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Publication date:
2013

Document Version
Early version, also known as pre-print

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Hu, Y., & Sørensen, O. J. (2013). *Exploring network organization in practice: the duality and triplicity of market, hierarchy and network*. Paper presented at CICALICS Workshop 2013, Beijing, China.
<http://www.globelics.org/the-news/report-cicalics-2013-innovation-policies-present-china/>

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Exploring Network Organizations in Practice: the Duality and Triplicity of Market, Hierarchy and Network¹

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Abstract

Constructing a network organization for global R&D is presented as a common sense practice in existing literature. However, there are still queries about the network organization, such as the persistence of hierarchies which make a network organization merely a “bureaucracy-lite” organization. Furthermore, in practice, we rarely see radical organizational change towards a network organization that adopts an internal market. The co-existence of market, hierarchy and network triggered research interest. A multiple case study of three transnational corporations’ global R&D organization shows that there are different logical considerations when designing a network organization to facilitate innovation. I identify three types of network organizations: market-led, directed and culture-led network organizations. Different types of network organizations show that organizations are dual and even ternary systems of three coordination modes, i.e. market, hierarchy and network. The three coordination modes are not discrete, but instead are complementary and mutually enhancing. The interactions of the three coordination modes and the dynamism of their interplay over time could be an interesting future research topic.

Key Words

Network organization, innovation, hierarchy, market, duality, triplicity

1. Introduction

Since the 1980s, in order to utilize technological resources across national borders, transnational corporations (TNCs) have begun to internationalize their R&D activities by setting up overseas R&D subsidiaries, and more and more R&D resources are becoming internationalized, entering developing and emerging economies (Boutellier, Gassmann, & Von Zedtwitz, 2008; Cantwell & Piscitello, 1999). Yet under the trend of internationalization of R&D, with the purpose of achieving sustained competitive advantages and continuous value adding, TNCs need to proactively adjust their strategies and internal organizations.

Network organization in literature is regarded as the appropriate organization for facilitating innovation. One major argument is that tight control and traditional

¹ Previous version presented at the 12th ISMD (International society for markets and development) Conference, Casablanca, Morocco, May, 2012.

hierarchies are no longer suitable and will even harm innovation performance (Andersson, Forsgren, & Holm, 2007; Boutellier et al., 2008; Child, Faulkner, & Tallman, 2005; R. E. Miles & Snow, 1986). More and more conceptual and empirical research has shown that there is a trend towards a so-called “network organization”, especially when companies adopt a transnational strategy and carry out global R&D (Bartlett & Ghoshal, 2002; Gassmann & Von Zedtwitz, 1999).

However, since its development, the concept of a network organization is highly debatable, and it is not easy to find many companies that adopt an internal market and radically change their internal organization. Moreover, hierarchical structures, though highly criticized, still persist (Hales, 2002). As a result, though the principles of network organization in theory seem quite clear, TNCs’ organizational designs may adopt dual coordination mechanisms in practice, i.e. using network organization to promote innovation and using hierarchies to control the process (Sundbo, 2001).

This dichotomy between theory and practice triggered my research interest of exploring the meaning of a network organization by focusing on TNCs’ global R&D organizations. In particular, I am interested in seeing the relationship between market mechanism, traditional hierarchy and network in practice. In order to achieve the above research purpose, this paper provides an exploratory multiple-case study of three Danish TNCs which declare that either they already have a network organization for innovation or are moving towards a network organization.

This paper is organized as follows. After the introduction, the theoretical background of this research will be reviewed. Then I will discuss the research design of this paper, which will be followed by presenting the research findings. After exploring the three cases, a framework showing the duality of organization and typology of network organization will be presented and discussed. I will then conclude the paper.

2. Theoretical Background

This research is informed by three streams of literature: (1) the confusing concept of network organization; (2) the relationship between market, hierarchy and network; (3) the dualism of hierarchy and network.

2.1 A network organization: A confusing concept

A network can be defined simply as a combination of nodes and ties. According to Hatch and Cunliffe (2006), one distinguishing feature of a network form is boundarylessness, meaning that network organizations exist in both intra- and interorganizational levels.

There has been extensive amounts of literature published on interorganizational and interfirm network forms such as strategic alliances, outsourcing, customer-supplier

agreements, joint ventures, etc. (Freeman, 1991; Hagedoorn, 1990, 2002; Powell, et al., 1996). These network forms are most likely to emerge “when organizations face rapid technological changes, shortened product lifecycles, and specialized and fragmented markets” (Hatch & Cunliffe, 2006, pp: 307). In particular, due to utilizing complementary and diversified knowledge resources from different organizations, such network forms are regarded as a suitable environment in which innovation can flourish (Freeman, 1991).

Yet, on the other hand, there are very limited studies on companies’ internal transition towards a network organization (Zenger, 2002), which is also the focus of this paper. Organizational scholars notice that in order to survive in the high-velocity market, the demand of innovation is increasing, which brings about companies’ internal organizational changes. One common trend is the evolution from a traditional hierarchical organization to a network organization. Here, a network organization mainly refers to those organizational structures deliberately created in order to achieve efficiency, flexibility, adaptability and innovation, and within which hierarchies are minimized (Child, 2005; Hatch & Cunliffe, 2006; Miles & Snow, 1986; 1992). Unlike interfirm networks of innovators that usually have similar definitions, the concept of network organization has been highly debatable since its appearance.

