The effects of increasing turbulence on organizational control - some reflections

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Abstract

The following question is addressed in this paper: what will be the impact of an increase in the uncertainty and turbulence facing organizations on the way control is carried out? First, a survey of research in organizational control will be presented. After that the principle nature of control in a relatively certain and a relatively uncertain situation will be explored. Then it is pointed out that a change in control when the situation is considered to be turbulent should not be made unless a comprehensive analysis of the situation has been undertaken. Next, the factors constituting an uncertain situation will be explored. After that the adaptation of controls to a more turbulent and uncertain world will be discussed. Many trends in the current debate and practice on control in organizations seem to be naturally explained according to the perspective chosen in the paper. The importance of studying the interplay between the various means of control is stressed as opposed to the dominating focus on one or two means of control in mainstream research. The paper itself is mainly of the survey type. Results from a couple of recent empirical studies in Sweden undertaken by the author have been utilized.

Keywords: control, organizational structure, turbulence, uncertainty.

Introduction

In a previous paper (Samuelson, 1994) I have suggested that a (or perhaps even *the*?) basic factor causing a demand for control in organizations, is the uncertainty and turbulence they are facing. Previous research in this area has furthermore pointed out that what actually matters is not uncertainty per se, but uncertainty as perceived by those designing control in the organization (see Tymon et al, 1998). Of course, there are also other factors calling for control, such as the need to coordinate activities and to motivate behavior. But, behind these needs we still find the uncertain future to be the factor causing these other needs. At least this is one way of conceiving the rationales for control.

Three major ways for organizations to deal with uncertainty have been suggested in the literature (cf. Cyert & March, 1963 and Thompson, 1967): 1. To internalize a market through the acquisition of a supplier; 2. To make long-term agreements with customers and suppliers ; 3. To improve the ability of the organization to control its situation. This paper will mainly only elaborate on the third way of dealing with uncertainty.

Control in organizations has been designed according to certain ideas and presumptions. When the situation changes there is a need to adapt the way control is carried out. Now the situation facing many organizations has become and/or is conceived to be more turbulent. *The basic*

question addressed in this paper therefore is: what impact will an increase in the uncertainty and turbulence facing organizations have on the way control is carried out?

First, I will discuss the meaning and development of organizational control and present an overview of some major theories and frames of reference in this area. Next, the nature of control in a relatively certain and a relatively uncertain situation will be explored. Then I point out the importance of in any situation to clearly define the problems facing the focal organization before any changes are contemplated. Although the basic idea behind this paper is that the turbulence facing organizations is increasing, it should not be taken for granted that adapting to this is what is mainly called for in every organization. Some organizations may for example first of all need a complete reorientation of its business. Next, the factors constituting an uncertain situation will be explored. After that the major part of the paper will deal with the adaptation of controls to a more turbulent and uncertain world.

The meaning and development of organizational control

Organizational control is as a phenomenon inevitably as old as organizations. Control is an activity believed to contribute to goal-fulfillment of the focal organization. Nowadays a distinction is made between control of an organization by its owners – which is called *corporate governance* in the case of corporations – and control of the organization by management – which here is labeled *management control*. In this paper the major focus will be on management control.

The concept of control has attracted a lot of interest in the literature and many definitions have been provided (see e.g. Flamholtz et al, 1985). The following definition is well in line with the concept dealt with in this paper:

> "…control is any process in which a person or group of persons or organization of persons determines, that is, intentionally effects, the behavior of another person, group, or organization" (Tannenbaum, 1968, p.5).

Control can thus be performed through different kinds of processes and I will below discuss some of these. Another basic feature of this concept of control is the inclusion of intention: control is undertaken in order to achieve some goals as put up by the one who controls.

Research in organizational control is very extensive. Most research is, however, nowadays partial and of a piecemeal character, i.e. the object of research is narrowly defined to deal with one or a few aspects of control. Less efforts have been undertaken to integrate the findings into comprehensive theories of organizational control.

There seems to be more examples of comprehensive theories of control in the first half of the 20th century than in the second half. As pointed out by Thompson (1967) such a development is to be expected for a theoretical field. There are of course exceptions to this general trend. As examples of more comprehensive theories or frames of reference that have been provided lately we have Otley's concept of control package (1980) and the configuration theory forwarded by among others Meyer et al. (1993). This theory is based on the assumption that different means of control are interdependent. It is therefore also an example of a systems theory.

Among the early writers we find Taylor (1911), who is at the forefront of the scientific management movement. His basic idea is that there is one best way of performing every job. The tasks of management are to define these ways; to find, train and reward employees ; to plan and to provide the proper conditions for work. The focus of Taylor´s concept is on controlling operations in a stable world.

Just a few years later on Fayol (1916) published a book in French on the functions of management. They were defined as planning, organizing, commanding, coordinating and controlling. The function of organizing included structuring as well as recruiting. Although these functions were included by Taylor, they were more clearly defined by Fayol. And we still can conceive of Fayol´s description as being fairly representative of the general activities of organizational control.

