs owing to poor information are high while the agency costs owing to inconsistent objectives are zero.¹²

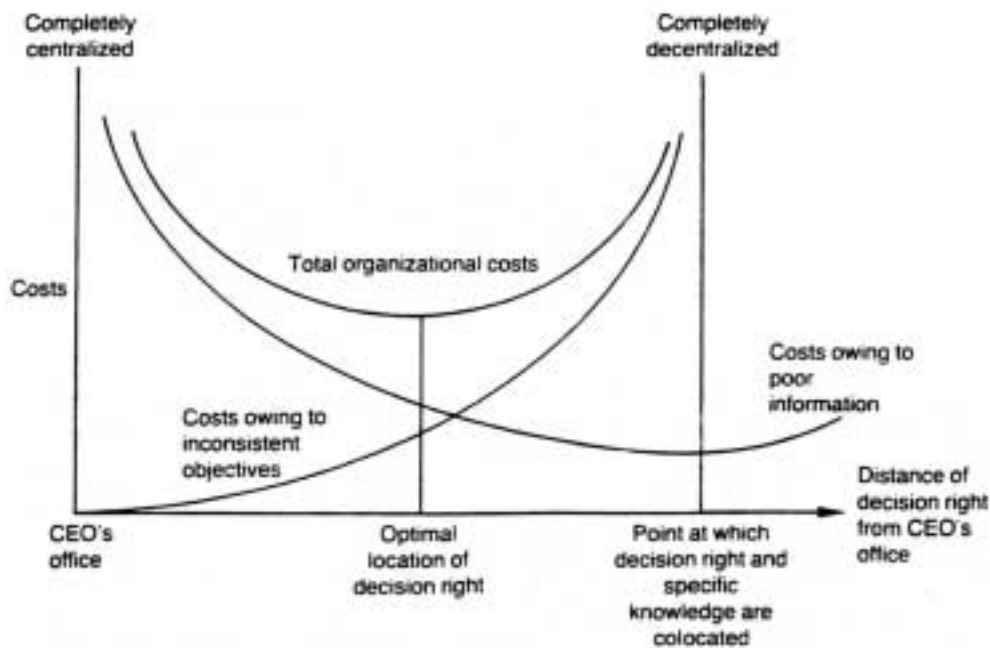


Figure 1 The trade-off between costs owing to inconsistent objectives and costs owing to poor information as a decision right is moved further from the CEO's office in the hierarchy.

¹¹ We can assume that the right is optimally assigned within each level in the hierarchy.

¹² Assuming the CEO does not have agency problems with himself or herself Thaler, Richard H. and H.M. Shefrin. 1981. "An Economic Theory of Self-Control." *Journal of Political Economy*, no. April..

The costs owing to poor information fall as the CEO delegates the decision right to lower levels in the organization. They fall because the decision right is exercised by agents that have more specific knowledge relevant to the decision. We assume for simplicity that the hierarchy and both cost functions are continuous. We assume the costs owing to inconsistent objectives increase monotonically and at an increasing rate as the right is assigned to lower levels, and that these costs are conditioned on optimal controls at each alternative rights assignment. We also assume that the cost owing to poor information has a unique minimum. By definition this minimum must occur where the right is collocated with the specific knowledge relevant to the decision.

Total organizational costs plotted in figure 1 are the sum of the costs owing to poor information and the costs owing to inconsistent objectives. They are high at the completely centralized allocation and decline as the right is moved down in the hierarchy to where more relevant specific knowledge is located. In figure 1 the vertical line marks the optimal location of the decision right. It occurs where the decrease in the cost owing to poor information just offsets the increase in the cost owing to inconsistent objectives (the point where the absolute values of the slopes of the two curves are equal).

Specific knowledge exists at all levels of the organization, not just at lower levels. For example, a machine operator often has specific knowledge of a particular machine's operating idiosyncrasies, but the chief financial officer is likely to have the specific knowledge relevant to the capital structure decision. The CEO may often have the best specific knowledge of the strategic challenges and opportunities facing the firm. The key to efficiency is to assign decision rights to each agent at each level to minimize the sum of the costs owing to poor information and the costs owing to inconsistent objectives. Figure 1 illustrates that even at the optimum an organization will be making poor decisions owing to both poor information and the conflicts that arise from inconsistent objectives.