The definitions of network organization have two focuses: one stream focuses more on the internal market mechanisms, and the other focuses on the cooperation and interaction mechanisms. On the one hand, a network organization refers to “clusters of firms or specialist units coordinated by market mechanisms instead of chains of commands” (Miles and Snow, 1986, 1992), which is compatible with the strategy of being a prospector that aims at providing the market with innovative products or services. The suggestion of adopting an internal market is accepted by many scholars such as Baker, (1993), Foss,(2003)and Zenger (2002). Besides focusing on the introduction of market mechanism, some other scholars emphasize the collaborative aspects of networks such as trust and interdependence between employees and business units, autonomy and bottom-up decision making, collaboration across R&D subsidiaries, global responsibility, etc. (Child, 2005; Gassmann & Von Zedtwitz, 1999; Medcof, 1997; Medcof, 2003).

However, when many scholars advocate the emergence of a network organization as a radical organizational change, some scholars find this concept exaggerated and confusing. Despite the claims of radical organizational change, to some scholars network organization is just a postmodern bureaucracy-lite organization, within which resource allocations are still coordinated by the visible hand of hierarchy, and formal and informal hierarchies still persist (Diefenbach & Sillince, 2011; Hales, 2002; Hatch & Cunliffe, 2006; Kastle & Steen, 2010).

Some other scholars adopt a network perspective/paradigm and argue that all organizations are fundamentally network patterns of relationships between employees

and their responsibilities, so there is no need to propose a concept of network organization (Baker, 1993; Borgatti & Foster, 2003). Following the network perspective, Baker (2003) argues that a network characterized by a hierarchical division of roles and tasks, vertical layers, and a central administration of resource allocation and decision making, is called bureaucracy. Conversely, a network characterized by decentralized decision making, flexibility, internal market and horizontal ties is similar to the concept of network organization.

The above discussions show that there are different ways of understanding and designing a network organization to facilitate innovation. Fundamentally, the different perspectives show different relationships between three basic organizational structures and coordination modes, i.e. market, hierarchy and network, which will be elaborated upon below.

2.2 Market, Hierarchy and Network

Market and hierarchy refer to two basic coordination modes and structures according to the transaction cost theory. Hierarchy serves as the “backbone for conventional forms of organization” (Child, 2005). A hierarchical organization is characterized by levels of authorities and responsibilities defined by employment contracts, chains of command, and vertical formal integration of positions within an organizational structure in which each position is subordinate to and dependent on a higher one (Child, 2005; Hatch & Cunliffe, 2006). In general, as a form of coordination that minimizes interdependencies between employees and maximizes repetition of tasks, the hierarchical form is suitable for governing the repeated and routinized production of stabilized goods and services; therefore it is not suitable when innovation and changes are required. In contrast, the market offers flexibility and choices, in which price mechanisms alone determine supply and demand of independent entities.

Within the dichotomy of market and hierarchy, hybrid forms are supported by neoclassical contracts, and they lie in between these two extremes (Foss, 2003; Williamson, 1991; Zenger, 2002). As proposed by Williamson (1991, pp: 280):

Market and hierarchies are polar modes... A major purpose of this paper is to locate hybrid modes-various forms of long-term contracting, reciprocal trading, regulation, franchising, and the like-in relation to these polar modes...The hybrid mode is located between market and hierarchy with respect to incentives, adaptability, and bureaucratic costs.

Here, the concept of hybrid is very much similar to that of network (Demil & Lecocq, 2006). Similarly, Thorelli (1986) proposes that the network is a coordination mode that lies in between market and hierarchy, and Thorelli highlights some key features of networks such as trust, long-term oriented and reciprocity.

As opposed to Williamson (1991) and Thorelli (1986), Powell (1990) demonstrates that the network is a distinctive coordination mode that has a different underlying logic than the market and hierarchy. Complementarity, relational communication, reciprocity, reputation, trust, mutual benefits, and resource interdependence are some key features of a network form. In this paper, I agree with Powell's trichotomy of market, hierarchy and network.

1.3 Network organization and duality

In nature, hierarchy, market and network are theoretical constructs, so in practice, the relationship between them is even more complex since they are usually intermingled (Farjoun, 2010; Jarillo, 1988). Powell (1990) has noticed some mixed forms such as profit centers, transfer pricing, hierarchical market contracts, and formal rules within networks.

Zenger (2002) identifies interfirm networks and intrafirm hybrids as external and internal hybrids. Internal hybrid mainly refers to hierarchies infused with elements of markets, which is in line with Miles and Snow's (1986, 1992)'s definition on network organization. Though the concept of network organization has been discussed for more than two decades, we have not seen many radical changes in firms' internal organizations so far, especially with regards to adopting market mechanism to optimize internal resource allocation and mobilization. Foss (2003) does an in-depth case study on Oticon's spaghetti organization, which is a radical internal hybrid. However, after a decade, Oticon changed back to a more traditional matrix organization since the internal hybrid organization is "inherently hard to successfully design and implement because of a fundamental incentive problem of establishing credible managerial commitments to not intervene in delegated decision making" (Foss, 2003, pp: 331).

Despite the fact that organizations are becoming flatter, hierarchies still persist as mentioned before. In an acutely observant statement made by (Diefenbach & Sillince, 2011) pp: 1517, "organization means hierarchy, and hierarchy means organization". In many cases, there is a duality of hierarchy and network within an organization (Farjoun, 2010; Fuglsang & Sundbo, 2005; Sundbo, 2001). Each employee has a clearly defined formal position, while at the same time there is a loosely interactive network structure which ensures bottom-up initiatives. Employees' behavior is guided by formal rules, and it is up to managers at higher levels to make final decisions.

