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Selective Intervention and Internal Hybrids: Interpreting and Learning from the Rise and Decline of the Oticon Spaghetti Organization

By

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Abstract
Infusing hierarchies with elements of market control has become a much-used way of simultaneously increasing entrepreneurialism and motivation in firms. However, this paper argues that such "internal hybrids," particularly in their radical forms, are inherently hard to successfully design and implement, because of fundamental credibility problems related to managerial promises to not intervene in delegated decision-making — an incentive problem that is often referred to as the "problem of selective intervention." This theoretical theme is developed and illustrated, using the case of the world-leading Danish hearing aids producer, Oticon. In the beginning of the 1990s, Oticon became famous for its radical internal hybrid, the "spaghetti organization." Recent work has interpreted the spaghetti organization as a radical attempt to foster dynamic capabilities by imposing loose coupling on the organization, neglecting, however, that about a decade later, the spaghetti organization has given way to a more traditional matrix organization. This paper presents an organizational economics interpretation of organizational changes in Oticon, and argues that a strong liability of the spaghetti organization was the above incentive problem. Motivation in Oticon was strongly harmed by selective intervention on the part of top-management Changing the organizational structure was one means of repairing these motivational problems. Refutable implications are developed, both for the understanding of efficient design of internal hybrids, and for the more general issue of the distinction between firms and markets, as well as the choice between internal and external hybrids.

Key words
Internal hybrids, organizational change, delegation, managerial commitment problems, new organizational forms

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Biosketch
Nicolai J Foss is Professor of Economic Organization, and director of the Learning, Incentives, and Knowledge (*LINK*) Program, Copenhagen Business School. His research, which centers on firm strategy, the theory of the firm, and new organizational forms has been published in *Organization Science*, *Journal of Management Studies*, *Industrial and Corporate Change*, and other journals. His monograph *Economic Organization and Management in the Knowledge Economy,* will be published by Oxford University Press in 2002.

Introduction

In academic research, as well as in managerial practice, the search for the sources of competitive advantage has increasingly centered on organization-related factors (e.g. Barney 1986; Kogut and Zander 1992; Mosakowski 1998; Nahapiet and Ghoshal 1999). Thus, many firms, particularly those in "knowledge-intensive industries," are argued to radically change the way in which they structure their boundaries (e.g., Helper, MacDuffie and Sabel 2000) as well as their internal organization (e.g., Miles et al. 1997). They so so in an attempt to become the "information age organizations" (Mendelsson and Pillai 1999) that may foster those "dynamic capabilities" (Teece, Pisano and Shuen 1997) that are necessary for competing in the emerging knowledge economy (Halal and Taylor 1998). Fundamental advances in IT and measurement technologies have facilitated these changes (Zenger and Hesterly 1997), while equally fundamental developments in the organization and motives of capital markets as well as increasing internalization are claimed to have made them necessary (Halal and Taylor 1998).

These experiments with economic organization are often referred to by notions such as "new organizational forms" (Daft and Lewin 1993) and "the non-standard firm" (Helper, MacDuffie and Sabel 2000), "cellular forms" (Miles et al. 1997). From an organizational economics perspective, they may be classified as either external hybrids (Williamson 1996), that is, market exchanges infused with elements of hierarchical control, or internal hybrids (Zenger and Hesterly 1997; Zenger 2002), that is, hierarchical forms infused with elements of market control. Empirical knowledge about the incidence and performance effects of many of these organizational changes and forms is still rather scant. However, there is growing evidence related to the performance effects of the adoption of "high performance work practices" (summarized in Capelli and Neumark 2001), such as employee involvement in teams, quality circles and Total Quality Management initiatives, that is, practices that essentially belong to the category of internal hybrids (Jensen and Wruck 1994; Zenger 2002). There is also some evidence that average firm size has been falling worldwide during the last two decades as firms have engaged in downsizing, spin-off, outsourcing, and other exercises that result in either the adoption of external hybrids (Zenger and Hesterly 1997) or the use of arms-length market contracting. Cutting size, spinning off business units, etc. are often taken to be means to reduce coordination costs, improve incentives, and help to clarify the nature of the businesses the firm is in. Improvements in entrepreneurial capabilities as well as a better ability to produce, share and re-produce knowledge often result (Grant 1996; Day and Wendler 1998; Mosakowski 1998). However, note that these are exactly the reasons that are often given for the adoption of *internal* hybrids (e.g., Miles et al. 1997). Internal and external hybrids therefore seem to be substitutes with respect to achieving these aims.

However, in practice they would appear to be rather imperfect substitutes. Thus, adopting an internal hybrid form has the benefit of involving fewer lay-offs relative to adopting external hybrids (or engaging in arms-length contracting). Moreover, spin-offs, carve-outs and the like are often legally complex operations, whereas adopting an internal hybrid may be a matter of *fiat*, and will therefore be an attractive alternative in terms of ink costs expended on corporate lawyers.[1] Further, management may fear that leaving too many activities in the hands of other firms will hollow out the corporation (Teece et al. 1994), and related considerations of protecting valuable knowledge may also be relevant (Liebeskind 1996). Given all this, one may wonder why firms should ever make governance choices in favor of external hybrids. However, a main point of this paper is that internal hybrids are beset by distinct incentive costs

[1] On the related idea that there are fundamental legal differences between organizing transactions inside the firm versus organizing across markets, see Williamson (1996).

that external hybrids (and markets) avoid. These costs may tip the balance in favor of external hybrids when firms confront the relevant governance choice.

Research on new organizational forms is clearly an emerging field (Daft and Lewin 1993; Zenger and Hesterly 1997; Foss 2002). Thus, little is known about the costs of new organizational forms, whereas the benefits may have been more thoroughly examined.[2] This is particularly the case of those new organizational forms that belong to the category of internal hybrids.[3] The present paper mixes empirical observation with theoretical reasoning, mostly drawn from organizational economics, in order to gain a better understanding of the organizational design problems of internal hybrids. The theoretical emphasis is on the (neglected) costs of internal hybrids, and in particular on commitment problems that derive from delegation of decision rights in firms. The root of such problems is that in firms, (delegated) decision rights are not owned; they are always loaned from the holder(s) of ultimate decision-making rights, namely the top-management and/or the shareholders. This means that "markets" in hierarchies are always simulated ones; because of the differences in ownership, they can never be real markets. Given this, a fundamental problem for top-management/owners is to commit to real delegation and refrain from "*selective intervention*" (Williamson 1996), which will harm motivation, and, hence, the incentives to invest in the accumulation of firm or project-specific human capital.

These ideas are presented and discussed empirically with reference to organizational changes that took place in the Danish electronics (primarily hearing aids) producer, Oticon A/S, beginning in 1991. Oticon became world-famous for its radical delegation and empowerment experiment. The "spaghetti organization," as it came to be known, was explicitly conceived of by its designers as an attempt to bring elements of market control into Oticon to a very large extent (Kolind 1990; Lyregaard 1993), emulating the superior incentive properties and the dynamism of real markets. The spaghetti organization was explicitly seen as a hard-to-replicate source of knowledge-based competitive advantage (e.g., Gould 1994). In fact, a recent cottage industry has explicitly treated Oticon as an outstanding example of the sustained benefits that radical project-based organization may provide (e.g., Lovas and Ghoshal 2000; Ravasi and Verona 2000; Verona and Ravasi 1999). This literature fails to note, however, that the Oticon spaghetti organization in its initial radical form does not exist anymore — it has been superceded by more structured administrative systems. In the following, these organizational changes will be discussed from an organizational economics starting point, placing primary emphasis on problem of selective intervention.

The paper begins by developing an organizational economics interpretation of the spaghetti organization ("*The Spaghetti Organization: A Radical Internal Hybrid*"). The spaghetti organization appears to have been a particularly well-crafted internal hybrid; thus, it consisted of complementary elements that were implemented rapidly and simultaneously. Still, it gave way around 1996 to a more traditional matrix structure. It is not plausible to ascribe this organizational change to external contingencies, or to dramatic changes in strategic intent. This suggests that the spaghetti organization may have been beset by organizational costs that came to dominate the benefit aspects, necessitating a change of administrative systems ("*Spaghetti and Beyond*"). The Oticon spaghetti experiment carries lessons for the design of internal hybrids. In particular, it directs attention to the incentive problems of delegating rights within a

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[2] This is exemplified and discussed in Mahnke (2002).

[3] Zenger (2002) argues that disproprotionately more work exists on external hybrids than on internal hybrids, investigation of the latter being largely confined to work on the multi-divisional form. And Poppo (1995: 1845) points out that "[e]mpirical work that examines the differences between internal and external markets are rare… Theory in this area is also limited."

firm when top-management keeps ultimate decision rights. Refutable propositions for the design of internal hybrids are derived ("*Discussion: Implications for Internal Hybrids*").

In sum the contributions of this paper are to 1) present a novel and in some respects more encompassing account and interpretation of a well-known organizational change case, exemplifying the interpretive usefulness of organizational economics in the process; 2) analyze the (neglected) costs of internal hybrids in terms of the problem of selective intervention, thus contributing to understanding the efficient design of such hybrids; and 3) argue that the analysis under 2) is also helpful for understanding the broader issue of the fundamental differences between firms and markets, including the choice between internal and external hybrids.

A Note on Method

Basic Method

A basic problem of undertaking research into the Oticon spaghetti experiment is that relatively few of those who were employed when the experiment was implemented in 1991 are still with Oticon, and the rest turned out to be very hard to locate. Moreover, the experiment was implemented a decade ago, and recollections of it are likely to be strongly influenced by rationalizations and other biases. Therefore, I decided to mainly rely on archival sources, newspaper and magazine articles, and, in particular, the large number of very rich and thick descriptions of Oticon that have been produced by a number of mainly Danish academics, journalists and Oticon insiders throughout the 1990s (in particular, Lyregaard 1993; Poulsen 1993; Morsing 1995; Søndergaard and Døjbak 1997; Morsing and Eiberg 1998; Eskerod 1997, 1998; Jensen 1998).[4]

Thus, the approach followed with respect to understanding the nature of organizational changes in Oticon was more that of the historian than that of the qualitative researcher trying to understand recent phenomena or ongoing change. In other words, the emphasis was more on evaluating, comparing and integrating written statements relating to past key events (Van de Ven 1992) than on performing the same operations on oral accounts relating to contemporary or ongoing events. This is a defensible research strategy, because the aim was not so much to uncover hitherto unknown data relating to Oticon, as it was to develop a different interpretation of already existing and very rich data, and discuss implications of this interpretation.[5]

However, the prime mover behind the spaghetti experiment, then-CEO, Lars Kolind, was interviewed (June 2000) about a number of specific issues that were not adequately treated in the existing material. He also commented upon earlier drafts of this paper. Also, the present Oticon HRM officer was interviewed in a three hours, in-depth interview (June 2000). The interview mainly focused on the nature of recent changes in administrative systems in Oticon. A subsequent follow-up was conducted to clarify details. Interviews were semi-structured.

The Nature of the Inquiry

It is necessary to reiterate a methodological point already alluded to. The following represents an attempt to pursue *a specific kind of interpretation of a specific aspect* of the Oticon spaghetti organization — namely, an (primarily) organizational economics interpretation of the organizational costs that this experiment imposed on Oticon —, discuss why it was partially

[4] Actually, these accounts are so rich that even very recent studies of Oticon, based on a large number of interviews, such as Ravasi and Verona (2000) and Verona and Ravasi (1999) add rather little in terms of descriptive detail.