During the years several changes and modifications have been made to these functions: the meanings have become broader and the terminology has changed. An example is the influential study by Barnard (1938) which was reprinted at least 18 times. He defines the executive functions as maintenance of organizational communication (including scheme of organization; personnel; and informal executive organization); the securing of essential services from individuals; the formulation of purpose and objectives. Barnard summarized his experiences as a manager and he inspired writers such as Copeland (1951), Sloan (1964), Chandler (1962) and Drucker (1954). And the well-known "Principles of Management" by Koontz & O'Donnell, which was first issued in 1955 and came out in its fifth edition in 1972, can clearly be seen to be a bearer of Fayol´s frame of reference.

Still these functions are believed to capture the major means of control available for organizational control. Below a slight modification of these functions is used in the discussion of adapting controls to an increasing turbulence.

After Fayol research in organizational control has diverted into many different fields and directions. First, we find studies focussing on organizational aspects: the administration management school tried to find principles of organization that would maximize effectiveness and efficiency (see e.g. Gulick & Urwick, 1937). Among the principles studied were span of control and delegation. This school was followed by bureaucratic theory (Weber, 1947), although Weber's work was published several years earlier in German.

Next there is a field dealing with behavioral aspects of control. Even though earlier writers such as Taylor have clearly realized the importance of motivation, it was not until the 1930s that research in the behavioral field started. A pioneering study was the one carried out at the Hawthorne works of Western Electric Company by Roethlisberger & Dickson (1939). Among the followers we find names such as Argyris (1957), Likert (1961) and McGregor (1960).

Another field of studies can be called systems or decision-theory oriented, within which we find Simon (1959) and Cyert & March (1963) as meritorious researchers. They reacted against Taylor's scientific views and carried forward Barnard's elaboration of the social-system concept of organization. Their focus is on cognitive limits on rationality and they describe management as almost equivalent with decision making.

After the 1940s quantitative approaches to management emerged. Starting with operations research one field soon broadened to management science. And closely related is the systems

approach to management (see e.g. Luthans, 1973) and cybernetics, a concept coined by Wiener in 1948. The meaning of the concept is to cover control and communication theory, whether in the machine or the animal. It has also been described as the study of "how systems regulate themselves, reproduce themselves, evolve and learn" (Pask, 1961). Beer (1966) has tried to apply the self-regulating principles believed to govern the human brain to organizations. Cybernetics merges into the wider field of general systems theory (Boulding, 1956).

The well-known Harvard-school of organizational control can be conceived of as emanating from systems theory. While several members of the school were engaged in developing what has been called the classical organizational control system (Birnberg, 1998), it was the work by Anthony (1965) that made it known to the wider public. According to this frame of reference there are three subsystems of control: strategic planning, management control and operational control. This structure has later on been criticized in several respects, for example that control has been shown to be very much intertwined and not possible to divide in this simplistic way (Lowe & Puxty, 1989). It can also be noted that the concept of management control is used in a more restricted sense then as defined in this paper.

Of course, there are examples of control structures that to some extent represent a development in relation to the Harvard-school. According to one such frame of reference, a distinction is made between results, action and personnel controls (Merchant, 1982). In another study the structure is based on the characteristics of the use of budgets: profit-conscious, budget-constrained and non-accounting style (Hopwood, 1972).

Another way of looking at the Harvard-school is to point out the major assumptions on which it seems to be based. Birnberg (1998) concludes that this frame of reference is mainly working in stable environments in which the nature of the task is routine. In more unpredictable environments and when the tasks are non-programmed other systems of control are called for. Birnberg demonstrates some general demands that are put on management in these situations, for example to organize for learning and adaptation. He also discusses three current issues for research in organizational control: the increased role of teams or groups; the increased role of cooperation and trust; the need to utilize case and field research.

According to the analysis presented by Birnberg, control is dependent on characteristics in the situation of the focal organization. It is thus an example of a contingency theory, which is another paradigm for organizational control. Initially, this kind of research was applied in organization theory (see e.g. Burns & Stalker, 1961; Woodward, 1965; Lawrence & Lorsch, 1967). Later on the approach was also adopted by researchers in other fields of organizational control, for example in management accounting and control (see e.g. Emmanuel et al, 1990).

Within the field of traditional management control there is also since several years a clear understanding of its shortcomings in the face of the current situation. It is believed to be too restrictive and too peripheral to fundamental needs of contemporary organizations (Otley, 1994).

Another group of approaches has been characterized as anthropological (Berry et al, 1995). The core issues here center around the culture prevalent in an organization and how this culture supports or restrains actions or reactions by the members. One idea is that if management can produce a strong and favorable culture in the organization, there is no need of control; the members will act according to the culture that prevails (Peters & Waterman,

1982). Studies that advance the key role of single individuals primarily with positions as CEO's (Chief Executive Officer) in shaping the culture and control in corporations also belong to this approach. An example is the understanding of the important role played by Jack Welch in redirecting General Electric during the 1980s (Jensen, 1993).