2. Research Questions and Design

Based on the above discussions, we can see that theoretically, the definition of a network organization is still ambiguous, especially when it comes to a firm's internal organizational design. Another interesting issue is that although the idea of designing a network organization to facilitate global innovation has been proposed for several decades, we seldom see a company radically changes its internal organization by

adopting market mechanism and eliminating hierarchies, and therefore there is only a very limited amount of research in this area. A third issue is that there is a very limited amount of research discussing the relationships and co-existence of the three coordination modes: market, hierarchy and network.

Bearing in mind these research gaps, the aim of this paper is to enrich the network organization theory by focusing on companies' internal innovation/R&D related network organization. This paper attempts to answer the following research questions:

1. *How do business managers understand the concept of network organization for innovation?*
2. *Are there any different ways of designing a network organization other than adopting an internal market?*
3. *How can we understand the relationship between market, hierarchy and network within an organization in business practice?*

3.1 A Multiple case study and case profiles

In order to answer these research questions, a multiple-case study strategy has been adopted in this research with the purpose of theory expanding and building (Eisenhardt, 1989; Eisenhardt, 1991; Yin, 2009). Compared with single case studies, a multiple case study design enables researchers to have a better chance of building more persuasive theoretical constructs and propositions that can be generalized analytically (Eisenhardt, 1989; Yin, 2009).

Three Danish case companies have been thoughtfully selected following the theoretical replication principle, meaning that they provide possibilities of bringing different or even contradictory findings to existing theories (Yin 2009). Table 1 gives an overview of the three case companies, which shows the different types of network organization with different sets of underlying logic.

Table 1. Overview of case companies.²

Cases	Industry	Employees	Annual Turnover (2012):Dkk Million	Main Characteristics of network organization
InnoFlex	Textile	64	247.6	Internal market mechanism
Circular	Pump	17984	22,590	R&D managers plays a key role, top-down, promoting a global network organization
Biozyme	Biotech	6041	11,234	Long history of networking, key concept in organizational culture

InnoFlex (Case 1) is a world-leading niche company within the textile industry. It develops, manufactures and supplies upholstery fabrics. Unlike most companies that compete in the red ocean, InnoFlex adopts the blue ocean strategy and aims at being the prospector in its niche area. Innovation and value-adding cooperation are key words of its business concept. InnoFlex now has one Danish headquarters and one subsidiary located in China representing businesses in the Asian Pacific Area. InnoFlex has been transitioning from a functional organization to a network-like organization since 2006. The organizational change is radical since InnoFlex introduces a market mechanism to optimize internal resource allocation between different business units. Its new organization gives every business unit high levels of autonomy, and empowers every employee to “speak things into practice”. Such a network organization coordinated by market mechanism facilitates InnoFlex’s innovation strategy, enabling continuous revenue increase and allowing it to grow alongside the largest global market participants.

Circular (Case 2) is a world leader in developing, manufacturing and supplying pumps as well as pump solutions. It covers over 50% of the global market share of pumps, and has more than 80 companies in more than 55 countries. Circular has several global R&D subsidiaries and innovation has always been one of its core values. In recent years, Circular has been trying to promote a global R&D network organization which integrates globally distributed R&D subsidiaries, talents and resources. The organizational change is a top-down process, and business managers play an important role in facilitating the formation of network organizations.

Biozyme (Case 3) is a world leader in biotech innovation. It has 31 business branches and subsidiaries in 17 countries all over the world. It is an innovation-driven company which has more than 20% of the workforce working in R&D and devotes around 14% of revenue annually to R&D. Furthermore, Biozyme has more than 6,000 active patents,

² For confidentiality considerations, company names are aliases.

licensed patents and patent applications. Networking based on trust is one of Biozyme's core values, and trust has been deeply-rooted into every employee's mindset. Its R&D competent subsidiaries are globally coordinated rather than separated or subordinate to one central unit. Moreover, it continuously and proactively seeks partners to collaborate with R&D. Its ability to innovate, change, and adapt to the environment has put the company in a strong market position.

The network organizations studied in this paper are not general corporate networks but networks related to the innovation/R&D function. In the case of InnoFlex, since all functional business units are adopting an innovation strategy, corporate network and innovation networks are more or less the same. However, in Circular and Biozyme, network organizations mainly refer to their global R&D structures. Moreover, InnoFlex is a small company compared to the other two giant TNCs (Circular and Biozyme), so people may think it is not a suitable case. However, I would even call InnoFlex a TNC since it adopts a transnational mindset that aims at global innovation, operates as a broker in different knowledge networks, and provides differentiated furniture fabrics for different markets (Bartlett & Ghoshal, 2002). Neither size or nor number of employees were the main criteria when choosing cases for this research.

The case study companies were chosen because, on the one hand, they share something in common: they all have leading positions in their respective fields through a prospector's strategy, and they all declare that they have networked organizations. Yet, on the other hand, responding to the theoretical replication principle, though the three case companies have a network organization, their network organizations are achieved through different means, which will provide us with conclusions on diversity in practice and possibilities for theory building.