The optimal degree of decentralization depends on factors like the size of the organization, information technology (including computers, communications, and travel), the rate of change in the environment, government regulation, and the control technology. In general, as the size of a firm increases, the sum of the cost owing to poor information and the cost owing to inconsistent objectives rises. When the marginal costs owing to poor information rise more rapidly with size than the marginal costs owing to inconsistent objectives, the optimal degree of decentralization rises. Changes in information technology have an ambiguous impact on the optimal degree of decentralization. The direction of the effect depends on which information is most affected. When improved technology makes it easier to transfer specific knowledge effectively from lower to higher levels in the organization there will be a shift toward centralization.¹³ When improved technology makes it easier to transfer to lower levels in the organization information that formerly was specific to higher levels in the organization, there will be a shift toward decentralization.¹⁴

Increased governmental regulation tends to increase centralization. It does so by increasing the amount of specific knowledge in the headquarters office dealing with the regulatory agency. Improvements in control technology, such as communication and measurement techniques that reduce the marginal agency costs associated with delegating decision rights, will tend to increase decentralization in an organization.

Our characterization of decision rights so far has been overly simple. It is relatively uncommon in large organizations for agents to have the total rights to make any

¹³ Mrs. Fields' Cookies is an example of a firm experiencing technological development that made it possible for headquarters to obtain detailed and timely information on store operations and to provide very detailed day-by-day, even hour-by-hour directions on operating decisions in its company-owned stores Richman, T. 1987. Mrs. Fields's Secret Ingredient. *Inc.*, October,...

¹⁴ J.C. Penney's investment in satellite communications that provided the firm with closed circuit TV made it possible to decentralize much of the store purchasing decisions from corporate headquarters to the local store managers. The TV system made it possible for central buyers in New York to display and "market" the goods to local store managers, who could then utilize their specific knowledge of local tastes and fashions to stock their stores Gilman, H. 1987. "J.C. Penney Decentralizes its Purchasing: Individual Stores Can Tailor Buying to Needs." *The Wall Street Journal*, May 8,...

major decision in the way we normally think about decisions. Instead, as Fama and Jensen (1983a; 1983b) argue, decisions are normally made by a process in which individuals are assigned decision management and decision control rights. Decision management rights are the rights to initiate and implement recommendations for resource allocations. Decision control rights are the rights to ratify initiatives and to monitor the implementation of resource commitments. Although we do not have space to pursue the issue here, the analysis portrayed in figure 1 can be applied to the assignment of both decision management and decision control rights. When, for example, the relevant specific knowledge for decision control (such as for the performance measurement, evaluation and bonus process for lower-level managers) lies at a lower level in the organization, some decentralization of control rights is optimal.

In sum, the CEO in the typical firm cannot generally use alienability to solve the firm's organizational problems. He cannot delegate the alienability of decision rights to decision agents without thereby converting them into independent firms. Organizational problems within the firm must therefore be solved by substitute means. This is accomplished by devising a set of rules of the game for the firm, which:

1. Partition out the decision-making rights to agents throughout the organization.
2. Create a control system that
 - a) provides measures of performance;
 - b) specifies the relationship between rewards and punishments and the measures of performance.

This is a simple but remarkably powerful list. While there are many factors that determine the behavior of any individual organization, our empirical observations indicate that knowledge of these rules of the game enables one to make good predictions about an organization's behavior and effectiveness. We now consider common organizational devices for implementing these organizational rules of the game.

6. The Technology for Partitioning Decision Rights in the Firm

The techniques available for structuring activities within the firm are a product of evolution, as is the system of rights for the economy as a whole. What has evolved is a complex body of managerial technology that is employed in partitioning decision rights and in controlling behavior within the firm. Scientific understanding of that technology is rudimentary, but we can describe some of its major components and their use.