[5] For similar research methodologies, see the studies in Temin (1991).

abandoned, and use this as an input to developing propositions about internal hybrids. Organizational economics *per se* is hardly in an early stage of theory development anymore, given that early work goes back more than six decades (Coase 1937) and the last three decades have witnessed a flurry of work in this field. There is therefore little need for following a logic of grounded theory *per se* (Glaser and Strauss 1967; Eisenhardt 1989). Moreover, organizational economics is a particularly appropriate tool of interpretation in the present context, because only this body of theory *simultaneously* frame internal hybrids theoretically, cast the analysis in the relevant comparative-institutional terms (e.g., allows to compare external and internal hybrids), and frame the kind of incentive problems that will be central in the following analysis. For example, information processing or motivation theory cannot accomplish all this.

However, a main purpose of conducting analysis of single cases often is to be able to pose competing explanations for the same set of events (and perhaps to indicate how these explanations may be applied to other situations) (Yin 1989). Allison (1971) is the classic exemplar here. Moreover, basic considerations of internal validity dictate that alternative explanations be considered.[6] However, while I shall indeed make reference to and discuss other possible explanations of some of the relevant events (e.g., ideas from motivation theory and information processing theory), the main emphasis is on developing one specific interpretation. While an eclectic, multiple perspective approach may be superior in the abstract, more insight may arguably be provided in the concrete by pursuing, in a relatively narrow fashion, one specific interpretation and explore the limits of this interpretation.[7] With respect to those limits, a suggestion to be made later is that the Oticon case suggests that organizational economics may need to develop a richer understanding of motivation (cf. also Osterloh and Frey 2000) and cognition (Foss 2001).

The Spaghetti Organization: A Radical Internal Hybrid

This section analyzes the Oticon spaghetti experiment as an internal hybrid, that is, an attempt to infuse hierarchies with elements of market control, and develops an organizational economics interpretation of this particular internal hybrid. Recent work has utilized the Oticon Spaghetti experiment for the purpose of developing notions of strategy making as "guided evolution" (Lovas and Ghoshal 2000), as well as to discuss how the deliberate introduction of "structural ambiguity" through the choice of loosely coupled administrative systems (Ravasi and Verona 2000) may help to build "organizational capabilities for continuous innovation" (Verona and Ravasi 1999). This literature places all of the emphasis on the benefit side (mostly innovation performance) of the spaghetti experiment and fails to note that the spaghetti structure has been largely abandoned, and therefore also fails to account for the possible reasons for this organizational change. In contrast, this paper accounts for the costs of this particular internal hybrid and argues that this assists understanding the change from the spaghetti organization. In order to develop this alternative account, the present section puts forward an organizational economics interpretation of the spaghetti organization.

[6] Cf. Rumelt's (1996) discussion of the famous Honda case.

[7] In addition, an adequate multi-perspective account of the spaghetti experiment would require at least a book-length study.

Oticon: Background

Founded in 1904 and based mainly in Denmark, Oticon (now William Demant Holding A/S) is a world leader in the hearing aids industry.[8] For a number of years in the beginning to the mid-1990s, Oticon became a famous and admired instance of a radical change. According to the main organizational designer, CEO Lars Kolind (1990, 1994) the aim of the Oticon turnaround was to reach what he explicitly saw as a set of complementary goals (Mandag Morgen 1991: 17), namely increasing employee empowerment and responsibility, reducing product development cycles, increasing contact to customers, mobilizing dispersed and "hidden" existing knowledge, and building new knowledge — all contributing to the explicitly stated strategic intent of achieving (once again) world dominance on the market for hearing aids. Kolind and his new organizational design became favorites of the press, consultants, and academics alike.[9] In retrospect the reasons for this are the following ones.

First, the spaghetti organization embodied a large number of those non-traditional management practices that were gaining currency at the time. It was seen, and cleverly marketed, as the very embodiment of loose coupling, project- and team-based organization, and empowerment driven to their extremes.[10] Second, the turnaround in Oticon was remarkable for taking place very quickly and for involving changes in a large number of organizational elements. It demonstrated that organizational change did not have to take place in a piecemeal, incremental fashion to be effective. Third, the spaghetti organization quickly delivered (Peters 1992; Poulsen 1993). Thus, it demonstrated its innovative potential by re-vitalizing important, but "forgotten" development projects, that, when implemented in the production of new hearing aids, produced significant financial results, essentially saving the firm from a threatening bankruptcy, as well as by turning out a number of new strong products. The background to the implementation of the spaghetti organization was the loss of competitive advantage that Oticon increasingly realized during the 1980s.

From being the world leader at a 15 % market share in 1979 and with subsidiaries in West Germany, Great Britain, The Netherlands, the United States, Norway, Switzerland, France, and Italy, Oticon lost that position in less than a decade. By the end of 1987, market share had fallen to 7 %. The results were massive financial problems. One rather direct cause of a continued fall in market share in the last years of the 1980s was the introduction in 1987 by the US firm, Starkey of a new hearing aid that was considerably more sophisticated than any existing Oticon product. More generally, the technological paradigm (Dosi 1982) in the hearing aids industry was gradually changing through the 1980s from "behind-the-ear" hearing aids to "in-the-ear" hearing aids (Lotz 1998). The capabilities on which Oticon's success in the 1970s was founded were miniaturization capabilities. While these had been critical for competitive advantage in the "behind-the-ear" hearing aid paradigm, new technological capabilities in electronics, which were not under in-house control by Oticon, were becoming crucially important in the emerging in-the-ear paradigm. In particular, digital signaling processing was appearing as an increasingly important technology that would drastically transform productive processes in the industry. At the end of the 1980s, Oticon management had to realize that the competition had leapfrogged Oticon in terms of technological

[8] See Lotz (1998) for a careful analysis of the hearing aids industry, with particular emphasis on patterns of innovation. The history of Oticon prior to the introduction of the spaghetti organization is extensively covered in Poulsen (1993) and Morsing (1995), and, briefer, in Gould (1994) and Lomas and Ghoshal (2000: 877-878).

[9] The Oticon case is reported to be the best selling IMD case (Gould 1994) ever (Børsens Nyhedsmagasin 8. november 1999). Kolind's dramatic and symbol-laden way of implementing the spaghetti organization as well as the form itself are still being given extensive treatment in management textbooks (e.g., Boddy and Paton 1998).

[10] Other firms had adopted comparable organizational changes earlier than Oticon (Semler 1989), but Oticon stood out as an extreme case.

developments and in terms of reducing product development time. However, realizing this took time and was painful; acting on it was apparently even more painful.

There is considerable evidence (e.g., Poulsen 1993; Gould 1994; Morsing 1995; Foss and Hertz 2000) that Oticon was locked into a competence trap that was reinforced by strong groupthink (Janis 1983) characterizing both the management team and the employees. A symptom of this was that around 1980, the dominant opinion among managers and development personnel at Oticon was that the in-the-ear hearing aid would turn out to be a commercial fiasco. Besides, in-the-ear hearing aids were not perceived to be Oticon turf, in terms of both technological and marketing capabilities (Poulsen 1993). The self-image of the company clearly was one of being a traditional industrial company with its strongest technological capabilities in miniaturization and specialized in mass-producing behind-the-ear hearing aids, developing the underlying technology incrementally. The dominant ethos in the company was one defined by engineering people, not by marketing people; technology, not customers, was central. Administrative systems were organized traditionally with functional departments, the managers of which together constituted the senior executive group. When problems began to accumulate, various attempts were made to change the situation; however, they were either too insignificant and incremental or did not survive political jockeying inside Oticon. The same executive team had been in control of Oticon for just about thirty years. As a consequence of the mounting difficulties, Oticon's Foundation Board decided that new management was needed to handle the crisis. In 1988 Lars Kolind assumed his position as new CEO. Holding degrees in mathematics and management, an important part of his background was the international scout movement.[11]

Upon assuming his new job, Kolind basically concentrated all decision-making in his own hands; for example, virtually all expenses, even trivial ones, had to be approved of by him. He used this centralization of power to cut costs dramatically, for example, through extensive layoffs. However, in a paradoxical way, he combined almost dictatorial concentration of power with a great openness and with great communicative skills. For example, the rather drastic cost-cutting measures were very openly communicated, and their necessity carefully explained. About a year after assuming his position, Kolind realized that the cost-cutting measures, which had almost immediately improved the company's financial situation, had been fully exploited. Although these measures were arguably necessary ones, and did yield immediate and substantial financial results, they could not secure longer-run competitive advantage. In particular, they were inadequate to cope with the decisive changes that were underway with respect to products and processes in the industry and which were prompted by changing preferences on the part of customers towards more advanced and aesthetically pleasing designs as well as changing technology (i.e., the application of digital signal processing technologies). More radical measures were needed with respect to the strategic orientation of the firm, the administrative systems that could back this up, and the technology that the firm sourced, leveraged and developed.

Trying Spaghetti

The new, radical measures were first sketched in a 6 pages memo, presented to Oticon employees on April 18, 1990 under the heading, "Think the Unthinkable" (Kolind 1990). The objective of the plan sketched in the memo was to create an increase in profitability by 30%

[11] It is perhaps significant that Kolind had been particularly impressed by the ability of that movement to organize and coordinate large-scale gatherings (e.g., international jamborees) in an efficient, flexible and rapid manner, not as a result of detailed planning and management, but rather as an emergent result of a strong and shared set of values that served to orchestrate and coordinate decentralized initiatives. One may speculate that Kolind's reorganization of Oticon may be interpreted as an attempt to mimic the coordination capabilities of the scout movement.

over the next three years. This required a change of corporate vision and mission: The company should be defined broadly as a first-class service firm with products developed and fitted individually for customers, rather than narrowly, as a manufacturing company producing traditional high-quality standard behind-the-ear hearing aids. In other words, customer orientation should be key. These strategic changes would be supported by a new organizational form, representing a complete overhaul of the Oticon organization. Kolind baptized the new organization the "spaghetti organization," in order to emphasize the point that the new organization should be able to change rapidly, yet still possess coherence. Furthermore, it should be explicitly "knowledge-based," that is, consisting of "… knowledge centres … connected by a multitude of links in a non-hierarchical structure" (Kolind 1994: 28-9). Making the organization "anthropocentric," that is, designing jobs so that these would "… fit the individual person's capabilities and needs" (ibid.: 31), was argued to provide an important part of the motivational underpinning of this knowledge network. Furthermore, basing the network on "free market forces" (Lyregaard 1993) would make it capable of actually combining and re-combining skills in a flexible manner, where skills and other resources would move to those (new) uses where they were most highly valued. Clearly, the aim was to construct a spontaneously working internal network that would work with only minimal intervention on the part of Kolind and other managers, that is, "essentially, a free market at work" (LaBarre 1996).

The new administrative structure was primarily implemented in the Oticon headquarters (i.e., administration, research and development and marketing), although various aspects of the spaghetti-organization were also implemented in the production plant in Thisted (DK) and in various sales offices outside of Denmark.[12] In order to symbolically underscore the fundamental transformation of Oticon, the company headquarters moved, at 8 am on 8. August 1991, to a completely new location in Hellerup just north of Copenhagen. All of the furniture of the old headquarters was sold. In the new building, all desks were placed in huge, open office spaces. Employees were not supposed to be permanently located at particular desks, but should move flexibly from desk to desk, bringing only a trolley with necessary documents with them, depending on which projects they working on. Inside a huge glass tube, placed in the lobby of the company headquarters, a steady stream of maculated paper fell down, emphasizing the ambition to run the headquarters in a virtually paper-less, electronic way. Finally, the number of formal titles was drastically reduced, resulting in a two-layered structure with Kolind and ten managers representing the managerial team and the remaining part of the organization being organized into projects (Kolind 1994).