3.2 Data collection and data analysis

Both primary data and secondary data are used to support the analysis and theory building process, which reflects the principle of data triangulation (Yin, 2009). Primary data are collected from interviews and open discussions with R&D directors and R&D managers in both Danish headquarters and Chinese R&D subsidiary (See Table 2). Some interviews are open (discussions) and encourage key informants to discuss the most important issues related to their organizational design and management challenges. Most interviews are semi-structured and guided by a questionnaire of open-ended questions. An interview or discussion takes around 1 hour, some of which are up to 2 hours. Moreover, before choosing these three cases, I had a discussion with each of them to investigate their organizational structure and innovation management and to see whether they are suitable cases for this research.

Most interviews were recorded and transcribed, and notes were taken during discussions. Reflections on interviews and discussions were taken down after the

interviews. Besides primary data, secondary data are collected mainly from case companies' websites and annual reports. Each of the three case companies have detailed annual reports to which I had access, and I went through their annual reports from the past ten years; these reports added up to around 2100 pages in total. These reports provided me with very in-depth background knowledge about the case companies and even some interesting descriptions on internal networking and partnership with external firms.

Table 2. Overview of interviews and discussions.

Cases	Key informants	Interview & discussions	Total hours
Case 1: InnoFlex	5	9	11.75
Case 2: Circular	8	9	13.5
Case 3: Biozyme	6	9	10.25
Total	19	27	35.5

In an exploratory case study, data collection, analysis and theory building processes are usually integrated. I followed Glaser and Strauss (1967)'s data coding and theory building process, which is widely used in exploratory case studies (Bryman & Bell, 2007; Miles & Huberman, 1994). The interview transcripts, discussion notes, and secondary data of each case were coded through an iterative process, i.e. moving back and forth between theories, case data, and emerging theoretical patterns. Following the principle of theoretical saturation (Glaser & Strauss, 1967), the three cases' data were collected and analyzed sequentially. After finishing the analysis of Case 3, I found my theoretical framework logically complete, and therefore I stopped increasing the case numbers. The empirical findings will be presented in the next section.

3. Findings

As mentioned before, the research focus of this paper is on the internal organizational design. The three case companies represent three types of network organization that adopt different underlying logics, i.e. market-led network organization, culture-led network organization and directed network organization.

4.1 Market-led network organization

In order to create value and optimize resource allocation, Case 1 (InnoFlex) adopts an internal market mechanism to assist the strategy of being a prospector. Based on this remarkable feature, I labeled the first form as "market-led network organization".

In the same way as the other companies, InnoFlex differentiates business units according to their functions. Each business unit consists of a team of specialists. In InnoFlex, a business unit is an independent profit center with its own mission statements, targets, strategies, action plans and budgets. That is to say, each unit has a high degree of *autonomy* of decision making which can reduce dependency on the top management. Resources across different business units are no longer coordinated by the top

management, but are coordinated by an internal market mechanism. One business manager describes the organization as “an internal shopping mall” with different competences. Each of the business units and its employees are empowered to identify and search for resources that they need. For example, if one business unit needs support from another one, it must pay a commission to the collaborating units based on working hours. This also avoids internal resource redundancy, since non-profit employees or business units cannot survive in such a market-led network organization.

Such a market-led network organization also enables *flexibility* of the organization. Firstly, with no complex reporting systems and with the unit being responsible for their own profits, each business unit is faster to change and take action. Secondly, since each business unit and employee can choose their own partners, a business unit may not need to always collaborate with internal colleagues on innovation projects; it is allowed to choose external partners and establish innovation networks when necessary. This dynamic and flexible organization makes each business unit act as a broker in its respective business networks, thus enabling them to utilize innovation resources from both inside and outside of the firm. Thirdly, each employee is empowered to take the initiative to bring about innovation and “speak things into existence”, which means that each employee is obliged to seek business and innovation opportunities proactively rather than waiting for jobs to be arranged by top management. Moreover, employees are encouraged to define their own job roles according to their specialties rather than being forced to do specifically laid-out jobs. This market-led network organization not only enables bottom-up innovation, especially employee-driven innovation, but has also helped InnoFlex overcome the financial crisis due to its flexibility and fast reaction to market changes. One business developer says,

I would say that probably, if we had not changed at that time, we would have been dead by now.

These advantages aside, this market-led network organization also has some major challenges. First of all, a market mechanism could bring about fierce internal competition rather than collaboration. Responding to this challenge, InnoFlex makes sure there is very little overlapping between business units’ responsibilities, which makes these business units interdependent to each other. Thus, although there is an internal market, business units are not competing with each other on the same part of the value chain. The only competition between different units may be the ability to create values. As described by one innovation manager:

There is little overlapping as each unit has an area of responsibility. The relationships between masters are a supplier and customer relationship.

In addition, since internal business units are highly autonomous, they may have different interests and goals. Another challenge then, is how to unite internal business units. InnoFlex’s top managers try to promote a strong corporate culture and common

strategy that glues the business units together. Therefore, as explained by a manager, each business unit tends to regard InnoFlex's other units as the first potential partner when considering an innovation project, due to the trust built up from previous collaboration experiences:

The glue between business units is culture... Since each unit already knows that internal masters have the professional knowledge and there are trustful relationships between them, the internal units are still the first choice.

4.2 Directed network organization

The second type of network organization is labeled as "directed network organization". The idea of global network organization came out in 2008 in Case 2 (Circular), and it was based on the working atmosphere in the Danish headquarters, where colleagues interacted proactively. Thus, Circular aims to promote the working environment of a network to the whole global organization. As described by one technical director:

We should have a network organization where we are working together as if we were sitting under the same roof.