6.1 Job Descriptions and Internal Common Law

Decision rights are allocated to agents within firms in various ways. Many are allocated directly to individuals or positions through job descriptions, and these descriptions are often the best source of written documentation of the assignment of decision rights in an organization. Examples include the right to make pricing, hiring, or promotion decisions, the rights to initiate recommendations for resource allocation, to ratify or monitor the initiatives of others, or to implement particular programs.¹⁵ The allocations of decision rights to individuals evolve over time as the organization and individuals change. These rights assignments occur both formally and informally, and are associated with committee memberships and project assignments as well as the organization's internal "regulatory" and "common law" traditions.

6.2 Budgeting

Physical and monetary budgets are common techniques for partitioning decision rights in firms. Agents can be given decision rights over the use of physical resources, such as capital equipment or building space. The rights allocated through such physical

¹⁵ Fama and Jensen Fama, Eugene F. and Michael C. Jensen. 1983b. "Separation of Ownership and Control." *Journal of Law and Economics*, V. 26, June 1983, pp. 301-325. Available from the Social Science Research Network eLibrary at: <http://papers.ssrn.com/paper=94034>. Reprinted in Michael C. Jensen, *Foundations of Organizational Strategy*, Cambridge: Harvard University Press, 1998. provide further discussion of the breakdown of the decision process into initiation, ratification, implementation, and monitoring rights.

budgets are less complete and therefore more constraining than are decision rights allocated by grant of monetary budgets. Dollar budget authorizations tend to be used when the intent is to grant some discretion in the choice of inputs. When rights are allocated through monetary budgets without side constraints, decision agents have the opportunity to sell or exchange, and therefore to substitute among assets. The organization is better off to the extent that managers use their specific knowledge to make substitutions that increase the efficiency of the organization. Such substitution is generally not possible with pure physical allocations of assets.

Budgets denominated in money terms are frequently constrained in ways that deny managers the opportunity to substitute. These line budgets (commonly used in government as well as industry) are broken down in great detail and the recipient is specifically forbidden from transferring funds from one category to another. Under such budgets the manager's ability to use his or her specific knowledge to increase efficiency is obviously restricted. Such restrictions can be optimal if the specific knowledge relevant to making these substitutions lies at a higher level in the organization.¹⁶

Budgets can be fixed or variable. They are fixed if the amount of authorized spending is independent of the level of activity or of performance. Under a variable performance budget, spending authority is a specified function of performance or activity levels, for example a fraction of revenues.¹⁷ While variable budget allocations have substantial incentive effects (because most agents prefer to have control over more resources), these incentive effects often seem to be ignored in practice.

Budgets are usually accompanied by side-constraints. Physical resource budgets, for example, are commonly restricted to use rights; the recipient is not allowed to sell the

¹⁶ This could occur when there are external effects on other parts of the organization that cannot be incorporated in the manager's performance measure, but can be incorporated in the performance measure at a higher level of the organization.

¹⁷ The "each tub on its own bottom" budgeting systems of some universities are examples of variable performance-related budgets.

resources and retain the proceeds. Diversion of dollars or physical resources to personal use (except that specified as compensation) is also prohibited. Manpower or head count limitations that are independent of the dollars available are another example of a separate constraint.

6.3 Rules, Regulations, or Fiat

The rules and regulations that accompany budgets are examples of regulatory constraints on behavior that exist because employees are self-interested. Such constraints imposed by fiat are the most primitive form of control technology. Like line budgets, they control by circumscribing in advance the opportunity set from which a decision-maker can choose. Unless the regulator is omniscient, such rules will eliminate superior, as well as inferior, courses of action because they are made without the specific knowledge that lies at the local level. In this sense, control by regulation tends to disregard the advantage of collocating knowledge and decision rights at the local level. Regulations are efficient control devices when the budget office has the relevant specific knowledge or where the prohibited behavior is virtually never consistent with the objectives of the CEO, for example theft or embezzlement.

7. The Control System

Because all individuals in a firm are self-interested, simply delegating decision rights to them and dictating the objective function each is to maximize is not sufficient to accomplish the objective. A control system that ties the individual's interest more closely to that of the organization is required. The control system specifies (a) the performance measurement and evaluation system for each subdivision of the firm and each decision agent, and (b) the reward and punishment system that relates individual's rewards to their performance. In a real sense, specification of the performance measurement and

evaluation system *is* specification of the objective function, but it is not generally viewed this way. Self-interest motivates individuals to discover and understand the performance measures and evaluation system on which their rewards and punishments depend. It does not take them long to discover when the rewarded objective is different from that which is stated.

