FARSYS: a knowledge-based system for managing strategic change

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Abstract

In theories of strategic management, organizational flexibility is considered as a strategic asset in situations in which anticipation is impossible and strategic surprise likely. In these situations, the use of traditional planning strategies will be increasingly supplemented and sometimes replaced by flexible configuration strategies. This paper distinguishes four of these strategies to configure the resources of the firm for effective responses to strategic change, namely the rigid, the planned, the flexible, and the chaotic mode. On the basis of this typology, the paper describes a method for diagnosing organizational flexibility and guiding the transition process, the flexibility audit and redesign (FAR) method. This method was applied successfully within an administrative unit of the Dutch Postbank, a production unit of Philips Semiconductors, and an R&D unit of the Dutch National Gas. Nonetheless, the application of the FAR method is very time-consuming for the consultant and very expensive for the organization. Hence, a system is developed that supports consultants in the application of the FAR method and helps them to derive a better solution for the organizational flexibility problem. This tool, called FARSYS, supports the data-gathering (FARSYS I) as well as the decision-making process of the consultant (FARSYS II). © 1999 Elsevier Science B.V. All rights reserved.

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1. Introduction

How do strategists reconcile the conflicting forces for change and stability? How do they promote order and control, while having to respond, innovate, and learn? Notwithstanding these provocative questions, most of the literature in strategic management is rooted in stability, not change (cf. Ref. [33]). Indeed, organizations must pursue strategies for purposes of consistency. Yet, they also must discard their established competencies in response to a changed environment. When environmental changes become increasingly undefined, fast-moving and numerous, it is risky to rely upon conventional strategic management approaches. Therefore, some researchers in strategic management considered organizational flexibility as a strategic option (cf. Refs. [1,16,39,48]).

In this article we will further elaborate the flexibility concept and explicitly develop various configuration strategies to deal with change and preservation. By considering some recent theoretical develop-
ments in strategic management from the linear, learning and dynamic capability model, we will show that flexibility is inherently paradoxical and requires a constructive friction between change and preservation. In this regard, an organization needs explicit strategic intentions in order to develop competencies [38], but at the same time remaining open for expanded search [28]. A clearer formulation of the strategic paradox of flexibility can be derived based on some insights drawn from systems theory of control. In this approach flexibility is perceived to be a managerial task. In this connection, the concern is with the managerial capabilities of the management that endow the firm with flexibility. Second, flexibility is perceived as an organization design task. The concern here is with the ‘controllability’ of the organization under different conditions: is it possible to implement different types of flexibility within the organizational context.

This two-dimensional conception of flexibility can be portrayed in a conceptual model or variance model. This model explains which organizational and environmental factors generate variations in organizational flexibility. From this model, therefore, some specific hypotheses are derived which state under which organizational conditions and environmental characteristics certain types of flexibility are effective. In addition, on the basis of the dimensions of the variance model, a typology of configuration strategies is developed, consisting of the rigid, the planned, the flexible, and the chaotic mode. Each mode reflects a particular way of dealing with the flexibility paradox of change vs. preservation at a certain point of time. Furthermore, from this typology different trajectories of transformation can be derived for handling the paradox over time. These trajectories serve as hypotheses with respect to the process of strategic change.

Besides the analytical approach above, a clinical approach of acquiring knowledge was used, describing and classifying the activities of skilled practitioners in improving organizational flexibility. The clinical understanding of flexibility improvement resulted in a process model for guiding the transition process.

By connecting the variance model, the organizational typology, and the process model, the flexibility audit and redesign (FAR) method was developed. In this paper we will describe an object-oriented tool FARSYS that can trace the knowledge processing of consultants who use the FAR method.

2. Flexibility from three strategic perspectives: the linear, the learning, and the dynamic capability model

Historically, an organization’s strategy has been thought of as an integrated plan. The most frequently cited definitions of organization strategy are provided by Andrews [2] (p. 28) and Chandler [11] (p. 13), and emphasize concepts such as goals, resource allocations, and especially plans. These concepts form the essential elements of the linear model of strategic management [10], corresponding to what others have called the ‘planning’ [31], ‘rational’ [36], ‘rational comprehensive’ or ‘synoptic’ [17] approach.

This linear model still pervades the literature on the process of strategic management. It characterizes the strategic process as a highly rational, proactive process that involves activities such as establishing goals, monitoring the environment, assessing internal capabilities, searching for and evaluating alternative actions, and developing an integrated plan to achieve the goals [21,29]. Emphasis is on planning ‘‘What to do’’, rather than on planning ‘‘What the organization might be capable of doing in the future.’’