So far different schools in management control have been surveyed. As noted in the beginning of this section these schools can generally be described as going from rather comprehensive (Fayol) to be more specific and partial although a few exceptions were noted in the beginning of this section (Otley and configuration theory). Now it is left to the reader or practitioner to come up with the comprehensive frame of reference; to collect different pieces of information that seems to be relevant to him or her and to build the own world view. I believe, however, that now and then it is well worth bringing together the pieces into a comprehensive frame of reference. Everything cannot be explained by studying their parts. Systems and configuration theory keep telling us that the interaction of parts is of importance per se and in organizations top management has the task and possibility to make changes in one or more means of control with due regard to the way they interact.

I now turn to some comments on the research in control of organizations – corporate governance as it is now labeled. A current and comprehensive survey of this field is provided by the collection of 82 articles edited by Keasey et al (1999).

"Corporate governance deals with the ways suppliers of finance to corporations assure themselves of getting a return on their investment" (Shleifer & Vishny, 1997). This subject has achieved an increasing attention during the 1990s as major investors (e.g. pension funds) have begun to put demands on the management of the firms which have received large investments. The investors actively make analyses of the financial situation and performance of the companies receiving investments and suggest actions to improve performance through the board of directors. The big international consulting firms have been active offering their services in this field (see e.g. Price Waterhouse, 1998).

Others have, however, warned that actions such as takeovers that are supposed to improve performance, will only improve short-term profit at the expense of long-run performance (Lipton, 1989). Funds will be invested in takeovers instead of in research, development and capital investment. There is also research showing that takeovers do not even improve performance in the short run (Bild, 1998).

Shleifer & Vishny (1997) in applying an agency theory perspective on corporate governance, first of all deal with legal protection of investors and concentration of ownership as the major means of governance.

One study tries to show that the control systems used by corporations until the 1990s have failed thus making room for corporate governance (Jensen, 1993). Johnson & Kaplan (1987) have also advanced similar ideas by describing the rise and fall of management accounting. Clearly this is also a major factor in Williamson's concept of market versus hierarchy (1975): if the costs of internal control are too high, a market solution should be more efficient.

Corporate governance can thus be conceived of as one part of organizational control, a part that from the outside put strong demands on the management. It is the task of management to comply with the demands and to design organizational and management control as means to

this end. As external demand for information is increasing the difference between the information used in management control and that provided external users is diminishing. The information of many organizations that now is available in their home pages through the Internet is not much less than the information that is internally available.

The principle nature of control in two different situations

Let us first consider an organization in a relatively stable and certain situation. We can think of this as approximately a closed system (Thompson, 1967). This situation is characterized by a stable demand; more or less fixed prices on output; a stable technology and thus a stable staff and other input factors. One may wonder if such a situation really exists nowadays? Probably not! But there may be some kinds of situations that come rather close to this one. For example some monopolies and public sector organizations may face such a stable situation.

In such a certain situation it will be possible to determine in advance the optimal combination of production factors to carry out the mission of the organization. After having acquired these production factors, control will be limited to control in the small: to control that the employees behave according to plan and not in an opportunistic way (Arrow, 1964).

In the other case we have an organization facing a real uncertain and changing environment. This case is characterized as an open system (Thompson, 1967). Demand is difficult to forecast; new competitors are entering the market all the time; technology is rapidly changing both when it comes to the design of the output and to the way the output is produced. Furthermore, the labor market is conceived to be turbulent as there is a shortage of well-qualified labor. Actually a lot of organizations seem to face this kind of situation. The ones facing the most turbulent situation seem to be many companies in the information technology market and in the telecom industry. Also the entire public sector has for some time been in a stage of thorough restructuring, which implies a situation of great uncertainty for many entities and their employees.

In the uncertain situation it is not possible once and for all to determine the optimal combination of production factors to carry out the mission. Control will in this case involve all aspects of the business: it will be of the ”control in the large”- type (Arrow, 1964).

But, there assumably is not one optimal way of carrying out control in the large in this situation. There may be some superior ways of doing it and there may also be some inferior ways. For example, it may be better to do just a small amount of planning and put more emphasis on the follow-up of operations than to do it the other way around. In order to cope with variations in demand, companies may confine to activities such as buffering, leveling, adaptation and rationing (Thompson, 1967).

It may also be more effective to run the company in a more decentralized way and let the employees who continuously have contacts with the markets adapt to the changing environment, than to make all decisions centrally.

If demand is very volatile, net income will be as well. Volatility in net income will also increase the higher the rate of fixed costs to total costs will be. One strategy to decrease the income volatility will therefore be to decrease this rate for example through extensive use of suppliers

(i.e. outsourcing) instead of building up capacity internally for the production of all input needed.

If demand seems to be steadily increasing the organization can choose between an offensive strategy according to which capacity is increased based on forecasts, and a more defensive strategy when capacity is increased first when demand de facto has increased. As is shown in a previous paper (Samuelson, 1994) the offensive strategy is more risky but it is also the one that may give the greatest return if the forecasts come true. The choice between these two strategies is similar to the choice between a push or pull strategy in organizing production (cf. Shingo, 1981/84).

It is difficult to control when uncertainty is high. We may expect organizations to try to reduce uncertainty as much as possible (or profitable) so as to reach a more stable position (cf. Thompson, 1967; Cyert & March, 1963). They may for example try to make agreements with external parties in order to turn uncertain variables into certain for a period.