7.1 Cost Centers and Profit Centers as Performance Measurement Systems

Cost centers and profit centers embody two widely used divisional performance measurement rules. Cost centers are subdivisions that are directed to minimize the total cost of providing a specified quantity of service. Manufacturing divisions are frequently organized as cost centers. Mathematically, and in the absence of information or agency problems, minimizing total cost for a given quantity of output is equivalent to maximizing output for a given total cost. In addition, both are consistent with maximizing the value of the firm if the correct output constraint is chosen. Given information and agency problems, however, the two formulations are not equivalent. Minimizing cost for given total output often seems to degrade into a system where managers are rewarded for minimizing average cost per unit of output.

Note that measuring performance by average cost per unit of output will virtually never be consistent with firm value maximization in the absence of a quantity constraint. The decision manager with such an objective will strive to achieve the output quantity that minimizes average cost even though it bears no relation to the value-maximizing quantity.

The tendency of firms to divisionalize along product lines appears to be influenced by control considerations. Product subdivisions are often operated as profit centers where the measure of performance is the difference between some measure of revenues and costs. Profit centers are more independent than cost centers; their budgets are more likely to be variable than those of cost centers, and this generally means fewer

knowledge demands on the CEO. The scale of operations of the center then varies directly with revenues, and does not require the same forecasting accuracy as a fixed dollar budget would require. The reduction in knowledge required to monitor the division is particularly evident where the products are sold in outside markets. Here the CEO can use competition in outside markets as a part of the control system. Competition and the ability of the division's customers to purchase from others provide the CEO with a performance measure for the product division (profits) that incorporates consumer assessment of quality, timeliness, and value. Internal transfer pricing systems in which buyers have the right to purchase from any source also allow the CEO to decentralize to the buyers an important part of the control system. Such decentralization is optimal to the extent that specific knowledge of product and service quality lies with the buyers and is costly to observe from higher in the hierarchy.

Neither profit centers nor cost centers are panaceas for the CEO's organizational problems. Cost centers, for example, tend to lead to problems of quantity and quality control. Measured on the cost of output for a fixed quantity, division managers are motivated to reduce cost by reducing quality. Preventing this requires quality to be cheaply observable from higher in the hierarchy. To the extent that quality is easily observable, cost centers will tend to be more desirable. Divisions where quantity is difficult or impossible to measure (such as computer services) are difficult to run as cost centers, because the manager can simply reduce the quantity of service to lower cost.

Strategic business planning is a widely used but ill-defined term. Strategic planning as implemented in its heyday at General Electric in the USA was a budget-target system in which performance is measured by how close the results are to a plan. In this form strategic business planning is the private organizational version of central planning in the market system. It poses problems because its success depends critically on setting correct plans or targets for each division and decision agent. This in turn imposes enormous knowledge requirements on the central staff that must do the planning. When

much of the required specific knowledge is located at lower levels in the organization and involves high cost to transfer to the central planning staff, strategic business planning will be inefficient. When such knowledge is important the result of centrally devised targets will be poor plans and strategic business planning will generate large organizational costs. This is consistent with the failure of large central planning staffs in many American corporations over the past two decades (see Hayes 1985; Hayes 1986; Kiechel 1982).

7.2 The Role of Budgets in Performance Measurement

Budgets are related to performance measurement in several ways. Budgets are sometimes used to delegate decision rights but they are also used as targets in the performance measurement system, for example as expenditure or revenue targets. In these cases the amount by which expenditures are less than the targets and by which revenues exceed targets are favorable performance measures. In the most general form (i.e. strategic planning), deviations on either side of the target are unfavorable measures of performance. When budgets are used to delegate decision rights, measures of violations of budgeted expenditures must be part of performance measurement if expenditure limits are to have meaning. Indeed, violations of any rules, regulations or fiat must affect performance measures and rewards and punishments if the constraints are to affect behavior.