Circular is trying to change to a global network organization, and the main reason for changing the existing organization is summarized by one technical director, i.e. utilizing global resources:

The old organization was perfect if the whole development were in Denmark...But once you start having part of the development in different time zones, different cultures and different maturities, you have to create a different organizational structure than just a matrix organization. Because our present organization is really not scalable to take full advantage of new colleagues in other countries, our way of working has been very much designed by how we have been working in Denmark.

With the same purpose of mobilizing global resources efficiently, Circular uses different principles to design its global network organization when compared with InnoFlex. Its matrix structure has not radically changed and its global R&D network structure is developed based upon this structure. Global R&D subsidiaries hold specialized competences and complementary resources, so they are interdependent with each other. In addition, each R&D subsidiary has global responsibilities rather than focusing on its own local market. In addition, virtual departments that consist of geographically distributed employees and globally responsible teams are established to facilitate knowledge sharing and global innovation projects. Here are some descriptions made by one business manager:

It's important to allow people to work in a network-like structure. For instance, colleagues working on electronic development globally are part of a community regardless of their reporting lines, so we tried to create what we call a virtual version of a technical department. One manager will have resources in China, Hungary, Denmark, and the US...We will sort of have a matrix structure, in which we establish global delivery streams. For instance, in one delivery stream there will be pumps, and that

stream will deliver all pump development to the entire Circular group. I mean to the site in China, Hungary and Denmark, and probably also constitute employees at all sites.

Circular's managers direct and are responsible for the networking performances. For such a big TNC, Circular believes that managers' support and supervision is absolutely necessary. The networking statistics such as knowledge sharing, cooperation times and trust levels are gathered, and the networking performances of each employee and business unit are mapped and evaluated, so managers can find more isolated areas and employees. In addition, within a network consisting of global employees, for example the aforementioned virtual technical department, there will be one manager responsible for the internal knowledge sharing and innovation performance. Moreover, within such a technical department, a core team is established around the manager for driving the activities in the network. Therefore, if one site's networking is unsatisfactory, the responsible manager will answer for that. One example is given by a commercial director:

We've had some problems with our Hungarian colleagues, they are not very active. But that's mainly because their manager thought it was a waste of time and wouldn't allow them to do so. The manager is no longer there, we do not think he is suitable for our organization.

In actual fact, Circular's high level managers are quite aware of the "academic version" of network organization that introduces a market mechanism, but they are not fully convinced. Budget and innovation projects are still centrally coordinated. As explained by an R&D director:

Probably we are not convinced that it (spaghetti organization) will give better results. There are always some projects that are considered more important than others. For the top projects, I guess as managers we would like to give our best project to the best people, making sure that those projects become a success. Also, if one project has a problem, we may know who is able to solve the problem, and we assign that person to the problem.

One of the challenges that such a directed network organization may come up against is cultural differences, i.e. some regions are reluctant to interact with others. The example of Hungary mentioned before demonstrates this. Another challenge is that since the autonomy of decision making is restricted from the top, employees may feel that they are being forced to network. Also, the incentives of networking may be merely satisfying managers and meeting the requirements. One technical director explained the reason for enforcement:

We have tried to enforce that for the first couple of years to encourage the habit of sharing knowledge. We were in doubt as to whether it was a good idea, but we did a complete competence mapping of all the staff within each of the communities... and most people are proactive now.

4.3 Culture-led network organization

Similar to Case 2, Case 3 (Biozyme) also maintains its matrix organization while having their version of global network organization. According to one senior R&D director:

For 30-40 years, networking has become their way of working and their gene. Nowadays, more than 80% of R&D projects are global rather than local. Global R&D subsidiaries' resources are integrated.

Therefore I label the third type of network organization a "culture-led network organization". To me, such a culture-led network organization can be regarded as the improved/upgraded version of directed network organization, in which global R&D subsidiaries are interdependent and globally coordinated. One key feature of Biozyme's network organization is that although it has a formal structure with different levels of authority still in place, the decision making is made by global teams of specialists rather than a sole executive. One example of such group decision making is the project portfolio committee, as described by a senior technical manager:

We have a committee called project portfolio committee. They are responsible for all the R&D projects that are running across different industries in the whole company. They prioritize the entire project and the resource allocation. Every half year, they will have a meeting to review all the progress for all the projects. During that meeting, each project should be reviewed on the status, resource allocation, and next steps in the next half year, etc.

Another example is the industry strategic group (ISG), which is a functional group that makes decisions regarding the approval of developing a new idea into an innovation project, resource allocation, and termination of innovation projects. Each industry will respectively have an ISG group. As described by a senior business manager:

The ISG is a cross-functional group. We are responsible for the whole project setup and termination. We also launch the project and decide whether we should invest more on this project or less. Normally there is a marketing director for a specific industry. Then we have an R&D director overseeing the R&D activities in that specific industry. And then we have a production director, a director from patent and licensing. Normally it consists of these four people. So they make most of the decisions related to the specific industry.

Besides these two decision-making groups, employees are encouraged to identify their own network organization consisting of stakeholders inside the whole Biozyme group, so when they encounter problems or discover opportunities, they know where, and to whom they can go. Such a stake-holder management style is described by a senior technical manager as follows:

We just had a so-called stake-holder management tool in our department. So we asked each scientist to figure out who the internal stakeholders are for their projects. And then they have to figure out who the stakeholders will be and they also make a plan as to how they should maintain our established relationships. These are internal partners, so it's also a big internal organization.