Surprisingly enough, it was Ansoff [3], one of the founders of the linear model, who suggested that the nature of environmental change was changing and giving rise to strategic surprises, making strategic anticipation and strategic planning of the sort that proceeds in an outside-in, market-to-product development manner no longer useful. The basic effect of uncertainty is that it limits the ability of the organization to preplan or make decisions about activities in advance of their execution [18] (p. 4). Because of this effect, organizations must search for flexibility [44] (p. 148). The more uncertain the situation, the more an organization will need flexibility as a complement to planning [16]. Therefore, Ansoff [3] asserted that in these situations the use of traditional action strategies (‘‘in which direction do we change the firm’s position in the environment?’’) would be increasingly supplemented and sometimes replaced by preparedness or flexible configuration strategies.
How do we configure the resources of the firm for effective responses to strategic surprises? Rather than adhering single-mindedly to a predetermined set of goals and course of action, it is better to be capable of adapting to a variety of possible events, exigencies or unpredictable states of nature.

In line with this learning model of strategic management, Mintzberg and Waters [34] argue that the focus should not be placed on deliberate planning and control, but on developing an organizational capacity for strategic thinking and learning, which means being open and responsive. From this capacity, strategies emerge which are not guided by explicit a priori intentions. Patterns or consistencies are realized despite, or in the absence of, intentions. Nevertheless, the emergence of these ex-post strategies does not have to mean that management is out of control, only that it is open, flexible and responsive, in other words, willing to learn. Such behavior is especially important when an environment is too unstable or complex to comprehend, or too imposing to defy. Openness to such emergent strategy enables management to act before everything is fully understood — to respond to an evolving reality rather than having to focus on a stable fantasy. As an example, Mintzberg and Waters [34] proposed that a distinctive competence cannot always be assessed on paper a priori; often, it has to be discovered empirically by taking actions that test where strengths and weaknesses really lie.

Until recently, this learning model of strategic management is reinforced by the dynamic capability model. In this perspective, flexibility refers to management’s ability to develop those capabilities that will be effective in different future positions. It is aimed at identifying and evolving those core capabilities that are important in multiple segments under alternate scenarios [41]. The objective of the firm’s strategy therefore becomes the acquisition of the set of resources and capabilities which endow the firm with its optimal set of strategic options [40].

These developments within strategic management from the linear towards the learning and more recently towards the dynamic capability model contributed substantially to the concept of organizational flexibility. Organizational flexibility from a strategic perspective means creating a flexible organizational configuration of managerial capabilities and organizational resources for facilitating emergent strategies. It results in a process of the management of ‘unintended order’ [34] or ‘controlled chaos’ [39], in which change as well as stability is possible. That is, the organization is capable of responding to surprises and initiate novel actions (core capability renewal), but also able to continuously improve its capabilities (core capability upgrading).

3. A definition of the paradox of flexibility

A clearer formulation of the strategic paradox of flexibility can be derived based on some insights drawn from systems theory of control [13]. In this approach flexibility is treated as a two-dimensional concept (see Fig. 1). First, flexibility is perceived to be a managerial task. Can managers respond at the right time in the right way? In this connection, the concern is with the managerial capabilities that endow the firm with flexibility, e.g., manufacturing flexibility to expand the number of products the firm can profitable offer in the market or innovation flexibility to reduce the response time for bringing new products to market. Secondly, flexibility is perceived to be an organizational task. Can the organization react at the right time in the directed way? The concern here is with the ‘controllability’ or changeability of the organization, which depends on the creation of the right conditions to foster flexibility. For instance, manufacturing flexibility requires a technology with multi-purpose machinery, universal equipment, and an extensive operational production repertoire. In the same way, innovation flexibility requires a structure which consist of multi-functional teams, few hierarchical levels and few process regulations. From these two dimensions, we derive the following definition [46–49].

**Flexibility** is the degree to which an organization has a variety of actual and potential managerial capabilities, and the speed at which they can be activated, to increase the control capacity of management and improve the controllability of the organization.

3.1. The managerial task: developing dynamic capabilities

As a managerial task, flexibility is concerned with the creation or promotion of managerial capabilities,
especially in situations of unexpected disturbance. Core components of this managerial task are the following.

(a) The existence of actual and potential managerial capabilities. Not only the actual arsenal of capabilities is important, but also the collection of potential flexibility-increasing capabilities. The possible emergence of opportunities or threats requires management to have some potential capabilities as insurance against risk [42].