Many situations will fall somewhere in between these two extreme ones. In general it will probably be possible to make fairly good forecasts of the nearest future and to determine the optimal or at least one satisfactory way of running the business for this period. Also in these cases there is not one optimal way of control, but there may be some better and some worse ways.

The start of a change process is problem definition

If an organization is met with some problems (for example declining profits), the very first step to take is clearly to define the problem or problems. This follows from common sense and standard models for change processes (cf e.g. Lundeberg, 1993). I nevertheless believe that is justified to make this comment as far too often people trying to draw attention to one management tool, seem to assume that many organizations are faced with just one problem the solution of which lies in using the suggested tool. This behavior has been described as SOPROD – Solution Oriented PROblem Definitions (Ewing & Samuelson, 1998).

There is, of course, a risk that also the theme in this paper can be criticized for being a SOPROD: that I try to draw attention to increasing turbulence as a general problem to be solved in every organization. I will not, however, argue that all organizations are in such situations. But I do believe that more or less all organizations are faced with uncertainties and also that from time to time organizations enter into stages of greater uncertainty and turbulence. Current examples of shifts in the uncertainty level are when companies place bids for new, big contracts. So long as it is unclear whether the order will received or not the situation is rather uncertain. After receiving the order a stage of increased certainty is reached. Another example refers to mergers and acquisitions where the rate of turbulence is dramatically increasing for the organizations involved immediately after the takeover. A similar situation is also faced in family companies after a sudden death of the owner.

If the degree of turbulence is conceived to have been increasing and profitability has been decreasing, the problem may not be the way the organization is controlled. So changing controls will not restore profitability. The activities involved in defining the problem are shortly outlined below.

The basic factors explaining performance are the mission of the organization and the way this mission is realized. If performance is poor will either the mission be bad or the way it is carried out be bad or both.

To improve performance the first step would be to determine which factor or factors that is/are unsatisfactory. If the mission is judged to be less satisfactory, finding a new mission will be the basic task in changing the organization.

If the way the mission is carried out is found to be deficient, a thorough analysis will have to be made regarding how this is done. This will involve all means of controlling an organization, from the definition of goals to organizing and motivating the employees and to planning and reporting the business.

Control in many organizations is carried out according to principles and methods introduced many years ago. It has become an institution, a tradition or a sediment (Danielsson, 1975; Emmanuel et al, 1990).

In order to evaluate and perhaps change the way control is carried out, it will be to an advantage to begin from the beginning, i.e. to determine the purposes or rationales of control. According to the view put forward in this paper, the basic purpose is to provide means for dealing with an increasingly uncertain future (control in the large). Are the major means of control (organizational structure, formal and informal control systems and the strategy chosen in order to realize the mission) designed in a way that supports the focal organization in managing its operations?

When a clear view of the basic aims of control has been obtained, there are also secondary purposes or rationales of control to attend to (control in the small). These purposes may for example be to help coordinating various activities or to motivate managers as well as all other employees to perform well. In this paper focus is on the design of control to deal with the uncertain and turbulent future (control in the large).

After having evaluated the control system in relation to the basic problem, it should be evaluated in some more detailed respects. Different criteria have been suggested in the literature. According to a newly published frame of reference the control system should be evaluated with respect to how it deals with three dimensions: time, space and aspects (Ewing & Samuelson, 1998). In general, a balance in the way these dimensions are dealt with is supposed to be helpful in achieving long run effectiveness. Furthermore, a change of focus from time to time is also suggested in this frame of reference.

What causes uncertainty?

Uncertainty is, of course, a relativistic concept. The situation faced is more or less uncertain. The degree of uncertainty is determined by characteristics of the product and factor markets: the volatility in demand, prices, wages, interest rates etc.

Variables are uncertain insofar as their actual values in the next period can not be determined in advance. Traditionally a distinction has been made between cases where values of variables

in the future can be determined by certainty, risk or uncertainty (Luce & Raiffa, 1957). In the case of risk it is possible to objectively determine probabilities for various values as opposed to the case of uncertainty in which this is not possible. To some extent it may be possible to try to get more information concerning possible future values (for example through consumer surveys). But uncertainty can never be entirely eliminated. The future values will in uncertain situations have to be subjectively estimated as a basis for actions and decisions.

The demand facing an organization is made up of volumes and prices for different products. If prices are fixed in a price list with due regard to the market situation, the volumes sold of the products will be the key uncertain variables. The reasons why the volumes are not known for sure in advance will differ between markets. For some consumer markets weather will be an important and uncertain factor. In other markets, changing regulations or taxes levied will have an impact. In other cases competition is rather keen with new products continuously coming out on the market.

With regard to production there is uncertainty both in the markets for all kinds of inputs as well as with regard to the technology for turning input into outputs. Uncertainty in the input markets is generally caused by the same kind of factors as those causing uncertainty in the output markets: weather conditions, regulations and new products. New technology will have an impact as it will change the most efficiently way of producing the products and so lead to a competitive advantage for companies rapidly adopting the new technology. The same will be true when it comes to the technology built into the products. Previously technology did change at a slow path; but nowadays technology especially when it comes to information technology, is changing at an astonishingly high speed as is commonly recognized.