Thus, the new organization represented a breakdown of the old functional department-based organization into an almost completely flat, project-based organization. Departments gave way to "competence centers" (e.g., in mechanical engineering, audiology, etc.) that broke with the boundaries imposed by the old departments. Another notable break with the traditional division of labor in organizations was the "multi-job" concept which had two key features: First, there were no restrictions on the number of projects that employees could voluntarily join, and, second, employees were actively encouraged (and in the beginning actually required) to develop and include skills outside of their existing skill portfolio.[13] The underlying notion was that this would increase the likelihood that project teams would consist of the right mix of

[12] For details on the planning and implementation of the turnaround, see Gould (1994) and Morsing (1995). The reorganization plan was initially very strongly resisted by Oticon management.

[13] As Kolind explained to Gould (1994: 465): "We quickly agreed that all employees would have a portfolio of jobs, and we were tough; we said at least three jobs, with the main one in their profession or using their greatest competence, and the other two in outside areas. This concept really expands an organization's resources: engineers are doing marketing, marketing people manage development projects, and financial people help with product development."

complementary skills and knowledge, because of the increase in the scope of the knowledge controlled by each team member. Moreover, the multi-job conceot would ease knowledge transfer, because of the increase in the overlap of knowledge domains that it would produce, as employees familiarized themselves with other employees' specialized fields.

These changes were accompanied by an extensive delegation of the rights to make decisions on resource allocation. Notably, employees would basically themselves decide on which projects they would join rather than being assigned to tasks and projects from the above. All projects were to be announced on an electronic bulletin board, and employees who would like to join a project could sign in electronically. Project managers were free to manage projects, as they preferred, "management" being understood more in terms of playing the role of facilitator and coordinator than that of a directing principal. Wage negotiations were decentralized, so that the project managers — that is, those managers who were supposed to possess the most intimate knowledge of employee skills and efforts — received the right to negotiate salaries. Finally, although project teams were self-organizing and, in theory at least, basically left to mind their own business once their projects were ratified, they were still to meet with a "Project and Product Committee" once every three months for ongoing project evaluation.

To meet the two, potentially conflicting, aims of making it possible for project teams to rapidly and flexibly combine the right skills, *and* achieving some overall coherence among what would under the new organization be rather independently taken decisions, the new organization was founded on four fundamental ideas (Kolind 1994). First, as already noted, the traditional functional department structure was eliminated in favor of a project organization that went considerably beyond the traditional matrix structure. The philosophy behind this was not only to make it possible to flexibly combine complementary skills, but also to eliminate department-specific group-think, a problem that had plagued the old organization. While this, of course, served to increase flexibility, the remaining measures were arguably more directed towards achieving organizational coherence. Thus, secondly, new information technology systems were designed and implemented to make it possible to coordinate plans and actions in this decentralized organization. The aim was to create a firm-wide information flow, increasing employee understanding of company activities, and making it easier for project teams to form. Moreover, the information-dissemination policy also helped to break knowledge-monopolies left over from the old organization, although this does not appear to have been an explicit aim.[14] Everybody was supposed to have full access to the same information. Third, in a move called the "breakdown of the palace," the traditional office was abandoned. No one would have private offices or fixed desks; instead, all employees were located in one large office. At each desk was a workstation that included a cellular phone and a computer with access to all information on the Oticon network. The employees' physical locations changed according to the projects they worked on. Coffee bars were strategically located around the building to stimulate and encourage discussion, and a central spiral staircase that was wide enough to permit chance encounters and dialogue, replaced the elevators in the building. Finally, Kolind worked hard to increase intrinsic motivation by developing a corporate value base that strongly stressed responsibility, personal development, and freedom.[15]

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[14] One of the means towards the end of creating a truly knowledge-based company was Kolind's dictate of a "no paper" policy. In principle, every document had to be scanned into a computer, filed there, and then being maculated, the goal being an elimination of 95% of all paper in the organization.

[15] Although the variance on the distribution of salaries was increased as a result of the new reward schemes that characterized the spaghetti organization, average salaries do not appear to have changed. In fact, average Oticon salaries have been, and still are, comparatively low, particularly for software developers. Intrinsic motivation is a key aspect of Oticon motivation policies, and is seen as complementary to (rather than substituting for) extrinsic motivation. On intrinsic and extrinsic motivation, and its implications for organization, see Frey (1997) and Osterloh and Frey (2000).

These fundamental organizing principles were backed up by other measures. For example, in order to increase motivation Kolind introduced an employee stock program, in which shop floor employees were invited to invest up to 6.000 Dkr (roughly 800 USD) and managers could invest up to 50.000 Dkr (roughly 7.500 USD). Although these investments may seem relatively small, in Kolind's view they were sufficiently large to significantly matter for the financial affairs of individual employees; therefore, they would have beneficial incentive effects. More than half of the employees made these investments. Kolind invested 25 millions DKK (roughly 4 million USD) of his own funds in Oticon (Kolind interviewed in Børsens Nyhedsmagasin 1991).

The implementation of the spaghetti organization had quick and strong performance effects (Peters 1992; Poulsen 1993). Improved performance in terms of the use and production of knowledge was almost immediate, resulting in a string of remarkable innovations during the 1990s (Verona and Ravasi 1999; Ravasi and Verona 2000). Improved growth and financial performance followed somewhat later (see Table 1).[16]

TABLE 1

Oticon Financial and Technological Performance

	1988	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Net rev. (mio. Dkr)	423,8	449,6	455,4	476,5	538,8	661,3	750,3	940,2	1.087,3	1.413,4	1.613,1	1.884,3
Profit mg. (%)	1,6	8	3,7	1,8	5,8	13,1	17,9	12,4	12,8	13,8	15,4	17,9
RoE (%)	-8,5	11,6	9,4	-1,5	7,2	37	37,9	25,9	24,3	30,6	35,7	53,8
Product innovation				*Multi-Focus*	*Personic*	*Oticon 4 Kids*	*Noah*	*Micro-Focus*	*Digi-Focus*	*Spin-off innovations of Digifocus*	*Spin-off innovations of Digifocus*	*Ergo Swift Digi-Focus II*

Sources: Ravasi and Verona (2000), Annual Reports of Oticon A/S and William Demant Holding A/S.

With respect to improvements in the use of knowledge, the spaghetti organization allowed significant, shelved projects to be revitalized. Thus, it was realized that Oticon actually already had embarked upon development projects for in-the-ear hearing aids as far back as 1979.[17] These projects were essential inputs into many of the product innovations that Oticon launched during the 1990s. Another effect of the spaghetti organization was that product development time was halved. In 1993, half of Oticon's sales stemmed from products introduced in 1993, 1992 and 1991. A total of 15 new products had been introduced since the implementation of the new organization, whereas none had been introduced in the last years of the earlier

[16] Oticon's growth in the 1990s largely represented growth of market share, since the market for hearing aids was rather flat in that decade.

[17] As one employee who had worked in product development in the old organization said: "We had created a good structure with five people – each with their own area of responsibility I was responsible for the ear plug. But at that time the organization simply wasn't functioning. No-one really believed in it and there was no support" (Foss and Hertz 2000). Some of these projects seem to have continued as skunkworks.

organization. The two major innovations that are usually directly ascribed to the increase in innovative capability that the spaghetti organization fostered are MultiFocus from 1991 and DigiFocus from 1996.[18] Both represented strong technological discontinuities, the former by being the first hearing aid that adjusted tonal balance and amplification in a fully automatic way, the latter by being the first fully digital hearing aid ever. The technological trajectories defined by these two major product innovations yielded a number of incremental products through the 1990s.

A recurring theme in academic treatments of the Oticon spaghetti organization (Morsing 1995, 1998; Verona and Ravasi 1999; Ravasi and Verona 2000) is that an important reason for the observed increase in Oticon's innovativeness, and, in turn, improved financial performance, was ultimately rooted in imposing a condition of loose coupling (Weick 1976) on that organization. Thus, Ravasi and Verona (2000) argue that loose coupling was achieved by introducing "structural ambiguity," that is, deliberately engineering freedom and ambiguity in the role system and in the authority structure (cf. also Vancil and Buddrus 1979) by means of introducing a radical project-organization. In turn, this condition facilitated the efficient and speedy integration and production of knowledge, resulting in the observed improvement of Oticon innovativeness in the 1990s. This interpretation fails, however, to explain why the spaghetti organization was gradually abandoned from about 1996 in favor of a more traditional matrix organization, and it also fails to account for the possible costs of the spaghetti organization. The following section presents an complementary interpretation, based mainly on organizational economics, that casts a different light over the organizational changes in Oticon.

The Spaghetti Organization as an Internal Hybrid

A striking aspect of the spaghetti organization is the prevalence of the market metaphor in the commentaries on the new form by both insiders and outsiders (Peters 1992; Lyregaard 1993; LaBarre 1996).[19] The spaghetti organization may indeed be interpreted as a radical internal hybrid, because the organization was strongly infused with elements characteristic of market exchange (see Table 2).

[18] Today, MultiFocus is described by Oticon insiders as the product that saved the company from the bankruptcy that would have been threatening in the somewhat longer run. The device exceeded sales expectations by more than 100 % (Gould 1994).

[19] Much recent management literature has suggested that firms in volatile elements need to emulate markets to the largest possible extent (e.g., Halal, Geranmayeh, and Pourdehnad 1993; Cowen and Parker 1997).

TABLE 2

Market Organization and the Spaghetti Organization Simulation

Market Organization	**The Spaghetti Organization**
Allocation by means of pricing.	Transfer prices not used.
Legal independence between parties (contract law).	Employment contracts (employment law).
Freedom of contract	Approximated by delegating rights to suggest and join projects.
High-powered incentives.	Variable pay; initially based on objective input and output measures.
Dispersed residual claimancy.	Employee stock schemes.
Dispersed decision rights.	Very widespread delegation of rights.
Dispersed ultimate decision rights (dispersed formal authority).	Concentrated ultimate decision rights (concentrated formal authority).
Resource allocation decentralized, and strongly influenced by local entrepreneurship.	Local entrepreneurship very strongly encouraged. Projects approval easily obtained.
Strong autonomous adaptation properties.	Secured through extensive delegation of decision rights.

Thus, although Oticon did not include an attempt to directly price services in the spaghetti organization and Oticon employees did not become legally independent suppliers of labor services, in many other relevant dimensions Oticon was like market organization than a traditional hierarchical firm. Employees (particularly project leaders) were given many and quite far-reaching decision-making rights. Development projects could be initiated by, in principle, any employee just like entrepreneurs in a market setting, although these projects had to pass, not the market test, but the test of receiving approval from the Project and Product Committee. Project groups were self-organizing in much the same way that, for example, partnerships are self-organizing. The setting of salaries was decentralized to project leaders, acting like independent entrepreneurs (Business Intelligence 1993). Incentives became more high-powered, as more performance pay was used and as the employee stock ownership program was introduced, thus mimicking the superior incentive properties of the market. Most hierarchical levels were eliminated and formal titles done away with, etc., mimicking the non-hierarchical nature of the market. Thus, market organization was emulated in a number of dimensions.