(b) The variety of managerial capabilities. Ashby [5] demonstrated that the required variety of a firm’s managerial capabilities must, at a minimum, be equal to the variety of disturbances in the environment. The variety of managerial capabilities can be in terms of either the quantity, that is the number of capabilities, or the quality of the capabilities (such as one-off vs. durable flexibility-increasing capabilities). For instance, the training of multi-skilled personnel results in a more durable mode of flexibility, while the contracting out of certain peripheral activities or ‘hire-and-fire’ employment practices tend to result in an one-off improvement in flexibility.

(c) The rapidity by which management can activate its capabilities. Management may possess the right capabilities, but this does not necessarily mean that the management can activate these capabilities in time. Flexibility is not a static condition, but it is a dynamic process. Time is a very essential factor of organizational flexibility.

These dynamic capabilities which endow the firm with flexibility are manifested in the ‘flexibility mix’. This refers to the repertoire of flexibility increasing capabilities that management possesses. The flexibility mix consists of three types of flexibility (see Table 1): operational flexibility, structural flexibility, and strategic flexibility [4,46]. For each of these types a distinction can be made between internal and external flexibility. Internal flexibility is defined as management’s capability to quickly adapt to the demands in the environment, while external flexibility refers to the capability of management to influence the environment, so that the firm becomes less vulnerable to changes in the environment.

Operational flexibility or routine maneuvering capacity consists of routine capabilities that are based
Table 1
Types of flexibility

<table>
<thead>
<tr>
<th>Operational (R) flexibility</th>
<th>Internal flexibility (I)</th>
<th>External flexibility (E)</th>
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<tr>
<td>Internal routine control (IR)</td>
<td>external routine control (ER)</td>
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<tr>
<td>Structural (A) flexibility</td>
<td>Internal adaptive control (IA)</td>
<td>external adaptive control (EA)</td>
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<td>Strategic (G) flexibility</td>
<td>Internal goal control (IG)</td>
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on present structures or goals of the organization. It is the most common type of flexibility and relates to the volume of activities rather than the kinds of activities undertaken within the organization. The routines used are directed primarily at the operational activities and are reactive. The time horizon involved is short term. Even though the variety in the environment may be high, the sort of combinations is reasonably predictable so that management, on the basis of experience and extrapolation, is able to develop certain routines to reduce this uncertainty. Examples of internal operational flexibility are the variation of production volume in the organization, the building up of inventories, and the maintenance of excess capacity in terms of financial resources. Examples of external operational flexibility are the contracting out of certain peripheral activities, using temporary labor to adjust the size of the work force to shifts in product demand, or obtaining resources from more than one supplier.

Structural flexibility or adaptive maneuvering capacity consists of managerial capabilities for adapting the organization structure, and its decision and communication processes, to suit changing conditions in an evolutionary way [26]. In addition, these managerial capabilities may involve the creation of changes in the environmental structure. When faced with revolutionary changes, management needs great internal structural flexibility or ‘intra-organizational leeway’ to facilitate the renewal or transformation of current structures and processes. Examples of internal structural flexibility are horizontal or vertical job enlargement; the creation of small production units or work cells within a production line; changes in organizational responsibilities; alterations in control systems; the use of project teams; and even the transformation from a functional grouping to a market-oriented grouping with interchangeable personnel and equipment. Structural flexibility can also be external in terms of ‘interorganizational leeway’ in supporting and sheltering new technologies or developing new products or markets. Examples include various forms of JIT-purchasing, co-makership, co-design, or even joint ventures and other co-alignments. By increasing such structural relations with outsiders, the organization can engage more easily in new developments.

Strategic flexibility or non-routine steering capacity consists of managerial capabilities related to the goals of the organization or the environment [1]. This most radical type of flexibility is much more qualitative and involves changes in the nature of organizational activities. It is necessary when the organization faces unfamiliar changes that have far-reaching consequences and needs to respond quickly. The issues and difficulties relating to strategic flexibility are by definition unstructured and non-routine. The signals and feedback received from the environment tend to be indirect and open to multiple interpretations, ‘soft’ and ‘fuzzy.’ Because the organization usually has no specific experience and no routine answer for coping with the changes, management may have to change its game plans, dismantle its current strategies [20], apply new technologies, or fundamentally renew its products. Its response may also be external, for example influencing consumers through advertising and promotions [30], creating new product market combinations [26], using market power to deter entry and control competitors [37], or engaging in political activities to counteract trade regulations. New values and norms are necessary and past experience may not provide any advantage [35]. The creation of new activities in new situations may be very important.