The degree of uncertainty varies between markets; some are mature and rather stable while others are new and turbulent. This seems to be valid at one point in time. But over time the conditions may change for a market. An entrepreneur may for example consider a stable market to present a business opportunity. By entering the market the former companies will face a period of turbulence. Examples of this kind are found in former public monopolies which are opened up for competition, e.g. the telecom market. An example concerning a regular market for consumer goods is found in furniture, where Ingvar Kamprad, an entrepreneur and founder of the Swedish company IKEA, introduced new ways of selling and distributing these goods (Björk, 1998).

What factors do Swedish companies perceive as the ones being the most uncertain? This question was one of many asked in a questionnaire we sent to all listed companies in 1996 (Johansson et al., 1997). The companies were asked to state with what degree of certainty a number of factors could be determined one year in advance. In a 7 point scale 1 stood for very low certainty and 7 for a high degree of certainty. Almost 100 companies answered according to table 1.

	Arithmetic mean	Standard deviation	Percentage 5-7
Production technology	5,8	1,1	89%
Product attributes	5,7	1,1	88%
Supply of input goods	5,4	1,1	76%
Labor disputes	4,9	1,4	60%
Competitor's behavior	4,6	1,2	62%
Input prices	4,1	1,4	42%
Demand	4,0	1,3	39%
Public rules and regulations	4,0	1,6	38%

Table 1 Perceived relative uncertainty of various factors

What perhaps is the most surprising result according to table 1 is that public rules and regulations is graded as the most uncertain variable jointly with demand (which is not surprising). One reason behind this probably is Sweden's at that time new membership in the European Community and the large amount of new regulations that accordingly was enforced. Another reason probably was the large problems in Sweden's economic situation: a comparatively high rate of unemployment and a large budget deficit. Our government tried to solve these problems in imposing a lot of changes in our welfare systems. There are also industries, such as the construction industry, that more directly are affected by changing political intentions.

How to control in increasingly turbulent situations?

In this section I will, based on published findings, discuss how the major means of control are adapted to a situation conceived to be increasingly turbulent. The four means chosen are derived from the previous survey and here defined as follows:

1. design of the *organizational structure* including the appointment of people with the right knowledge and experiences to the positions and the design of the *reward system*
2. design of *strategies* based on the mission of the organization
3. *formal control systems* such as a planning, budgeting and control system
4. *informal control systems* such as establishing a certain culture and ways of conduct within the organization.

All four types of control may explicitly be designed with regard to the effects on the organization's ability to deal with uncertainty as will be shown below. As previously noted a basic presumption in the paper is that adaptation to a more turbulent situation should, to be most effective, not only involve one means of control but the simultaneous adaptation of several means. I will try to point out examples of interactions of this kind. In principle the ways of dealing with a turbulent situation is believed to be the same in any society. The examples given do, however, refer to Western societies.

Organizational structure

One basic issue in determining the structure of a corporation is to decide on what activities that should be brought out internally and what activities or parts that should be bought from external suppliers. One rule has been to include activities that if placed in the environment would be crucial contingencies (Thompson, 1967). Now, in many cases just a few activities are considered to be that crucial. Currently we learn how companies engage in many alternative forms of cooperation with other parties: through alliances, networks, joint ventures and through the building of virtual companies (Hedberg et al, 1994; Whitley, 1999). Other current concepts contributing to fewer activities being carried out internally are outsourcing and shared services.

Above a more decentralized structure was suggested to be more effective than a centralized to deal with turbulence and uncertainty. In their influential book March & Simon (1958) propose that "under rapidly changing circumstances specialization will be sacrificed to secure greater self-containment of separate programs" (op.cit., p. 159). A study giving some support to this proposition was carried out by Gul & Chia (1994).

The degree of decentralization is a relativistic concept. Precisely what degrees of freedom that should be given to each employee should be made explicit and based on the effects on the organization's ability to effectively adapt to changes in the various markets .

A high degree of decentralization may rise problems in the coordination of different activities. Changes in demand will lead to changes in production and in the purchases of input. Coordinating these activities can for example be done through grouping them together in profit centers or through the establishment of coordinating mechanisms (cf. Galbraith, 1977). The advocates of BUNSHA follow a philosophy according to which no business unit should have more than 50 employees (Sakai & Sekiyama, 1989). This is a far-reaching way of decentralizing a company into profit centers.

To decentralize responsibility means that more is demanded from the employees. When recruiting people more trained and well-educated people are sought. And changing the responsibilities will also call for training of existing employees. Such changes can also be assumed to lead to adaptations in the formal and informal control systems. When it comes to the informal systems they will have to be adapted to the new structure of responsibilities so that people know "by heart" who will decide in various matters and on which grounds the decisions will be taken. Changing routines takes time. Therefore organizations run explicit programs focussing these matters.