In order to facilitate internal networking across global business units, Biozyme has a full-disclosure information system that provides global employees with an infrastructure and platform for knowledge sharing and communication. An internal IT system serves several functions. Firstly, by using the internal IT system, project members may be able to track the job processing and discuss problems related to the project. Secondly, the internal IT system serves as a knowledge pool in which employees are able to find the knowledge they need. Thirdly, the IT system can also be used for bottom-up idea generation and innovation project initiation since employees can propose their ideas on the ideation database. The bottom-up project generation process is described by a technical manager as follows:

When I have a new idea, I will do some scouting work first without formal resource allocation. I need to squeeze in my schedule and do it. If the idea turns out to be promising after some proof-of-concept trials then I will discuss this idea with my colleagues and write a formal proposal. After the approval of the ISG, I can initiate a project based on this, and probably be the project leader.

There are some challenges related to such a culture-led network organization. Firstly, long-term cultivation is needed to substitute traditional hierarchical control and administration. Secondly, networks of internal projects are sometimes too loosely coordinated. A third issue is related to the tension between high level management's commitment and project member's enthusiasms, which is a fundamental conflict between hierarchy and bottom-up innovation. Since resource allocation is still held in the hands of higher management groups such as the ISG, one project may not get enough attention from the top. One senior business manager describes the challenge:

Technically they rarely formed a real "group" to work together and to solve problems or issues from the trials in that project. Maybe from the top level side, they didn't commit that we should make this happen. My guess could be that for this project, it is not something of top priority in their head, so they don't think this project is very important to them, but to Biozymes, we felt that this should have been very important.

4. Discussion

5.1 The Dual Organization?

The above findings show that companies may adopt their own logic when designing a network organization to facilitate global innovation. Moreover, the three case companies show dualities of the three coordination modes, i.e. market, hierarchy and network.

Case 1's network organization by nature has the duality of network principles and market mechanism. However, though there is little hierarchy left in Case 1, it still has a CEO that is over and above all business units. It is difficult to pinpoint the role of the CEO, since a CEO can be regarded as a combination of authority, guidance, rich knowledge, and the capability to see business potential across all the business units. Perhaps we can say that the CEO is like a bee moving around and collecting information

from all business units in order to facilitate the prosperity of all of them. Thus, Case 1 still maintains hierarchies within the organization to a small extent, which are regarded as necessary for maintaining some formal guidance and in order to unite the internal business units by its managers.

Case 2 and 3's formal matrix structures have been maintained, and it is based upon this structure that their global network organizations have been established. Compared with Case 2, Case 3 has a softer version of directed network organization, in which a strong culture that is commonly shared by all global R&D subsidiaries acts as an invisible power that stimulates internal knowledge sharing and innovation collaboration. In addition, traditional hierarchy in Case 3 has been changed to leadership, guidance, cultivation and facilitation of a collective vision, team-based decision making, etc.

Furthermore, we can also identify market mechanism in Case 2 and 3. For example, after finishing production, their global production sites will sell the batches to their sales companies based on internal prices. However, these transferring prices are set from the top rather than being negotiable. In addition, there are some departments in Case 2 and 3 that have the autonomy of setting market prices rather than waiting for arrangements from the top. Thus, from the above findings, we can see that an internal network organization in practice is dual or even ternary in terms of the three coordination modes, i.e. market, hierarchy and network.

5.1 Summary of the three network organizations

Table 3 summarizes the key features and main challenges of the three types of network organizations shown in Section 4, i.e. market-led, directed, and culture-led network organizations.

Table 3. Three types of internal network organizations.

Categories	Features	Main challenges
<i>Market-led network organization</i>	Internal market mechanism instead of commands and directions	How to unite different units to work towards a common goal and identity problems.
<i>Directed network organization</i>	Top-down promoting, managers as supervisors and facilitators. Creation of a set of index or targets to measure the performance of networks.	Loss of autonomy and the ability to self-organize. Employees are forced to be networked. Motivation comes from satisfying bosses.
<i>Culture-led network organization</i>	Strong corporate culture and core values as invisible hand guiding employee's behaviors. Group decisions.	Culture differences, long-term cultivation. Floating and too loose, inefficiency of resource allocation, incentive problems.

The first form of network organization, in accordance with Miles and Snows (1986, 1992)'s suggestions, adopts an internal market mechanism to allocate resources between business units. It is worth noting that, in economics, market transactions are one-off and a rational man has no memory about the past. In a market-led network organization, the market mechanism twists with the accumulation of trustful relationships and successful experiences. If we consider an extreme case of a market-led network organization, where each employee generates business value and work as a self-employed entrepreneur inside a company, there will be intense competition within a firm. In the long run, a firm may lose its internal cohesiveness and its network organization may turn into chaos. Employees may snatch customers from each other, and although this may stimulate each employee's potential, it is a waste of resources. Thus, the main challenge is how to unite internal business units and make these units consider themselves as part of a company, i.e. identify the challenge (Kogut & Zander, 1996). The solutions to this challenge could be, firstly, to make sure that different functional units located at different parts of the value chain are interdependent to each other, and secondly, cultivating a strong corporate culture that glues these business units together .