As a general matter, the attraction of infusing hierarchical forms with elements of market control is that some of the basic advantages of the hierarchy, such as the superior ability to perform coordinated adaptation to disturbances (Williamson 1996), build specialized social capital (Kogut and Zander 1992; Nahapiet and Ghoshal 1999), and share knowledge (Osterloh and Frey 2000), can be combined with the superior incentive properties of the market (Williamson 1996) and its superior flexibility with respect to autonomous adaptation (Hayek 1945; Williamson 1996). Kolind's explicit aim was to build an administrative system that was superior to any other conceivable system with respect to discovering, building and combining knowledge. His reasoning was that the superior abilities of an organization to build knowledge-sharing environments and foster a cooperative spirit would complement the flexibility and creativity that market-like project organization would foster (Kolind 1994).

The Structure of Rights in the Spaghetti Organization

Organizational economics suggests that understanding the costs and benefits of any organizational form begins from understanding the structure of decision and income rights in the relevant form (Fama and Jensen 1983; Jensen and Meckling 1992; Hart 1995; Williamson 1996; Barzel 1997; Baker et al. 1999, 2000; Holmström 1999). This is because the structure of rights determines incentives and therefore crucially influences decisions and the outcomes of interacting decisions. Both the benefits and the costs of the spaghetti organization can be comprehended through this lens. The remaining part of this section concentrates on the benefit side.

Centralized decision-making systems, particularly large ones, have well-known difficulties with respect to mobilizing and efficiently utilizing important "sticky" knowledge (von Hippel 1994), such as the precise characteristics of specific processes, employees, machines, or customer preferences (Jensen and Wruck 1994). They therefore often also have difficulties combining such knowledge into new products and processes (Laursen and Foss 2002). As Hayek (1945) explained, the main problem is that much of this knowledge is transitory, fleeting and/or tacit, and therefore costly to articulate and transfer to a (corporate) center.[20] Markets have advantages relative to pure hierarchies with respect to utilizing such knowledge, particularly when it is not required to utilize the relevant knowledge in conjunction with other knowledge sets (where a hierarchy may have comparative advantages).[21] Thus, markets economize on the costs of transferring knowledge by allocating decision rights to those who possess the relevant knowledge, rather than the other way around (Hayek 1945; Jensen and Meckling 1992). Rights will move towards the agents who put the highest valuation on the relevant rights. Since these agents are residual claimants, effective use will be made of the rights they acquire. From this perspective, internal hybrids are fundamentally attempts to mimic, inside the hierarchy, the decentralization of decision and income rights that characterizes the market in an attempt to improve the efficiency of processes of discovery, creating, and use of knowledge.

The implementation of the spaghetti organization may be understood through this lens, that is, as a hybrid organizational design that aimed at improving the co-location of knowledge and rights through extensive delegation, and backed this delegation of decision rights up by giving employees more income rights.[22] By giving project teams extensive decision rights, requiring that ideas for projects be made public, and ensuring that project teams possessed the necessary complementary skills for a particular marketing, research or development task, the spaghetti organization stimulated a co-location of decision rights with knowledge. More high-powered incentives were implemented in an attempt to make sure that efficient use was made of those rights. This improved the use of existing knowledge (cf. the revitalization of project that had been shelved in the old organization) and eased the combination of knowledge in the production of new knowledge.

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[20] Group think exacerbate these problems, that is, make it even more costly to transfer knowledge to those who are supposed to make decisions based on this knowledge (Janis 1983).

[21] For a full comparative analysis, see Nickerson and Zenger (2001).

[22] The possibility that external hybrids or market contracting may be alternatives to internal hybrids never seems to have been considered in Oticon. Thus, that incentives may be strengthened by relying on the *real* market (rather than the simulated internal one) through spinning off functions and departments (Aron 1991) does not appear to have been seen as a serious alternative to internal disaggregation. The production of some "discount" (i.e., inexpensive, low-tech) hearing aids were in fact spun-off (with Oticon maintaining financial control over the spin-off), but this was clearly an exception to the rule, and the company remains strongly vertically integrated to this day.

However, Oticon's use of "free market forces" (Lyregaard 1993) was fundamentally a simulation, because the allocation of decision rights in that organization (as in any firm) was in some crucial respects different from the allocation that characterizes market organization This is manifest in two (related) ways, one having to do with how decision rights connected to projects were allocated and one having to with the exercise of ultimate authority by Oticon management. Consider these in turn.

In contrast to markets, firms cannot concentrate to the same extent income rights (i.e., residual claimancy) and decision rights in the same hands. An agency problem results from this separation. Many of the elements of the spaghetti organization may be seen as responses to this fundamental agency problem, most obviously the increased use of high-powered incentives. Consider also the rights to allocate resources to a particular project. These may be broken down into groups of decision-making rights, namely rights to 1) initiate projects, 2) ratify projects, 3) implement projects, and 4) monitor and evaluate projects (cf. Fama and Jensen 1983). Decision-making processes in project-based firms rest on the allocation and exercise of such rights. Thus, how these rights are allocated and exercised has profound implications for the efficiency with which decision-making processes take place and for the outcomes of these processes. For reasons of efficiency, firms usually do not concentrate these rights in the same hands; rather initiation and implementation rights may be controlled by one person (or team) while ratification and monitoring rights are controlled by other persons, usually hierarchical superiors.[23]

This allocation of decision rights was characteristic of the spaghetti organization. Whereas anybody could initiate a project, in the sense of sketching, making preliminary plans, doing the required calculations, making contacts, etc., projects had to be evaluated by the Products and Projects Committee that was staffed by Kolind, the development manager, the marketing manager, and the support manager. The Committee either rejected or approved of the project. The only formal criteria for getting a project accepted were that the relevant project relate to the business areas of Oticon and yield a positive return over a three years period and with a discount rate of 30 %. Apparently, the Products and Projects Committee did not control the use of corporate resources by means of controlling the budgets of individual projects at the project ratification stage. In particular, the use of human resources, the main category of inputs, across projects was not monitored. The rights to implement a project following approval included the right to hire employees in open competition with other projects (Eskerod 1998). Operating projects would meet every third month with the Products and Projects Committee, or a representative thereof, for project evaluation (i.e., monitoring).

The fact that the Project and Products Committee could veto a project *ex ante* suggests that it was the real holder of power in Oticon. Frequent intervention on the part of the Committee *ex post* confirms this (Eskerod 1998). Thus, it became increasingly clear that the Committee could at any time halt or close down projects or change their employee composition. This kind of intervention took place very frequently. The Project and Products Committee's exercise of their ultimate decision rights may be seen as simply reflecting the separation discussed above between decision management (i.e., initiation, implementation and daily project management) and decision control (i.e., project evaluation and monitoring). Thus, it could reflect attempts to curb moral hazard in project teams. However, this does not seem to have been the case (Eskerod 1997), and, besides, the increased use of high-powered incentives and more widespread employee ownership were designed to remedy problems of moral hazard.

[23] Exceptions may occur when giving subordinates more extensive rights (e.g., a package of initiation, ratification and implementation rights) strengthens employee incentives (see Aghion and Tirole 1997; Baker, Gibbons and Murphy 1999; and Foss and Foss 2002 for analyses of this).

Moreover, note that the theoretical separation between decision management and decision control does not logically imply the kind of *ex post* intervention that the Committee engaged in. For example, one may imagine that the relevant rights be allocated so precisely and with so much foresight that there are incentives to intervene *ex post*, as in the case of a very detailed contract between two legally independent firms. Everything may proceed smoothly. However, the way in which the Project and Products Committee exercised their ultimate decision rights is more akin to renegotiating a contract, perhaps even to performing a "hold-up" (Williamson 1996). Thus, implicit contracts between the Committee and projects were renegotiated as the efforts of project teams became, in the eyes of the Committee, superfluous (e.g., because of new technological developments), moved in unforeseen directions, or simply turned out to have been founded on ill-conceived ideas. In turn, this exercise of ultimate control rights caused unforeseen incentive problems, as will be discussed later.

Organizational Complementarities

A interesting aspect of the spaghetti organization is that an explicit logic of complementarity was present in the reasoning of its main designer. Observed Kolind: "It was not strictly necessary to do all these things at the same time, but we opined that with a simultaneous implementation of the changes [in organizational elements] … they would reinforce each other" (in Mandag Morgen 1993: 17; my translation). Consistent with Kolind's reasoning, complementarities between elements of an organizational form exist when increasing the level of one element increases the marginal return from increasing the level of all remaining elements (Milgrom and Roberts 1990; Hemmer 1995; Zenger 2002). Loosely, when such complementarities obtain, the dynamics of organizational elements imply that they move together. Changing one element in an isolated way is likely to set in motion (possibly unforeseen) processes of change in other elements, because the system will grope towards an equilibrium where all elements have changed (Zenger 2002). The process of groping may be associated with serious inefficiencies. Therefore, organizational change initiatives should "get the complementarities right."

Apparently, the spaghetti organization got the complementarities exactly right. On a fundamental level, the change in the rights structure of Oticon was designed in such a way that decision rights changed in a way that was complementary to the change in income rights; specifically, widespread delegation of decision rights was accompanied by making incentives more high-powered through performance pay and employee ownership. In turn, the change in incentives was backed up by complementary changes in measurement systems. Thus, a performance evaluation system was implemented in which employee performance was measured in 3-8 different dimensions (depending on the type of employee) and pay was made dependent on these measures (Poulsen 1993). Other initiatives may also seen to be complementary to the increase in the delegation of rights in the spaghetti organization. For example, the open office landscape and the strategically placed coffee bars and staircases were complementary to rights delegation in terms of utilizing and building knowledge, because they helped foster the knowledge exchange that gave rise to new ideas for project teams. With respect to the moral hazard problem introduced by delegating rights, the new much more information-rich environment was also complementary to this delegation, because it helped to build reputational effects (cf. Eskerod 1997, 1998) and eased mutual monitoring among employees, keeping agency problems at bay. Kolind's (1990) strong emphasis on building culture in the new organization may be seen in a similar light: Influencing preferences through the building of shared values became a more valuable activity in the spaghetti organization, because its strong delegation of rights introduced both problems of coordinating numerous rather independently made decisions (Miller 1992) and agency problems, problems that are reduced as preferences become more homogeneous.

The complementary nature of these organizational elements also explains the speed and toughness with which Kolind managed the transition from the old organization.[24] This is because it is usually inefficient to change systems of complementary elements in an incremental manner; transition between such systems should normally be accomplished in a "big bang" manner (cf. Dewatripont and Roland 1995). In fact, Kolind favored a big bang approach to organizational change, because he reasoned that this would more effectively break old commitments, make life hard for those who had held power positions in the old organization, and create new organizational expectations than a more incremental approach (Poulsen 1993; Morsing 1995).

Spaghetti and Beyond

A Puzzle

In his account of the spaghetti organization, Gould (1994: 470) noted that "… Lars Kolind's vision was the right one for Oticon. In any case, one thing was certain: there could be no turning back." Kolind's vision may have the right one for Oticon at the particular time in which it was implemented. However, beginning in 1996, a considerable "turning back" actually begun: Oticon embarked upon a partial abandonment of the spaghetti organization and gradually adopted a more traditional matrix structure. This organizational change is puzzling because the account of the spaghetti organization in the previous section suggests that Kolind got it right with respect to organizational design, at least from an organizational economics point of view. The puzzle is aggravated by the fact that it does not appear plausible to ascribe this organizational change to outside contingencies, such as new technological discontinuities, changes in regulations and in the competition, or to dramatic changes in strategic intent; no such changes happened. The argument in the following is that just as organizational economics provides an interpretation of hitherto neglected aspects of the spaghetti organization (i.e., the allocation of rights, organizational complementarities), this body of theory is also helpful for developing a plausible interpretation of the retreat from the spaghetti organization. In contrast to the preceding section, the present section focuses more on the costs of the spaghetti organization.