Also the formal control systems will have to be adapted to new responsibility structures. Decentralization will probably mean that more profit or investment centers will be used and results control may be applied (Emmanuel et al., 1990). Results control means results accountability: standards of performance are defined, performance is measured against these standards and rewards are provided for desired results. It goes perhaps without saying that this also means, that these centers are mainly controlled by financial measures such return on capital employed or return on sales. The centers are normally given the right to decide freely on how to reach established goals. As few restrictions as possible are put on them in order to induce a flexible behavior in the face of uncertainty

An activity characterized by a very high degree of uncertainty is research and development (R&D) in the pharmaceutical industry. One former president of a large company in this industry, commenting on the genuine uncertainty of R&D, told us [1] that

controlling an industrial enterprise in participating in a lottery is not simple .

The way they did control R&D was mainly through recruiting very skilled researchers or engaging them in advisory bodies and through a rather tight follow-up of the research projects. This may at first seem to contradict the general strive for decentralization in handling uncertainty. But realizing that the R&D activity actually belongs to one basic business unit, this may not be the case.

According to agency theory the reward system will have an impact on behavior when the situation is characterized by uncertainty (cf. Scapens, 1985). The key factor is to decide on to what extent the risks should be shared between the agent and the principal. A risk-sharing system will induce a more risk-avert behavior of the agent than a system where the agent has to bear the full risk. The design problem for top management is thus to decide on what kind of behavior that is wanted of the agents.

There are a few studies on the relationship between perceived environmental uncertainty and the design of reward systems. Some of them use agency theory as a basis. For example, Kren & Kerr (1993) found, based on a questionnaire answered by 80 divisional managers in 63 manufacturing firms among the Fortune 500 companies, that the rate of performance-contingent pay increased when uncertainty increased. This was the case for companies using low monitoring control. But in companies where monitoring was high, the rate of performance-contingent pay decreased with increasing uncertainty.

Strategy

In defining how the mission of the organization should be realized many aspects are to be worked out, for example the product structure, price strategy, services provided, customers and markets to focus, where to place factories and other facilities, what to make and what to buy and choice of suppliers. In all these cases decisions will have to be taken with due account of the influence from different possible outcomes of key variables. As concluded by Kloot (1997) this will when turbulence is increasing, have to involve more managers and employees than just a small group of senior managers.

Here a couple of examples of how strategies are designed and/or adapted to turbulent and uncertain situations will be given.

In expanding into new markets a strategy that will minimize risks and uncertainties is sometimes followed. IKEA has been very successful in its expansion into new markets (Björk, 1998). IKEA has very thoughtfully chosen what markets to enter and as a first step testing its concept in the new market. An alternative to testing or experimenting in situations in which knowledge about cause/effect-relationships is low is through analogizing, i.e. to try to find similarities between the current situation and a previous one that the decision maker has

experienced (Nilsson, 1996). Not testing, choosing wrong markets and too many markets will expose a company to more risks than necessary.

In a situation where the technology is rapidly changing the design of many components used, it will be to an advantage to buy components instead of making them oneself. Much of the work to adapt to the new technology will then be taken care of by the suppliers while the focal organization can concentrate on adapting the product to the final consumer. We find this behavior to be increasing for example in the car industry. In this industry many joint ventures have been established between competitors aiming at developing new components. The logic behind this is the rising costs for research and development (R&D) in this industry.

Changing strategies will also imply adaptation of the other means of control. Organizational structures will have to be changed for example when the new strategy is based on more extensive use of external suppliers. This will in turn lead to changes in the formal control systems as former cost centers are eliminated in exchange for external suppliers. It will also motivate an information program in which the rationales behind the new strategy are explained to managers and employees. If they understand the new strategy they may perhaps find more activities that may be handled in a similar way.

Formal control systems

Formal control systems include all planning and control systems used. Some years ago, when the situation was comparatively stable, many organizations developed comprehensive and detailed planning systems. A lot of effort was put into making these plans mainly on a yearly basis. A lot of effort was also put into the follow-up of the plans. As the situation became more turbulent it became more and more difficult to come up with realistic plans. The plans were based on premises that were valid at the moment when the plans were made. But soon enough some premises changed and the plans became unrealistic. It was for example experienced that the budget was out of date already at the beginning of the budget year as it was based on premises that seemed to be relevant a couple of months ago.

In the face of increased uncertainty the control systems may be changed in three major ways: 1. Instead of doing plans only once a year, planning is turned into a more continuous activity ; 2. Relatively more effort is put on follow-up in comparison with planning ;
3. The amount of information collected and spread within the company will increase.

In the questionnaire referred to above (Johansson et al, 1997), questions were asked about how control was carried out. We have made statistical analyses of possible covariance between control and situational variables[2]. We found that in more uncertain situations the faith in planning in general is less. This conclusion is valid for most uncertainty variables in Table 1 above. No correlation was, however, found between the control variables and uncertainty in demand and with product attributes.