The top managers of directed network organizations believe that experienced managers may have a better understanding of where strategic resources should be allocated. The main purpose of such a network organization is to fully utilize global competences, which can avoid duplicate investment in the same competency in different subsidiaries. Guided by managers, globally distributed subsidiaries are becoming interdependent, and employees from different subsidiaries are able to work together seamlessly on a global project. Virtual departments consisting of globally distributed employees with global responsibilities are emerging across the TNC's formal structures. The main problem of this network organization is that the autonomy of employees and business units are restricted, which might harm the employee's potential. Another issue is that employee's motivation for establishing their own innovation networks is to fulfill their manager's requirements, and once the control becomes too loose, employees may become passive again.

The third type of network organization is based on its strong corporate culture and long history of cultivation. In Case 3, different forms of group (network) decision making and responsiveness are adopted, and the employee's innovation potential is highly encouraged. For example, employees can generate their own innovation idea, do some trials, apply resources from the top, and initiate an innovation project from a bottom-up process. The hierarchical reporting structures are hidden behind the overlapping networks between employees, and groups of managers act as gate keepers at each stage of the R&D project, while still leaving much space for self-organizing. Thus, there is a challenge for

managers as to when they should play the control card and when they should let the organization self-organize.

In the extreme case of a culture-led organization, there may be two potentially challenging situations. One situation could be that internal business units would be strongly tied through the cultural values and behaviors. The organization is not a hierarchy in the traditional sense but is rendered stable through values and routines. Therefore, the flexibility and dynamism of a network organization could be harmed. Another situation could be that the organization would lose cohesiveness since little control remains. Employees might do things according to their own interests, having lost the incentive of achieving the common objectives of the company since they won't gain any benefits from doing so. Moreover, employees with more critical knowledge resources may receive more collaboration invitations and hierarchies may emerge again, i.e. resources will be more concentrated within a few employees or business units (Diefenbach & Sillince, 2011). The above two situations could cause an organization to turn back to a certain degree of hierarchical control, just like in Case 2. Yet another direction may be that the company adopts a market mechanism such as Case 1 does, making individual business units and employees into profit centers and creating incentives of value-adding collaborations. Indeed, a profit-seeking company is not a social network of groups, it can hardly rely solely on network features such as trust, knowledge sharing, self-organizing and interdependence to create value-adding innovation.

5.3 Overlap of market, hierarchy and network

Market, hierarchy and network are theoretical constructs, and it's hard to find pure forms of these three modes. From this study, we can see that the relationships between the three coordination modes in reality are overlapping rather than discrete (See Figure 1). According to different design principles, we can see that directed and market-led network organizations are in reality based on duality, so they are placed respectively in the overlapping areas of market and network, and hierarchy and network.

In a culture-led network organization, a strong culture acts as an invisible hand and stimulator that guides and regulates employees' behavior. Employees believe that they are capable of bringing about changes and therefore proactively engage in innovation related networking activities. Thus, the culture-led network organization mainly shows the principles of networks (Powell, 1990). However, as shown in Case 3, hierarchies are "hibernated" rather than completely eliminated. Whenever immediate decision making and resource mobilizing are needed, we may still see strong authority held in top managers' hands. As discussed in Section 5.2, we can see that an organization cannot rely solely on network principles, so it is not stable and may become a directed-network organization or a market-led network organization. In essence, as proposed by Farjoun (2010) and Sundbo (2001), organizations must integrate and reconcile the requirements

of keeping both stability through formalized rules and structures, and innovation and change through networks. Thus, stability (hierarchy) and change (network) are fundamentally co-existent and even mutually enhancing in an organization.

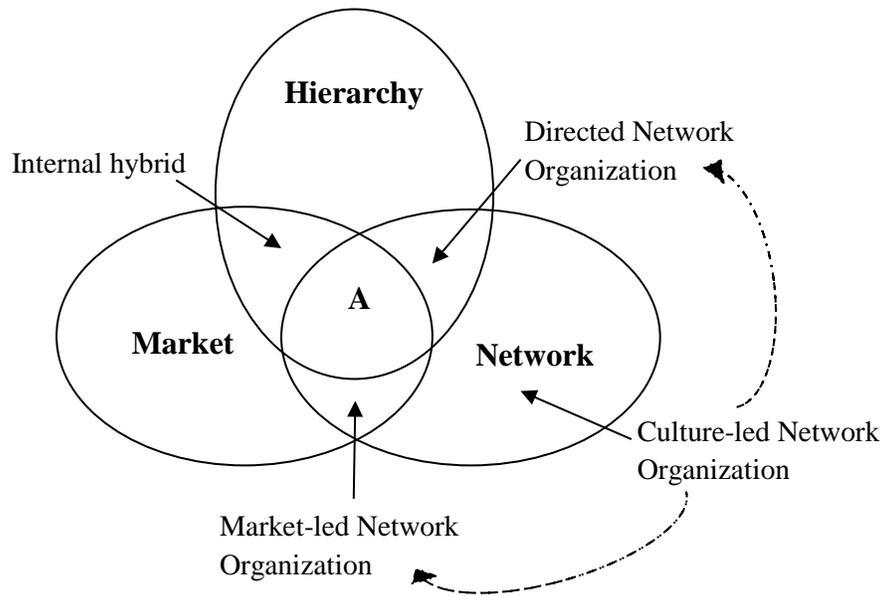


Figure 1. Overlap of market, hierarchy and network.