Retreating From Spaghetti

The retreat from the radical spaghetti organization that Kolind had implemented in 1991 began long before he resigned as CEO in 1998. In 1996, Oticon headquarters was divided into three "business teams," called "Team Advanced," "Team Technology," and "Team High Volume." These serve as a new administrative layer relative to the original spaghetti organization, and function as overall administrative units around projects. Each business team is managed by two team leaders, namely a technician and a person with marketing or human resource skills. These teams refer directly to Niels Jakobsen, the new CEO. In addition to the business teams, a "Competence Center" has been set up. This unit is in charge of all projects and their financing and of an operational group that controls administration, IT, logistics, sales and exports. The Competence Center is led by the chief HRM manager, and comprises nine managers. It is one of the successors to the now abandoned Project and Products Committee. However, its style of managing projects is very different. In particular, the utmost care is taken to avoid the kind of intervention in already approved of projects that characterized the Products and Projects Committee. The team leaders and the head of the Competence Center comprise, together with the CEO, the "Development Group," which may be seen as a second successor to the Products

[24] The change was assisted by the symbolic acts undertaken by Kolind, which helped to signal his commitment to the change. For example, Kolind's 26 million Dkr investment was such an act of commitment (Hermalin 1998).

and Projects Committee of the original spaghetti organization. The Development Group, which essentially is the senior executive group, is in charge of overall strategy making.

Most of the initiative with respect to starting new projects is taken by the Development Group, although the need for employees to provide inputs in the form of new project ideas is still stressed. Many of the decision-making rights earlier held by project leaders have now been concentrated in the hands of the Competence Center, or the managers of the business teams. For example, project leaders' rights to negotiate salaries have been constrained. Project leaders are appointed by the Competence Center, so that the right to be a project leader is not something that one grabs, as under the spaghetti organization. Although the multi-job concept is still present, the extreme forms which it took under the spaghetti organization are not. The electronic job *bourse* where anybody in the old spaghetti organization could advertise projects and seek co-workers has been abandoned.

To sum up, recent changes of administrative systems at Oticon, beginning around 1996, and after the major innovations of MultiFocus and DigiFocus, have amounted to a break with the bottom-up approach that characterized the original spaghetti structure. Much of the initiative with respect to development efforts now comes from the Competence Center. More hierarchical layers have been introduced, the number of managers is considerably larger, and many of the decision rights that were decentralized under the spaghetti organization have now been concentrated in the Development Group and the Competence Center. Thus, although Oticon is still characterized by considerable decentralization and delegation of rights, many of the crucial elements of the spaghetti organization have been left. What happened?

Searching for Possible Causes of the Partial Failure of the Spaghetti Experiment

Although the spaghetti organization at first inspection seems to have been a particularly well crafted internal hybrid, reflection suggests that it may still have been beset by problems, stemming from design mistakes, which caused its partial abandonment about five years later. In the following, a number of such possible problems are discussed. It is convenient to group these into problems of allocating competence, eliminating tournaments, sacrificing specialization advantages, coordination, knowledge sharing, and influence activities.[25]

Problems of Allocating Competence. Demsetz (1988) and Casson (1994) argue that firms are hierarchical because this is an efficient way of utilizing different, yet complementary knowledge. Direction may be less costly than instruction or joint decision-making. When this is the case, those with more decisive knowledge should direct those with less decisive knowledge. Thus, the hierarchy is an efficient method of allocating competence. The spaghetti organization eliminated most hierarchical levels. Thus, the extent to which hierarchy could be used as a sorting mechanism for allocating skills was much smaller in the spaghetti organization. For example, the delegation of project initiation rights implied that competent and less competent people had the same rights to initiate projects and get a hearing before the Projects and Products Committee. Knowledge-based inefficiencies may have resulted that may have been avoided in a traditional hierarchy.

However, this explanation implicitly asserts that managers are, on average, more knowledgeable with respect to what actions subordinate employees should optimally take than these employees are themselves (Foss 2002). If this is not the case, bottom up selection

[25] A further cause of the retreat from the spaghetti has to do with the fact Lars Kolind became increasingly involved in managing acquired subsidiary companies, and had to increasingly delegate control over the headquarters to other members of the management team. Much of the ”glue” of the spaghetti organization may have consisted in the unique communicative and leadership skills of Kolind.

processes may sort better than hierarchical processes. In fact, the spaghetti organization was (at least in the official rhetoric) very much founded on the notion that bottom up processes would select more efficiently than hierarchical processes. Hierarchical superiors may be more knowledgeable about which actions should be optimally taken by subordinates is when there are strong complementarities between the actions of subordinates, and hierarchical superiors possess private information about these complementarities, and/or they possess private information about which states of the world that have been realized. To be sure, complementarities between subordinates' actions and knowledge sets obtained in the spaghetti organization. However, the purpose of the spontaneous, market-like, bottom-up processes was exactly to discover and utilize such complementarities — something that the earlier hierarchical organization had not been capable of. Thus, it seems unlikely that abolishing the hierarchy in Oticon led to serious inefficiencies inefficiencies related to the allocation of competence.

Problems of Eliminating Tournaments. From an incentive perspective, the extremely flat spaghetti organization implied that a particular incentive instrument was no longer available to the organization: Hierarchical job ladders could not any longer function as incentive mechanisms in their own rights, since the spaghetti organization essentially abolished what agency theorists call "tournaments" between managers (Lazear 1995). Promotion was no longer a "prize" that could be obtained through expending effort. However, while the spaghetti organization may have eliminated this particular incentive instrument, it introduced a number of new incentive instruments, such as performance payment based on a number of measures. From the point of view of individual employees, these new instruments were probably stronger than tournaments, because they were less open to political manipulation. Thus, the sacrifice of tournaments as an incentive instrument is not likely to have been a major problem.

Problems of Sacrificing Specialization Advantages. As mentioned earlier, a key ingredient of the spaghetti organization was the multi-job concept which implied 1) that each employee was encouraged to develop skills that were outside their present skill portfolios, and 2) was free to join projects as they saw fit (dependent on the acceptance of the project leader). Much work on Oticon has treated the multi-job concept as a strong stimulus to knowledge exchange and integration (e.g. Verona and Ravasi 1999; Ravasi and Verona 2000). There is clearly much to this argument. However, there were also costs associated with this principle. Most obviously, the encouragement to develop skills outside the current skill portfolio may have sacrificed specialization advantages. However, there are indications that this was actually not the case. Thus, an Oticon engineer may have been encouraged develop English writing skills (Søndergaard and Døjbak 1997). He would then be in a position to undertake technical translation relevant to his project, and do so in a much more informed way than a professional translator would. Thus, rather than sacrificing specialization advantages, this aspect of the multi-job concept may rather have exploited complementarities between different skills.

Problems of Coordination. However, there is strong evidence that the second part of the multi-job concept, the freedom to join projects, had significant costs.[26] Nobody kept track of the total time that employees spent on projects.[27] Moreover, project leaders were free to try to attract those who worked on competing projects, and in many cases they succeeded in doing so. This was a consequence of the explicit aim to emulate the market, but the effect was that it was hard to commit employees to projects and to ensure an efficient allocation of attention to projects

[26] Eskerod (1997, 1998) in particular documents this. My later interview with the chief HRM officer strongly confirmed Eskerod's finding that the multi-job concept had severe costs in terms of problems of coordination and frustrating employees.

[27] And neither would this have been possible, as nobody in Oticon, not even the Projects and Product Committee, kept track of the total number of development projects. Records were only kept of the 10-20 major projects. An estimate is that under the spaghetti organization, an average of 70 projects were continously running (Eskerod 1998: 80).

(Gifford 1992). This led to severe coordination problems, because project leaders had very little guarantee that they could actually carry a project to its end, given that anybody at the project could leave at will, if noticing a superior opportunity in the internal job market. Moreover, many employees joined more projects than their time resources possibly allowed for, creating problems of coordinating schedules and work hours. The Products and Projects Committee had no routines for dealing with these problems, and apparently reputation mechanisms were not sufficient for coping with them either.

It seems that these problems could have been have been reduced by simply prohibiting employees from working on more than, say, two projects that could not add up to more than 100 % of the employee's total work hours.[28] Establishing such controls in the original spaghetti organization would, however, have run against the official rhetoric of autonomy, empowerment, and delegation. Alternatively, monitoring systems might have been refined to control dimensions of employee behavior that related to their attention and work allocation across the projects they participated, so as to reduce coordination problems. However, the very elaborate monitoring system that was implemented together with the spaghetti organization and involved the construction of objective measures on half a dozen aspects of employee behavior (Poulsen 1993) appears to have been quickly and tacitly shelved and substituted with a simpler system that relied much more on subjective performance assessment (Business Intelligence 1993). This suggests that the problem with monitoring systems under the original spaghetti organization rather was that they were already too complex and costly to administer in practice.

Problems of Knowledge Sharing. The vision behind the spaghetti organization was to build an organizational form that was far superior to the earlier one (and to any other conceivable system) in discovering, building and utilizing knowledge (Kolind 1996). The multi-job concept clearly promoted knowledge sharing and, in turn, knowledge creation. However, there is evidence (Eskerod 1996, 1998) that knowledge sharing was not always spontaneous and uninhibited. In fact, in some cases, knowledge tended to be held back within projects, because of the widespread, and correct, perception that projects were essentially in competition over corporate resources. Thus, by stressing so strongly a market-like competitive ethos and by making incentive systems more "high-powered" (Williamson 1996) than they had been under the old organization, the spaghetti organization to some extent worked against its stated purposes. The organization's measurement and reward systems apparently could not cope fully with these problems.[29]

It is debatable how significant this problem was. It may be argued that the impressive innovation record of Oticon in the 1990s indicates that the firm's creation of knowledge may not have been significantly harmed by the competitive relations existing in the spaghetti organization. Still, the relevant question is whether the knowledge-sharing environment could have been better designed. Knowledge sharing is not necessarily best stimulated by a kind of project organization that simulates competitive markets. To the extent that knowledge sharing is a hard-to-measure performance variable, employees are likely to put less of an emphasis on this (Holmström and Milgrom 1991). Upon realizing this, resort to lower-powered incentives is likely (Holmström 1999). This corresponds to what took place in Oticon, where it was realized that the internal market produced not only benefits with respect to knowledge-integration, but had certain harmful effects on knowledge-sharing. Although the performance measurement

[28] In fact, the more structured project organization gradually implemented from 1996 has established controls that secure that the coordination and time-allocation problems that beset the original spaghetti organization are kept at bay.

[29] Possibly as a reflection of these problems, the most important variable with respect to determining salary changes in the *present* organization is the degree to which an employee contributes to knowledge-sharing.

systems in Oticon now includes attempts to measure employees' contribution to knowledge sharing, it is also the case that the strong competitive ethos which characterized the spaghetti organization has been significantly dampened in the successor form.