In Sweden, Wallander (1994) has since the early 1970s pointed out that a fixed yearly budget will limit the ability of the organization to adapt to new premises. Swedish companies have gradually changed their budget systems to cope with the more turbulent situation. First, not only were the budgets followed-up on a regular basis. Revised forecasts were also made three or four times a year in order to evaluate the effects of new premises. In the middle of the 1990s

several companies have also changed their systems into a rolling planning system. Thus, plans are made three or four times a year for another 12 months period. Alternatively, plans for a fixed two-year period are revised three or four times a year. A forest industry company makes monthly updates of the profit forecast for the current year based on current prices, exchange rates, volumes etc.

The president of a large producer of consumer durables newly concluded, when interviewed by us, that

> *markets and competitors change so quickly that a one year budget offers a too long planning horizon to be suitable for a short run system.*

Wallander (op cit.) himself is an advocate of a system based only on follow-up: ”it is better to adapt instead of to plan” is his slogan. He designed his system for a bank and it is probably well adapted for such an industry: the system was designed in the early 1970s and is still in use. The bank has been the most successful in this industry in Sweden since then.

In a study of two corporations operating in similar situations except that one was facing much more uncertainty than the other, Alam (1997) found some differences in how the budgetary process was carried out. The corporation facing intense uncertainty in the task environment placed emphasis on the management of external relations to improve its position in its external institutional environment. The internal budgetary process was rather limited. The other corporation facing less uncertainty was able to generate information in its major area of uncertainty and based its budgetary process on an extensive use of information for strategy formulation. This study therefore clearly supports the tendency among companies to decrease the amount of budgeting in the face of uncertainty.

In changing the formal system from one mainly concerned with details of the current year to a system open to changes and to adaptation, the focus of the system will also change from internal to external variables. The traditional systems have mainly been involved with detailed plans for the use of resources inside the organization, while a system adapted to a turbulent environment first of all will depict what is going on outside the organization. In relation to this Simons (1995) has suggested that the control system of the company should be divided into two parts, one dealing with the follow-up of the current business (a diagnostic control system) and one dealing with the follow-up of possible changes in the environment (an interactive control system). The interactive control system should depict tendencies in the market and should be the basis for a continuous dialogue between top management and their employees.

Such a system consisting of two major parts has been used by a large Swedish carmaker. The former president of this company implemented a system according to which corporate management made a proposal concerning how to deal with a new situation, which was evaluated by the divisions and subsidiaries in replies to corporate management. In this way the company made fast reactions to changing conditions while the company at the same time ran a more or less traditional formal control system. Thus, dialogue was an important way of managing uncertainty in this company.

There are also some other ways of adjusting the formal control system to a more turbulent situation, for example by using contingency plans, i. e. plans covering different possible future states or scenarios. The plans will state what actions to take if a certain state will be realized in

the future. This is one way of preparing the organization for different possible situations in the future.

The third way of adjusting the formal control system to an increasingly uncertain environment is through increasing the amount of information dealt with in the control processes. An early article advicing such a behavior was written by Hedberg & Jönsson (1978). Gul & Chia (1994) and Chong (1996) found in their studies that in situations characterized by a high degree of environmental uncertainty, managerial performance was higher when management accounting systems had a broader scope and aggregation. In another study, Gordon & Naravanan (1984) found that "as decision makers perceive greater environmental uncertainty, they tend to seek external, non-financial and *ex ante* information in addition to other types of information *and* increasingly move toward an organic form of organization" (p.42).

Lal & Hassel (1998) have shown that managers differ with regard to how they react in uncertain situations, which will have an impact on the relationship between environmental uncertainty and control system design. As a personality factor tolerance of ambiguity (TA) is used. They found that "Managers high on TA perceive non-conventional MAS information to be more useful when PEU increases, while managers low on TA see MAS information less useful when PEU increases" (pp. 267-8)[3]. In a similar study Fischer (1996) tested the hypothesis that individual differences in locus of control also would be connected with different use of information in uncertain situations. The hypothesis was, however, rejected. Instead she suggests that the origin of information may be of greater importance.

There are also several studies stressing that the information used in control systems will have to be changed when the situation has changed for the focal organization. If not, the information systems will contribute to a narrow focus in the decision-making process and delaying the organization's adaptation to the new situation (Hines, 1988; Miller, 1993; Macintosh, 1994).

Changing formal control systems in more turbulent situations will imply concurrent changes in the other control means. Most notably will be efforts pertaining to informal controls such as training as the amount of formal planning will decrease leaving more decisions and responsibilities to the local managers. Changing responsibilities may motivate a revision of the organizational structure. Even the strategy may be changed but probably more as a result of a new focus of the formal control systems than of the systems per se. In more turbulent times the formal control systems will to a greater extent deal with information that is of strategic importance in comparison with systems in more stable times (cf. Simons, 1995).

The informal system

To establish a culture and ways of conduct in an organization that will guide the employees in dealing with new premises such as an increased turbulence is considered to be a very efficient way of control (see e.g. Birnberg, 1998). Important components in such a culture may be to stress that everybody will all the time have to face new premises, which will demand flexibility and openness of the employees. They will have to face challenges and to make many decisions. It will probably also be stressed that all decisions can not be the best ones: it is understandable that mistakes can be made. But it is better to decide and try to cope with the situation than to move aside and to do nothing.