Besides, these three different types of flexibility, we can distinguish the metaflexibility of an organization, that is, the supporting monitoring or learning system of the organization. Metaflexibility involves the processing of information to facilitate the continual adjustment of the composition of management’s
flexibility mix in line with changes in the environment. This requires the creation, integration and application of managerial capabilities in a flexible way.

3.2. The organization design task: creating adequate organizational conditions

The ability to initiate these managerial capabilities depends on the design adequacy of organizational conditions, such as the organization’s technology, structure, and culture. Those conditions determine the organization’s controllability or responsiveness. Designing the appropriate organizational conditions requires identifying the type of technological, structural, or cultural changes necessary to ensure effective utilization of managerial capabilities.

For many service and manufacturing organizations, recent developments in technology have created a range of programmable automation systems and general information systems that seem to afford much greater flexibility potential [49]. In this connection, technology refers to the hardware (such as machinery and equipment) and the software (knowledge) used in the transformation of materials and/or information. The design of technology can range from routine to non-routine, corresponding to the opportunities for routine capabilities.

Increases in controllability might also involve changes in organizational structure. Organizational structure comprises not only the actual distribution of responsibilities and authority among the organization’s personnel, but also the planning and control systems and the processes of decision-making, coordination, and execution. The former is related to the construction of the organization in functions and units, while the latter is related to the organizational regulations of processes [25]. The structural design of the organization can range from mechanistic to organic [9], corresponding to the opportunities for adaptive capabilities.

Not only structural changes, but also cultural changes may be necessary to increase the controllability of the firm. Organizational culture can be defined as the set of beliefs and assumptions held relatively commonly throughout the organization and taken for granted by its members. Essential features of such beliefs are that they are implicit in the minds of the organization members and to some extent shared [22]. These beliefs may constrain managerial capabilities by specifying broad, tacitly understood rules for appropriate action in unspecified contingencies. The organizational culture can range from conservative to innovative, depending on the slack within the current norms and value systems for strategic capabilities.

Core aspects of this organization design task are ‘stability’ and ‘preservation.’ These frequently neglected conditions are indispensable elements for the realization of flexibility (cf. Ref. [45]). Just as there cannot be differentiation without integration [27], similarly, there cannot be flexibility without some stability or preservation. Stability provides certainty for organizational members and preservation facilitates controllability of the organization.

In sum, this two-dimensional conception of flexibility creates a paradox. The challenge for management is to develop dynamic capabilities that enhance flexibility and to have an adequate design to utilize those capabilities. In other words, a flexible organization must possess some capabilities which enhance its flexibility to avoid becoming rigid, but it must also be anchored in some way by distinctive organizational conditions in order to avoid chaos. There has to be a constructive tension [24] between dynamic managerial capabilities which must be easily changed and the distinctive organizational conditions which are necessary to preserve.

4. The variance model: basic assumptions and hypotheses

Up to this point, we have considered the managerial and organization design tasks of flexibility. On the one hand, we have argued that the managerial task of flexibility is concerned with the creation of a sufficient flexibility mix. On the other hand, we have claimed that the organization design task of flexibility is concerned with designing appropriate technological, structural, and cultural conditions to generate the potential for flexibility within the organization necessary to realize the flexibility mix. If the potential for flexibility within the organizational conditions is much smaller or much larger than the re-
quired flexibility mix, it will be necessary to re-design these organizational conditions.

Nonetheless, we have not explicitly examined the factors that determine the sufficiency of the flexibility mix and the design adequacy of the organizational conditions. To be more specific, when can management combine operational flexibility with tight organizational conditions and when must it combine structural or even strategic flexibility together with looser organizational conditions? We assume that the sufficiency of the flexibility mix and the adequacy of the organizational conditions depend on the turbulence in the environment. That is, the more dynamic (frequency and intensity of environmental changes), complex (number and relatedness of environmental changes), and unpredictable the environment (extent to which cause–effect relationships are incomplete), the more difficult it is to handle the managerial and organization design tasks [47,49].