Problems Caused by Influence Activities. Influence activities are those activities in which subordinates may engage in the hope of influencing hierarchical superiors to make decisions that are in one's interest rather than in the organization's (Milgrom 1988; Schaefer 1998; Argyres and Mui 2000). Resources expended on influence activities are, from the point of view of the organization, waste. It is arguable that it is relatively more difficult under an organization such as the spaghetti organization to protect against influence activities. This is because everybody has, in principle, direct access to the management team. A comparative advantage of the traditional, hierarchical and rule-governed organization is exactly that it may be better at protecting itself against influence activities, because access to those who hold ultimate decision rights is more difficult. Moreover, what each employee is allowed to do and perhaps say (Argyres and Mui 2000) in a more traditional organization is likely to be more narrowly circumscribed than in a loose-coupled organization such as the Oticon spaghetti organization (Milgrom 1988).[30]

In fact, the spaghetti organization which actively stimulated competition between project groups for the approval of the only relevant "hierarchical superior" left, namely the Projects and Products Committee, clearly produced such influence activities. In contrast, under the hierarchical form existing prior to the spaghetti organization, such activities had been much less prevalent, because of the aloof management style of the old management (Poulsen 1993). Personal relations to those who staffed the Committee became paramount for having a project ratified by the Committee. As Eskerod (1998: 80) observed:

> *Part of being a project group may be lobbying in the PPC trying to obtain a high priority status by influencing the PPC members. The reason for doing this is that a high priority project is regarded as a very attractive place for the employees, because the management sees this project as important.*

It is, however, not clear from the existing empirical studies of the spaghetti organization that this was perceived of as a serious problem in the organization, for example, whether it resulted in obviously unimportant projects being approved of by the Committee. Rather, it was taken as an unavoidable, and relatively small, cost of the spaghetti organization.[31]

To sum up, the search for the causes of the partial abandonment of the spaghetti organization so far seems to lead to only inefficiencies stemming from the lack of well functioning project management routines on the part of Products and Projects Committee being a really serious problem. However, as mentioned, this problem could have been dealt with by adopting better project management routines; handling it did not necessarily require a major organizational change. Still, the many possible small liabilities of the spaghetti organization (some problems of knowledge being held back in projects, some influence activities, etc.) may together have added up to significant costs that could be reduced by adopting a more structured organizational

[30] This is not to say that "non-traditional" organizational forms are necessarily beset with influence costs. See Argyres and Mui (2000) for an excellent analysis of how organizations may commit to certain rules that regulate what is acceptable discourse. Those rules reflect a trade-off between the benefits of organizational learning stimulated by dissenting opinion and the costs of rent-seeking activities that are pursued in the organizational conversation.

[31] Interview with HRM manager Henrik Holck.

form (Børsens Nyhedsmagasin 1999; interview with Henrik Holck June 2000). Moreover, there is one fundamental incentive problem left that was clearly present in the spaghetti organization, and which is the strongest candidate for the decisive cause of the partial abandonment of that organizational form.

The Problem of Selective Intervention

Although infusing hierarchical forms with elements of market control seems attractive, crafting and implementing such internal hybrids is a highly complicated problem. One reason is a fundamental incentive problem that plagues all hierarchies, but is arguably particularly prevalent in the kind of very flat organizations of which the Oticon spaghetti organization is an example. An early statement of the nature of this problem can be found in the comparative systems literature in economics, that is, the literature taken up with the economic differences between capitalist and socialist systems. Thus, Mises (1949: 709) argued that there are fundamental problems involved in "playing market" inside hierarchies.[32] Specifically, he argued that schemes for designing a socialist market economy would not work. Importantly, the concentration of ultimate decision-making rights and responsibilities, and therefore ownership, in the hands of a central planning board would dilute the incentives of managers. Thus, while planning authorities could (and according to those schemes , should) delegate rights to make production and investment decisions to managers, these rights were likely to be used inefficiently. First, because managers could always be overruled by the planning authorities, they were not likely to take a long view, notably in their investment decisions. Second, because managers were not the ultimate owners, they were not the full residual claimants of their decisions and, hence, would not make efficient decisions.

Later research has clarified that 1) handling the problem requires that the planning authorities can credibly commit to a non-interference policy, and 2) the problem is much more general than the comparative systems context. It is latent (or manifest) in all relations between "rulers" and "ruled" (North 1990; Miller 1992; Miller and Hammond 1994; Williamson 1996). The ancient problem of "constraining the kind" is an instance of it (Miller and Hammond 1994). The problem arises from the fact that it is hard for the ruler to commit to a non-interference policy, because reneging on a promise to delegate will in many cases be extremely tempting and those to whom rights are delegated will anticipate this. Loss of motivation results. These kinds of problem are far from unknown in organizational studies, (e.g., Vancil and Buddrus 1979: 65). Thus, transaction cost economist, Oliver Williamson (1996) has coined the concept of the "impossibility of elective intervention." He describes it as:

> *… a variant on the theme, "Why aren't more degrees of freedom always better than less?." In the context of firm and market organization, the puzzle is, "Why can't a large firm do everything that a collection of small firms can and more." By merely replicating the market the firm can do no worse than the market. And if the firm can intervene selectively (namely, intervene always but only when expected net gains can be projected), then the firm will sometimes do better. Taken together, the firm will do at least as well as, and will sometimes do better than, the market (1996:150).*

Williamson directly argues that (efficient) selective intervention of this kind is "impossible." Incentives are diluted, because the option to intervene "… can be exercised both for good cause (to support expected net gains) and for bad (to support the subgoals of the intervenor)" (Williamson 1996: 150-151). Promises to only intervene for good cause can never be credible, Williamson argues, because they are not enforceable in a court of law.

[32] Somewhat later, the literature on internal transfer prices revealed the existence of various incentive problems that may beset this organizational practice (Eccles 1986; Holmström and Tirole 1991).

The wider implications of Williamson's reasoning, although they are not explicitly stated in his work, are that since decision rights cannot be delegated in a court-enforceable manner inside firms, and therefore are not contractible, authority can only reside at the top. Authority cannot be delegated, even informally, since any attempt to do this will run into the problem of the impossibility of selective intervention. One would therefore expect to see little use of delegation. Given that delegation is clearly a viable and widespread organizational practice, this suggests that Williamson's argument that selective intervention is *strictly* impossible goes too far.

In fact, it is conceivable that the intervenor may credibly commit to not intervene in such a way that the "subgoals of the intervenor" are promoted. The logic may be stated in the following way (cf. Baker, Gibbons and Murphy 1999). Assume that a subordinate initiates a project.[33] Assume further that the manager has information that is necessary to perform an assessment of the project, but that he decides upfront to ratify *any* project that the subordinate proposes. Effectively, this amounts to full informal delegation of the rights to initiate and ratify projects — "informal," because the formal right to ratify is still in the hands of the manager and because that right cannot be allocated to the subordinate through a court-enforceable contract (cf. Williamson 1996). Because the subordinate values being given freedom — he is partly a residual claimant on the outcomes of his activities — this will induce more effort in searching for new projects (Aghion and Tirole 1997; Foss and Foss 2002). To the organization, the expected benefits of these increased efforts may be larger than the expected costs from the bad projects that the manager has to ratify.

However, a problem arises when the manager has information about the state of a project ("bad" or "good"). He may then be tempted to renege on a promise to delegate decision authority, that is, intervene in a "selective" manner. If he overrules the subordinate, the latter will lose trust in him, holding back on effort. Clearly, in such a game a number of equilibria, each one characterized by different combinations of employee trust and managerial intervention, are feasible. What determines the particular equilibrium that will emerge is the discount rate of the manager, the specific trigger strategy followed by the sub-ordinate (e.g., will he lose trust in the manager for all future periods if he is overruled, or will he be more forbearing?), and how much the manager values his reputation for not reneging relative to the benefits of reneging on a bad project (Baker, Gibbons, and Murphy 1999).

So far, the approach followed builds on standard economic rationality assumptions and on managers and employees being only extrinsically motivated (cf. Frey 1997). Extending it by introducing richer motivational and cognitive concerns that go beyond standard economic assumptions aggravates the problem of selective intervention. In the economics approach sketched above, the employee is motivated solely by being able to share in the outcomes of his activities; managerial intervention decreases motivation because it means that the expected gain of putting effort into the project diminishes. However, as argued in an extensive literature in psychology (summarized in Frey 1997), people are also likely to be intrinsically motivated. Such motivation may be sustained by psychological contracts that involve loyalties and emotional ties (Brockner et al. 1992; Robinson and Morrison 1995; Osterloh and Frey 2000: 541). Selective intervention, particularly when it is perceived to be essentially arbitrary, breaks such contracts and harms intrinsic motivation (Robinson and Rousseau 1994). Thus, even if employees have no direct financial stake in the outcomes of their efforts, but are, for example,

[33] This should be understood in a broad sense: A "project" may refer to many different types of decisions or clusters of decisions.

simply being paid a flat wage, their motivation is still likely to be harmed by selective intervention.

Other parts of psychological research (summarized in Bazerman 1994) suggest other ways in which the problem of selective intervention may be aggravated in practice. Thus, robust findings in experimental psychology show the presence of a systematic overconfidence bias in judgment, that is, people tend to trust their own judgments more than is "objectively" warranted. Managers are not likely to be exceptions to this bias, perhaps quite the contrary. The presence of the overconfidence bias in the judgments that underlie managerial decision-making is likely to lead to aggravate the problem of selective intervention, because it produces additional meddling in subordinates' decisions (Nickerson and Zenger 2001: 15). Although the problem of selective intervention may be cast entirely in standard economic terms, a full theoretical and managerially relevant understanding of the problem must draw upon these psychological findings.

Selective Intervention in Oticon

It is arguable that a the main reason why the spaghetti organization was changed into a more hierarchical, organization has to do with the sort of incentive and motivational problems described above. The official rhetoric, stressing bottom-up processes in flexible, market-like and essentially self-organizing system, with substantial autonomy and a management team (i.e., the Projects and Products Committee) that acted as little more than facilitator (Kolind 1990; Lyregaard 1993), became increasingly at odds with the frequent selective intervention that was undertaken by the Projects and Products Committee. The need for selective intervention was rationalized by an external observer in the following terms:

> *…PPC [the Products and Projects Committee] does not make general written plans, which are accessible to the rest of the organization … if this were done, plans would have to be adjusted or remade in an ever-continuing process, because the old plans had become outdated (Eskerod 1998: 80).*

In other words, instead of drafting and continuously revise plans under the impact of changing contingencies, the Products and Projects Committee preferred to intervene directly in projects. In fact, this was taken by the Products and Projects Committee to be an unavoidable feature of a flexible, project-oriented organization (Eskerod 1998: 89). However, this approach was a direct signal to employees that the "contract" between any project and the Products and Projects Committee was very incomplete (Williamson 1996), and that the Committee might at any time exercise its ultimate control rights for the purpose of intervening in projects. This led to diluted incentives and strongly harmed motivation (as documented at length by Eskerod 1997, 1998). Thus, the frequent intervention and changing priorities of Kolind and the Products and Projects Committee caused mounting frustration among employees. Accumulating frustration finally resulted in a major meeting in 1995, announced as the "Take shots at top management!" meeting. This meeting marks the beginning of the retreat from the pure spaghetti organization. On the meeting employees dramatically expressed their concerns about the contrast between, on the one hand, the Oticon value base, including the strong rhetoric of delegation, and, on the other hand, the way in which the company was actually managed. Frustration that projects were interrupted in seemingly arbitrary ways and that the organization was far better at generating projects than at completing them was openly voiced.