A basic condition behind giving employees the responsibility to react to changing circumstances is, of course, that some of them do meet these changes first. Those who continuously have contacts with customers, suppliers, and perhaps competitors, are also those who in many cases are the first ones to learn about the changes. Naturally they therefore will play a key role in reacting to the new premises. Reacting may mean either to deal with the matter by him- or herself, or to provide another unit in the organization with the information in order to have this unit deal with it.

Informal systems and organizations were very much left out during the 1960s and 1970s (at least in the literature) when the faith in formal controls seemed to be at a maximum. Before that period its importance was, however, well recognized. For example Thompson (1967) found the informal organization to be "a necessity in complex organizations, permitting the system to adapt and survive" (op cit., p. 7).

Nowadays the interest in informal systems is renewed. A current example of an informal control system is so-called personnel controls. Personnel controls may involve individual self-control, social control, or both (Emmanuel et al., 1990).

Another current example of informal control is the concept of trust. According to the findings of a Swedish research program trust was a major characteristic of control in decentralized units (Jönsson, 1996).

Our questionnaire referred to above (Johansson et al., 1997) also posed a couple of questions dealing with the exercise of informal controls. When relating these variables to the uncertainty variables in Table 1, we found for most variables that a higher degree of uncertainty was related to more informal ways of control. This conclusion is valid for most uncertainty variables in Table 1 above. The only exception is public rules and regulations in which case a weak correlation with the opposite direction was found. Also in this case, no correlation was found between the control variables and uncertainty in demand and with regard to product attributes.

In order to behave in a correct way the employees should be able to distinguish between two different situations: those that appear in correspondence with normal variation in a variable and those that correspond to a change in premises. Argyris (1977) has named these two situations single-loop vs. double-loop learning. Learning in organizations will thus be increasingly important (cf. Senge, 1990, Kloot, 1997). In one study of the relationship between learning and environmental uncertainty, Chenhall & Morris (1993) found that post-completion audits (i.e. a formal control system) of investment projects are best suited for improving managerial learning under conditions of low uncertainty. They also found a statistically significant association between learning and operational performance.

The stress on informal systems means that the effectiveness of the organization is increasingly depending on the so-called intellectual capital (Edvinsson & Malone, 1997). It will be more important to have trust in the employees than to control them (although control in the small will to some extent have to be exercised).

The informal way of controlling is evolving together with the other ways. In the previous sections examples of the interactions between the means of control have been given. Suffice it

here to point out that if greater stress on informal controls and trust is placed in an organization as a response to increasing turbulence, evidently the formal control system will have to be adapted as well.

Conclusions

The aim of this paper has been to discuss the design of control in organizations facing an increasingly uncertain and turbulent environment, this being a (the?) major contingency factor (and rationale for control). The effects on organizational structure and reward systems, on strategy formulation and on formal as well as informal systems have been shortly outlined. Several studies were quoted according to which the degree of decentralization was increased as turbulence increased. This called for adaptations among the formal as well as informal control systems. The formal control systems were found to rely on less planning, more follow-up and more information related to objects outside the focal organization. Strategies were increasingly changed to build on cooperation with other corporations (e.g. through outsourcing).

The review of previous findings concluded that a general (and natural) development from more comprehensive to more specific studies has taken place. An ambition in the paper has, however, been to take a broader view and to bring together aspects pertaining to organizational structure, to strategies, and to formal as well as informal control systems. These means of control are believed to interact in contributing to the effectiveness and survival of organizations. This interaction is probably well considered in practice. Now and then this should also be done in research and the author does indeed hope that more research of this kind will take place in the future.

In the paper the design of control in a more stable environment was also outlined as a contrast to control in more turbulent situations. The (obvious) importance of defining the problems the focal organization is facing before any changes is made in its control systems was also noted. The nature of uncertainties and turbulence was also shortly commented.

The focus in this paper has been on the general structure of control in organizations. Many more detailed aspects of control have been omitted. When it comes to these details a balance in relation to how the dimensions of time, room and aspects are dealt with is seen to be searched. In general control in organizations is supposed to strive for a balance between short- and long-term measures; between vertical as well as horizontal degrees of freedom; and between the use of financial and non-financial measures. The organization will probably also benefit from focusing from time to time one particular aspect of the business, for example quality or throughput times. The object of the focus may also be chosen to explicitly follow some causes or effects of turbulence in the environment.

Besides adapting the control system to the uncertainty faced, the focal organization will also make arrangements so as to meet other demands and purposes of control: what kind of system should be used in order to ascertain that managers and other employees are reasonably motivated? Are the activities of the organization effectively and efficiently coordinated? Is control in the small carried out in a satisfactory way?

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[1] At the end of 1996 and beginning of 1997 the author in collaboration with Per Ewing interviewed nine presidents or persons in similar positions regarding their current views on control in and of companies. A few quotations from these interviews have been included in this paper.

[2] These analyses have been performed by Christer Johansson. Chi-square tests have been made; Pearson Chi-square and likelihood ratios have been calculated.

[3] PEU stands for Perceived Environmental Uncertainty and MAS for Management Accounting Systems.