If we take a look at the highly cited propositions of Miles and Snow on internal network organization, which has a set of key elements such as vertical disaggregation, brokers, and full-disclosure information systems (Miles and Snow, 1986), we may find that they don't even mention trust, interdependence, mutual benefits, long-term oriented, etc. It seems that Miles and Snow's network organization is actually based on Williamson (1991)'s dichotomy of market and network. Their network organization is actually in line with the concept of internal hybrid (Foss, 2003; Zenger, 2002), or we may say it is a dual organization of market and hierarchy. In Figure 1 internal hybrid is shown in the overlapping areas between hierarchy and market.

Besides the above discussions on dualism, Zone A in Figure 1 integrates all three coordination modes, i.e. a ternary organization of market, network and hierarchy, which is still mysterious to us. Generally speaking, three coordination principles as well as three ultimate presumptions are integrated within Zone A as shown in Table Error! No text of specified style in document.4.

As a coordination mode, network assumes that every employee has the innovation potential, and the motivation of hardworking comes from gaining reputation among peers. Therefore, a network encourages bottom-up innovation potentials through cultivating

internal trust, interdependence and knowledge sharing opportunities between different business units. In order to facilitate the global innovation strategy, a ternary organization may use network as a main design to facilitate flexibility and bottom-up innovation while mixing market mechanism ensuring fair cooperation and hierarchies ensuring responsibilities and formality. Hierarchy clarifies chains of responsibility and regulatory rules to ensure the stability of an organization. Moreover, a hierarchical form assumes that every employee likes to be regarded as more important in a group and wants to own more authority and resources than others, which is also the source of incentives. A market form assumes that all individuals are rational profit seekers. Therefore, adopting an internal market mechanism can optimize internal resource allocation and track value creation clearly.

Table Error! No text of specified style in document.4. Comparison of the three coordination modes regarding firms' internal organizations.

Coordination Mode	Ultimate Presumptions on Employees	Coordination Purpose	Coordination Principles
<i>Market</i>	Rational profit seekers	Clearly track value creation and optimize internal resource allocation	Internal market mechanism: buying and selling based on market price, internal competition.
<i>Hierarchy</i>	Promotion seekers	Stabilization and formality of organization	Routines and regulations, chains of commands and responsibilities
<i>Network</i>	Potential innovators, gaining reputation among peers	Innovation and flexibility, especially employee-driven innovation	Trust, interdependence, mutual benefits, commonly shared culture

Yet, does such a ternary organization exist in reality? From the case companies, we can see that the ternary organization that integrates principles of market, hierarchy and network has already been a common phenomenon. In a market-led network organization (Case 1), the remaining hierarchy manifests itself in the CEO's leadership and guidance. In a directed network organization (Case 2), internal transfer prices and departments with autonomy for price setting are emerging. Thus, at the end of this paper, we propose the following: organizations, especially transnational corporations' organizations, are moving towards a ternary organization with the triplicity of market, hierarchy and network.

5.4 Dynamism of a ternary organization

The balance of three forms, i.e. market, hierarchy and network, in a ternary organization depends on each TNC's practical situation. It may relate to several factors, such as external business environments, a firm's history, the local context and culture, strategies, etc. For example, when the business strategy is to provide innovative products

and services in order to strive for a competitive stance in the market, we may see internal networking being encouraged, and along with that, an internal market mechanism may also be adopted to promote resource mobilization. In such a situation, the hierarchical restrictions and commands may be limited. When an organization has diversified business divisions, and there are limited cross-divisional knowledge flows, a suitable solution may be to render each business division as an independent profit center and adopting an internal market to track value exchanges between businesses units. However, when the organization is suffering from the economic recession, it is no longer wise to give employees freedom to investigate their own interests. In this case, internal networking will be confined, and resource control and regulatory rules aiming at saving costs and surviving in the recession will emerge again. However, research on the dynamism of a ternary organization that integrates market, hierarchy and network is very limited in existing literature, and to address this gap, perhaps this could be a future direction of research.

From the above discussions, I could not help but wonder whether the concept of a network organization is still viable, or whether it just represents the tendency of leaning to the network pillar of the triplicity of market, hierarchy and network modes when companies' current strategy is focused on innovation. Following this logic, the dualism mentioned before means the salience of two coordination modes out the three. An internal hybrid is thus leaning more towards the market and hierarchy pillars, while a directed network organization mainly promotes hierarchy and network coordination modes.

6 Conclusion

This paper investigates network organization in practice based on a multiple-case study of three TNCs' global R&D organization. This research is exploratory in nature and has the following contributions. Firstly, based on an exploratory multiple case study of three Danish transnational corporations' internal network organization, I identify three types of network organization that have different sets of underlying logic, i.e. market-led, directed, and culture-led network organization. Only the market-led network organization adopts an internal market mechanism as proposed by the academia. The alternative ways of designing a network organization lead to a discussion on the viability of the contemporary definitions of a network organization. In particular, we may have to reconsider the advocacy of eliminating hierarchies to facilitate innovation. To me, the hierarchical mode for network organization needs to replace rigidity and commands with guidance and leadership, and when this is the case, it can facilitate rather than hinder innovation.

Secondly, this research discards the view of regarding market, hierarchy and network as discrete and exclusive coordination modes and structures. Here the three modes are

seen as complementary to each other and mutually enhancing. Based on the integration of different modes, different types of network organizations emerge. Thirdly, I show the possibility of creating a ternary organization that integrates all three modes, and actually, in practice, companies are already doing that unconsciously. However, how to balance the three modes and the dynamism of the three modes within an organization along the business cycle could be interesting future research topics. Finally, this research shows different experiences of designing a network organization for TNCs' global innovation, which can provide some managerial implications for business managers.

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