The preceding discussion suggests that a fundamental organizational problem in the spaghetti organization was that Kolind and the Products and Projects Committee never committed to a policy of not intervening selectively; neither, apparently, did they intend to do so, or even see any sensible rationale in it. Kolind's view appears to have been that in important respects and

in many situations, he and the Products and Projects Committee would possess accurate knowledge about the true commercial and technical possibilities of a given project, and that efficient utilization of corporate resources dictated intervening in, and sometimes closing down, projects. However, that view clashed on a basic level with the rhetoric of widespread delegation of decision rights, leading to the demise of the radical spaghetti organization, and the adoption of the present more structured matrix organization.

In principle, Kolind and the Products and Projects Committee could have committed to a policy of non-interference from the beginning, rather than acting on the belief that organizational flexibility required that they selectively intervene in projects. Conceivably, this might have made this radical internal hybrid viable. However, even if Kolind and the Products and Projects Committee had announced initially that they would refrain from selective intervention, there are reasons why this commitment may not have sustainable in the longer run. Thus, it was increasingly realized that the elaborate system of measures that was initially installed was inadequate. It did not capture important dimensions of behavior (e.g., employees' contribution to knowledge sharing) and it may have contributed to some projects holding back knowledge. Rather than trying to refine the system further, it was abandoned.[34] However, the implication was that management could no longer take place solely through incentives (following initial ratification of projects). The employee stock ownership program was arguably not sufficiently high-powered to truly motivate, and did not confer sufficient decision rights to halt the practice of selective intervention to employees. The implication was that Kolind and the Products and Projects Committee had to engage in much more monitoring of the projects. Doing this without compromising team autonomy and harming motivation was unlikely.

The New Organization

The present Oticon organization is characterized by a much more consistent approach towards projects on the part of the Competence Center (one of the descendants of the Products and Projects Committee). Organizational expectations appear to be that priorities do not change in the rapid and erratic manner that characterized the original spaghetti organization, and that employees can be much more sure that the projects they are working on are taken all the way to the end. In the new organization, projects are rarely stopped or abandoned, and there is an explicitly stated policy of sticking to ratified projects. Two reasons are given for this. First, projects now rest on generally more secure ground, having been more carefully examined beforehand. An aspect of this is that the Competence Center now much more actively puts forward projects ideas and contacts potential project leaders, rather than relying on the bottom-up approach that characterized the original spaghetti organization. Thus, hierarchical selection has to some extent substituted for selection performed by bottom-up processes. Second, the wish to avoid harming motivation (i.e., diluting incentives) by overruling going projects is strongly stressed. Apparently, present Oticon management has realized the need to credibly commit to a policy of non-interference with going projects. The Competence Center has announced this policy, and has made it credible by 1) sticking to it and 2) researching project ideas carefully *ex ante* so that employees' perceived probability that intervention will occur is low. Some reasons why a more traditional hierarchy may be better at making such commitment credible is discussed in the following section.

[34] Since behavior was apparently difficult to measure, a more output-based system could have been tried (Prendergast 1999), for example, contracts that specified rewards for specific accomplishments (e.g., a system that rewarded according to milestones in a development project). However, it is doubtful whether such a contract could actually be made court-enforceable. A managerial commitment problem would again be the result.

Discussion: Implications for Internal Hybrids

Proponents of internal hybrids argue that their main advantages lie in the ability to integrate the virtues of more conventional organizational forms, and that such an integration may be paramount under knowledge-intensive, hyper-competitive conditions (Miles et al. 1997). Specifically, internal hybrids combine the ability to achieve efficiencies through specialization that characterizes the functional form with the relative independence that can be granted in an divisional form and the ability to transfer resources and capabilities across division and business unit boundaries that characterize the matrix organization (e.g., Miles and Snow 1992). Strikingly similar arguments were invoked by the designers of the Oticon spaghetti organization (Kolind 1990, 1994; Lyregaard 1993). This suggests that something may be learned from the Oticon experience about the design and viability of internal hybrids. This section derives a number of refutable implications from the discussion. It also relates to a complementary explanation of the Oticon spaghetti experiment, and it touches upon some broad implications for economic organization, particularly the distinction between firms and markets.

Getting the Complementarities Right

A basic proposition in much of organization theory is that for reasons of efficiency organizational forms are aligned with environmental conditions, strategies and exchange conditions in a systematic and discriminating manner (Thompson 1967; Meyer, Tsui and Hinings 1993; Williamson 1996; Nickerson and Zenger 2000).[35] Thus, Zenger (2002: 4) argues that many attempts to infuse hierarchies with elements of market control break with this basic proposition and often "… violate patterns of complementarity that support traditional hierarchy as an organizational form." Discrete governance structures that consist of consistent elements result. For example, managers implement new structures without new performance measures and new pay systems, or they implement new pay systems without developing new performance measures (also Baron and Kreps 1999). Such attempts results in unstable, and possibly inefficient, hybrid forms. The conclusion is the Williamsonian one (Williamson 1996) that just as markets and firms as governance structures are characterized by organizational elements clustering in certain characteristic, complementary combinations, so are (internal) hybrids.

Did the spaghetti organization get the complementarities right? On first inspection, it did, as has been argued. However, closer inspection reveals that this may not have been the case, after all. Thus, it may be argued that Oticon did not get the organizational complementarities exactly right, because the kind of very radical internal hybrid that was adopted in actuality required that projects be managed almost exclusively through the provision of incentives and ownership (Miles et al. 1997; Zenger 2002). Oticon's measurement systems were not adequate to undertake precise, fine-grained performance evaluation. Also, the incentive effects of the employee stock ownership program appear to have been limited. Thus, remuneration schemes may not have sufficiently high-powered to complement the widespread delegation of decision rights in the organization, fostering, in turn, a need for monitoring and selective intervention on the part of Kolind and the Products and Projects Committee that went beyond what would have been necessary with better measures of employee performance, and which had the unintended side-effect that motivation was seriously harmed.

[35] In contrast, some theorists argue that organizational elements are more malleable, and that the set of stable discrete governance structures (i.e., clusters of organizational elements) is larger, than what is conventionally assumed in much of organization theory and in the economics of organization (e.g., Grandori 2001; Helper, MacDuffie and Sabel 2000).

Thus, from this perspective, an important problem of not getting the complementarities right in the design of radical internal hybrids is that it gives rise to selective intervention which is intended to remedy problems (of coordination and moral hazard), but harms motivation. This suggests the following proposition:

> **Proposition 1:** Internal hybrids that violate patterns of complementarity characteristic of this organizational form will be subject to more problems of selective intervention than hybrid forms that get the complementarities right.

A corollary to this proposition is that advances in measurement methods will result in less selective intervention, because the measurement of performance is improved so that the moral hazard stemming from the delegation of rights is reduced. This makes it easier to establish viable internal hybrids.

Commitment Problems and Organizational Form

Although there may thus be more selective intervention in internal hybrid forms where patterns of complementarity are violated, selective intervention may still take place even in well crafted internal hybrids. Even if, for example, very fine-grained performance measurement systems that complement strong delegation of decision rights may be implemented, the top management team still possesses those ultimate decision rights that allow them to overrule subordinates. Fundamentally, even very well-crafted attempts at infusing hierarchies with elements of market control will always be merely a simulation of market exchange, because, unlike independent agents in markets, corporate employees never possess ultimate decision rights. They are not full owners. This reintroduces the problem of selective intervention, because those who possess ultimate decision rights can always overrule subordinates.

However, the problem of selective intervention is not independent of organizational structure, notably, the number of hierarchical layers in the organization, and therefore the distribution of information and authority in a firm. Arguably, organizations that adopt internal hybrids that amount to drastically reducing the number of hierarchical layers, such as Oticon's spaghetti experiment, are particularly prone to this problem relative to more hierarchical firms. There are (at least) three reasons for this.

First, decision rights are more solidly established in a traditional hierarchy, being associated with well-defined, distinct positions, than in a flat, project-based organization, where decision rights are much more fleeting. Organizational expectations that certain positions involve certain decision rights are very well established, and potentially costly for a top-manager to break with through selective intervention. The same kind of organizational expectations are not likely to be established in a flat, project-based organization.

Second, a top-manager who selectively intervenes in a hierarchical organization risk overruling the *whole* managerial hierarchy (all those below him), whereas this may be a smaller a concern in a flat organization, where the CEO may only harm motivation in a specific project if he overrules that project.

Third, information processing perspectives (Thompson 1967; Galbraith 1974) suggest that the hierarchy is not just a structure of authority, but also one of information. The informational distance between projects and top-manager may be made large by having a multi-layered hierarchy. This implies that the top-manager knows that he is in key dimensions ignorant about the project (Aghion and Tirole 1997). In this case, his incentives to selectively intervene will be small. In the case of Oticon, commitment to non-intervention was established with the more hierarchical structure that succeeded the spaghetti structure. The preceding arguments suggest the following proposition:

> **Proposition 2**: An internal hybrid form that is organized within a firm with few hierarchical layers will be associated with larger efficiency losses caused by problems of selective intervention than an internal hybrid form that is organized within a firm with more hierarchical layers.

Clearly, an implication of this proposition is that more traditional types of internal hybrids, such as some kinds of matrix organization and perhaps even the M-form structure, are likely to be more stable than very radical internal hybrids that breaks down the hierarchy in an attempt to emulate the market. This is consistent with the Oticon experience.

Commitment Problems and the External Environment

In the case of the Oticon spaghetti organization, one of the reasons why the Products and Projects Committee considered that selective intervention was necessary had to do with impossibility (or high costs) of making detailed plans for future business development. An important reason why detailed planning (or detailed contracts) is difficult to undertake has to do with the emergence of unforeseen contingencies (e.g., new technologies) that upset existing plans (contracts). The rather turbulent hearing-aids industry arguably was an environment in which such contingencies occurred. This fostered the need, from the perspective of the Oticon management team, of intervening in projects in an attempt to adapt to new contingencies. This suggests a third proposition:

> **Proposition 3:** There will be more selective intervention in internal hybrid forms that operate in turbulent industries than in internal hybrid forms that operate in tranquil industries.

Analytically, this proposition may be taken to be the other side of the coin of the transaction cost argument that *external* hybrids are unstable in "dynamic" industries (Williamson 1996), because in such industries unexpected contingencies that may give rise to hold-ups are more likely. Along similar lines, the theoretical argument underlying Proposition 3 is that in dynamic industries, the implicit contract between teams/projects and management in *internal* hybrids is likely to be relatively more incomplete than in more tranquil industries. Therefore, management is likely to engage in more selective intervention in an attempt to influence how projects react to unexpected contingencies.

Internal and External Hybrids and Internal and External Markets

The problem of selective intervention casts a novel light over governance choices between internal and external hybrids and internal and external Markets (Poppo 1994). These organizational forms may be thought of as substitutes, as mentioned earlier. For example, all may be adopted in order to better exploit local knowledge (Cowen and Parker 1997), or to strengthen incentives, because they (albeit to varying degrees) make agents residual claimants to a higher degree than in traditional hierarchies. Thus, they would appear to be rather close substitutes. However, such a conclusion overlooks that whereas internal hybrids/internal markets may suffer from the problem of selective intervention, external hybrids/external markets do not suffer from this problem (Day and Wendler 1998; Corts and Neher 1999). Admittedly, external hybrids and markets may suffer from inefficiencies caused by hold-up problems when specific assets are deployed. These inefficiencies should be compared with the inefficiencies caused by the problem of selective intervention in the choice between internal and external hybrids. However, creating competition between suppliers, investing in hostages, having some tapered integration, etc. may strongly reduce the hold-up potential.