7.3 Measuring, Rewarding, and Punishing Individual Performance

The performance measurements discussed previously are group measures. But the CEO's measurement problem is not simply one of measuring group performance. In the end, he or she must reward and punish individuals. For a sizable organization, the CEO cannot literally either review the performance of every individual or decide on his or her specific rewards. Inevitably, the CEO will delegate much of the responsibility for measuring and rewarding performance and will promulgate rules or policies that control

the decisions of those to whom authority is delegated. The CEO can, for example, tie individual rewards to individual performance by direct pay-for-performance systems (and here the sensitivity of the relation between pay and performance is a major decision variable), or by promotions that depend on performance. Individual rewards can be tied to group performance by creating bonus pools that are a function of group performance or by profit-sharing plans, employees' stock ownership plans, stock option plans, or phantom stock plans. The tendency for large organizations to avoid pay-for-performance incentive plans and to rely instead on promotion-based rewards is an interesting phenomenon that is as yet poorly understood by economists (see Baker, Jensen, and Murphy 1988).

8. Conclusions

This chapter analyzes the relations between knowledge, control, and organizational structure, both in the market system as a whole and in private organizations. The limited capacity of the human mind and the costs of producing and transferring knowledge mean that knowledge relevant to all decisions can never be located in a single individual or body of experts. Thus, if knowledge valuable to a particular decision is to be used in making that decision, there must be a system for assigning decision rights to individuals who have the knowledge and abilities or who can acquire or produce them at low cost. In addition, self-interest on the part of individual decision-makers means that a control system is required to motivate individuals to use their specific knowledge and decision rights properly.

The rights assignment and control problem are solved in a capitalist economy by a system of voluntary exchange founded on a system of alienable decision rights. Voluntary exchange of alienable decision rights tends to ensure that the agent with the relevant knowledge and abilities, who therefore values a decision right most highly, will acquire

it. This solves the rights assignment problem of collocating decision rights and specific knowledge.

In the absence of externalities, alienable decision rights also solve the control problem; they motivate individual decision agents to use their decision rights efficiently. Alienability does this by providing an effective system, the market price or capital value of the right, that measures the performance of any individual's use of a decision right. Alienability also means that the individual can capture the value of the right in exchange. Thus, alienability also provides an effective reward and punishment system that capitalizes the costs and benefits of an individual's actions on to his or her own shoulders.

Alienable rights cannot generally solve the control problem in firms because firms cannot generally assign alienability along with the decision rights without turning each individual agent into an independent firm. Indeed, the absence of alienability is one of the major distinctions between firms and markets.

Because of the limited computational capacity, storage, and input/output channels of the human mind, it is often desirable for groups of individuals to exercise decision rights jointly. Private organizations are widespread examples of such joint exercise of decision rights. In such organizations independent individuals coordinate their actions through contracts with the legal fiction that serves as the firm's nexus. The bundle of decision rights owned in the name of such an organization is vested nominally in its board of directors and CEO, and the rights are then partitioned out among decision agents in the organization. Those organizations that accomplish this partitioning in a fashion that maximizes their value will tend to win out in the competition for survival. The characteristic that distinguishes such organizations from markets is the fact that alienability of the rights is not delegated to individual decision agents in the organization.

The inalienability of decision rights within an organization means that the exchange mechanisms that partition decision rights to collocate them with the relevant

knowledge and skill are not operative. Furthermore, the inalienability of rights within an organization means that the control problems must be solved by alternative means. Organizations solve these problems by establishing internal rules of the game that provide:

1. A system for partitioning decision rights out to agents in the organization.
2. A control system that provides:
 - a) a performance measurement and evaluation system;
 - b) a reward and punishment system.

In general, because of their inability to simulate true capital value claims, these substitute rules of the game will not perform as effectively as alienable rights in a market system. Therefore, survival requires that the firm must realize offsetting benefits from the joint exercise of rights that are large enough to offset the disadvantages incurred by sacrificing alienability. Economies of scale and scope, information advantages, and specialization are potential sources of such benefits.

The creation of a science of organizations is still in its infancy. We believe that the structure outlined in this chapter provides a view of organization that yields important insights for both social scientists and managers. Knowledge of an organization's rules of the game and a surprisingly small amount about its technology or opportunity set enables one to make accurate predictions of its behavior. Such predictions are of great value both to managers and to social scientists.

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