The point is that it is inherently harder to design the problem of selective intervention away, as it were, since a solution cannot rely on market forces or court-enforceable contracts. The

implication is that, on average, external markets and external hybrids are likely to have incentive properties that are superior to those of internal markets and internal hybrids, so that there will be (transaction and production) cost penalties associated with the use of the latter. This results in the following proposition:

> **Proposition 4:** Except for transactions with a very high level of asset specificity, for the same kind of transactions those firms that choose external hybrids (markets) over internal hybrids (markets) will demonstrate better cost performance than those who choose internal hybrids (markets) over external hybrids (markets).

This reasoning may be seen as a variation of a familiar theme of transaction cost economics (Williamson 1996), namely that vertical integration be considered the option of last resort. What it adds is an elaboration of the incentive liabilities of internal organization that makes this the case.

Managing Commitment to Not Selectively Intervene

While theory suggests that the problem of committing to not selectively intervene is a tough one, we do seem to observe a substantial amount of delegation in real world firms. This indicates that it is possible to credibly commit to non-intervention. There are two fundamental methods that managers may use for this purpose. Both essentially tie the hands of a would-be intervenor.

The first one is to commit oneself to being (rationally) ignorant. Thus, a manager may choose not to be informed about a number of critical dimensions in projects. In very hierarchical organizations this may be easy to accomplish because of the large informational distance between top-management and projects.

A second approach proceeds by managers making it harmful to themselves to selectively intervene. Open announcement of a non-intervention policy, making such policy recorded in company documents, working to install it in corporate culture, etc. all go some way to meet this aim, since it makes the possible clash between the communicated values and managerial interventionist practice extremely sharp, and makes very obvious the break of the explicitly stated psychological contract (Brockner et al. 1992). Managers may suffer substantial psychic costs as a result of this. Commitment may be further strengthened by letting the manager take a financial position in the company; this will also make him suffer in financial terms from his own harmful selective intervention.

The Spaghetti Organization as a Modulation Between Stable Organizational Forms

Although organizational designers sometimes design organizational forms that break with a logic of complementarity, the possibility exists that although such unstable forms incur penalties in terms of static efficiency (i.e., economizing with transaction costs and costs of production), they may sometimes yield benefits in terms of dynamic efficiency (i.e., innovativeness). Calls for “chaotic” organization (Peters 1992) often implicitly makes such arguments. Organization design activities need to consider both type of efficiencies (Ghemawat and Ricart i Costa 1993). An implication is that in an intertemporal perspective, choosing “consistent” configurations of organizational elements may not necessarily maximize the value of the firm.

An ingenious argument of this kind has been developed by Nickerson and Zenger (2000). They suggest that considerations of efficiency may dictate modulating between discrete organizational forms (such as the old hierarchical Oticon organization and the post-spaghetti matrix structure), even in response to a *stable* set of environmental conditions. This is because

the steady-state functionality delivered by a discrete organizational form may itself be discrete, and the desired functionality may lie in between those delivered by the discrete organizational forms. Efficiency gains may then be obtained by modulating between the forms.

If indeed the Oticon spaghetti organization may have incurred inefficiencies with respect to the organization of its administrative systems, it is hard to dispute the proposition that it was also a quite innovative organization (cf. Table 1). These benefits may likely have overwhelmed the organizational costs.[36] Although the spaghetti organization was not stable in the presence of the problem of selective intervention, it would still have made sense to choose this form, even if the designers had known it to be inherently unstable. In fact, much of the early discussion of the spaghetti organization made reference to the need to try something entirely new and admittedly chaotic, for the purpose of drastically shaking up the original, bureaucratic organization (Kolind 1990; Peters 1992; Poulsen 1993). This is consistent with Nickerson and Zenger's theory: The Spaghetti organization may indeed be an example of modulating between the stable organizational form of the traditional, pre-spaghetti hierarchy, and the stable matrix organization *post* the spaghetti. What lends credence to this interpretation is that although the hearing aids industry was quite dynamic in the relevant period (Lotz 1998), it is not possible to identify environmental changes that might have caused the organizational change away from the spaghetti.

Firms and Markets

Finally, the emphasis on the problem of committing to not selectively intervene casts light over the classical issue of what are the fundamental differences between firms and markets. This paper supports the original Coasian position that the difference is that markets do not rely on resource-allocation by means of authority whereas firms do (Coase 1937). "Authority" is a problematic word because it is often invested with a too narrow meaning, for example, detailed direction and supervision (Foss 2002). However, authority also means the power to set th boundary conditions for a relation, such as deciding that employees of our firm cannot also be employees of another firm (Holmström 1999), or defining what is acceptable discourse within a firm (Argyres and Mui 2000). Ultimately, the meaning of having authority is that one can restrict the decisions of one's subordinate, overrule him, and perhaps fire him. This means that although decision rights may be delegated, we can still trace the chain of authority in a firm, and we will always realize that ultimate decision-making power resides at the top. As this paper has illustrated, all subordinates' decision rights "are loaned, not owned" (Baker, Gibbons and Murphy 1999: 56). Fundamentally, it can never be otherwise. This is because ultimate decision-making rights can only be transferred from bosses to subordinates in one way, namely by transferring ownership (Hart 1995). However, transferring ownership amounts to spinning off the person to whom ownership is given. It means creating a new firm. It is this fundamental difference in how ownership is allocated that underlies the problem of selective intervention. The analysis in this paper thus makes direct contact with important modern theories (Hart 1995; Williamson 1996; Baker, Gibbons and Murphy 2000) that stress the importance of ownership for the understanding of the nature of firms and firm boundaries.

[36] At least for some time. It may be noted that the retreat from the spaghetti organization began when the major innovations of Oticon had been introduced, thus suggesting that organizational costs might have begun to overwhelm gains in terms of dynamic efficiency. The organization has not yet come up with something as radical as the 1996 DigiFocus. Most of the innovations in recent years have spin-offs of DigiFocus (cf. Table 1).

Conclusions

To many firms, the adoption of hybrid organizational forms is increasingly seen as imperative. Although extensive research exists on the subject of external hybrids, rather little theoretical and empirical research has treated internal hybrids (excepting the rather extreme case of the M-form). This paper has examined a specific experiment with adopting and later strongly modifying a radical internal hybrid in an attempt to identify some possible liabilities of the adoption of such organizational forms. In particular, the focus has been directed to the managerial problem of credibly committing to a policy of refraining from selective intervention. While a few organizational economics contributions has treated this and related problems (Williamson 1996; Baker, Gibbons, and Murphy 1999, 2000), it has not been applied to the understanding of internal hybrids and related design issues, that is, the main purpose of this paper.

A number of testable propositions were formulated to capture the arguments. In particular, the argument was made that problems of selective intervention are particularly prevalent in organizations that adopt radical internal hybrids. In contrast, firms with more traditional hierarchical structures better shield themselves from the problem of selective intervention. Managers may commit to non-intervention by means of rationally choosing to be ignorant or by making it harmful to themselves to selectively intervene. Also, the environment in which the firm is placed influences the incidence of problems of selective intervention, these being more prevalent in dynamic than in tranquil environments. Finally, the problem of selective intervention is a prime candidate for understanding the incentive liabilities of hierarchies and internal hybrids *vis-a-vis* markets or external hybrids.

On the level of research methodology, this paper has, hopefully, exemplified the interpretive power of organizational economics. Admittedly, however, organizational economics only tells a part of the story. From an organizational economics perspective, the spaghetti organization represented a matrix of rights and incentives that are helpful for understanding its liabilities, and how these liabilities gave rise to certain organizational dynamics (i.e., the partial abandonment of the spaghetti organization). However, it may indeed also be understood in terms of an attempt to, for example, foster dynamic capabilities through imposing loose coupling and structural ambiguity on an organization (Ravasi and Verona 2000), a perspective that cannot directly be captured by an organizational economics perspectives. Thus, the full story of the Oticon spaghetti experiment requires that more than one perspective be considered. Relatedly, the paper has suggested that organizational economics should consider to a fuller extent psychological insights in motivation and in cognition. While it is possible to tell limited stories of managerial commitment, selective intervention and stifled incentives based only on organizational economics, there is little reason to be so narrow. A vast literature on procedural justice in organization, psychological contracts, and biased cognition exists, the insights of which should be combined with the relative rigor of organizational economics in order to further a fruitful understanding of the nature of problems of managerial commitment, including problems of selective intervention (cf. also Miller 1992; Lindenberg 2000; Foss 2001).

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Danish Research Unit for Industrial Dynamics

The Research Programme

The DRUID-research programme is organised in 3 different research themes:

- The firm as a learning organisation
- Competence building and inter-firm dynamics
- The learning economy and the competitiveness of systems of innovation

In each of the three areas there is one strategic theoretical and one central empirical and policy oriented orientation.

Theme A: The firm as a learning organisation

The theoretical perspective confronts and combines the resource-based view (Penrose, 1959) with recent approaches where the focus is on learning and the dynamic capabilities of the firm (Dosi, Teece and Winter, 1992). The aim of this theoretical work is to develop an analytical understanding of the firm as a learning organisation.

The empirical and policy issues relate to the nexus technology, productivity, organisational change and human resources. More insight in the dynamic interplay between these factors at the level of the firm is crucial to understand international differences in performance at the macro level in terms of economic growth and employment.

Theme B: Competence building and inter-firm dynamics

The theoretical perspective relates to the dynamics of the inter-firm division of labour and the formation of network relationships between firms. An attempt will be made to develop evolutionary models with Schumpeterian innovations as the motor driving a Marshallian evolution of the division of labour.

The empirical and policy issues relate the formation of knowledge-intensive regional and sectoral networks of firms to competitiveness and structural change. Data on the structure of production will be combined with indicators of knowledge and learning. IO-matrixes which include flows of knowledge and new technologies will be developed and supplemented by data from case-studies and questionnaires.

Theme C: The learning economy and the competitiveness of systems of innovation.

The third theme aims at a stronger conceptual and theoretical base for new concepts such as 'systems of innovation' and 'the learning economy' and to link these concepts to the ecological dimension. The focus is on the interaction between institutional and technical change in a specified geographical space. An attempt will be made to synthesise theories of economic development emphasising the role of science based-sectors with those emphasising learning-by-producing and the growing knowledge-intensity of all economic activities.

The main empirical and policy issues are related to changes in the local dimensions of innovation and learning. What remains of the relative autonomy of national systems of innovation? Is there a tendency towards convergence or divergence in the specialisation in trade, production, innovation and in the knowledge base itself when we compare regions and nations?

The Ph.D.-programme

There are at present more than 10 Ph.D.-students working in close connection to the DRUID research programme. DRUID organises regularly specific Ph.D-activities such as workshops, seminars and courses, often in a co-operation with other Danish or international institutes. Also important is the role of DRUID as an environment which stimulates the Ph.D.-students to become creative and effective. This involves several elements:

- access to the international network in the form of visiting fellows and visits at the sister institutions
- participation in research projects
- access to supervision of theses
- access to databases

Each year DRUID welcomes a limited number of foreign Ph.D.-students who wants to work on subjects and project close to the core of the DRUID-research programme.

External projects

DRUID-members are involved in projects with external support. One major project which covers several of the elements of the research programme is DISKO; a comparative analysis of the Danish Innovation System; and there are several projects involving international co-operation within EU's 4th Framework Programme. DRUID is open to host other projects as far as they fall within its research profile. Special attention is given to the communication of research results from such projects to a wide set of social actors and policy makers.

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