This two-dimensional conception of flexibility together with the turbulence characteristics of the organizational environment are portrayed in a conceptual model or variance model (see Fig. 2). In particular,
the model relates the composition of the flexibility mix and the design of the organizational conditions to the degree of environmental turbulence. In this connection, the flexibility mix represents the actual flexibility of management. Furthermore, the organizational conditions indicate the potential for flexibility available within the organization, while the environmental turbulence characteristics determine the required volume and composition of the flexibility mix. The basic assumptions of our conceptual model are that: (i) management’s flexibility mix must match the degree of environmental turbulence (sufficiency of the flexibility mix); (ii) to activate a sufficient flexibility mix, the design of the organizational conditions must provide adequate potential for flexibility (design adequacy of the organizational conditions); and (iii) the sufficiency of the flexibility mix (i) and the design adequacy of the organizational conditions (ii) are continuously threatened by shifts in the degree of environmental turbulence and autonomous changes in the organizational conditions.

These assumptions are based on our definition of flexibility. In this two-dimensional conception of flexibility, flexibility corresponds with large or at least sufficient control capacity of management (i) and high controllability of the organization (ii). Consequently, the first assumption reflects the managerial task of flexibility, the second reflects the design task of flexibility, while the third indicates the difficulty of matching the two tasks in a dynamic context.

From these basic assumptions of the model, three central hypotheses can be derived which combine the degree of environmental turbulence, the flexibility mix, and the organizational conditions.

**H.1. In a static, simple, and predictable environment (stable), effective organizations employ a limited flexibility mix and have a routine technology, a mechanistic structure, and a conservative culture. In addition, the sensor and information processing capacity as a part of the metaflexibility is very elementary.**

This first hypothesis is very straightforward. In a stable environment, there is little need for managers to expend effort on a flexibility mix or for the organizational conditions to generate potential for flexibility. As a consequence, the sensor and information processing capacity can be restricted to the primary functions of the organization.

**H.2. In a dynamic and/or complex, but largely predictable environment (moderately turbulent), effective organizations employ a more comprehensive flexibility mix dominated by operational flexibility, and have a more non-routine technology, a relatively mechanistic structure, and a conservative culture. In addition, their sensor and information-processing capacity is very extensive and directed towards routine proliferation.**

According to our second hypothesis, in a dynamic and complex, but largely predictable environment, management must activate many sophisticated routines to cope with complex changes. They need a potential for operational flexibility originating from a non-routine technology. In addition, management needs an extensive information-processing capacity to anticipate complex changes and to facilitate development of routines.

**H.3. In a fundamentally unpredictable environment, which may also be dynamic and complex (turbulent), effective organizations employ a broad flexibility mix dominated by structural and strategic flexibility, and have a totally non-routine technology, an organic structure, and an innovative culture. Moreover, the sensor and information processing capacity as a part of the metaflexibility is very rudimentary and directed towards enhancing the receptiveness to new environments through routine reduction.**

The third hypothesis suggests that in unpredictable environments, management must activate both strategic flexibility and structural flexibility, which originate from innovative culture and organic structure. In such highly turbulent environments, the organization has neither specific experience nor data, and therefore pure anticipation in the form of routine proliferation is impossible. The latter may even reduce its receptiveness to change. Instead of building on current routines as part of its operational flexibility, management should reduce the need for information processing and enhance its structural and strategic flexibility to cope with unexpected changes.
5. A permanently flexible form: a Utopia?

The above variance model clarifies variations between organizations in the composition of the flexibility mix. Nonetheless, this instrumental model ignores the process of variation in the composition of the flexibility mix over time. In other words, how does management cope with change? Our hypotheses raise serious doubts as to whether there is a permanently flexible organization. Shifts may occur in the degree of environmental turbulence, and the composition of the flexibility mix and the design variables of the organizational conditions must vary correspondingly. An ongoing process of variation in its flexibility mix and related organizational conditions is needed. In this process of change, the organization has to prevent itself from overshooting and becoming extremely rigid or chaotic. Therefore, we will explicitly consider how organizations deal with the flexibility paradox over time. First, on the basis of the dimensions of the conceptual model, a typology of configurations with respect to flexibility is developed. Each configuration represents a particular strategy of dealing with the flexibility paradox of change vs. preservation. Furthermore, from this typology different strategic trajectories for handling the paradox over time are obtained.

5.1. A typology of strategic configurations

On the basis of the two central dimensions of organizational flexibility — the composition of the flexibility mix (preponderance of operational, structural, or strategic flexibility) and the controllability or design adequacy of the organizational conditions (low or high controllability of organizational conditions) — we can roughly distinguish four ideal types: the rigid, the planned, the flexible, and the chaotic configuration (see Fig. 3).

In this typology, each ideal type is a result of a deliberate or emergent configuration strategy of management regarding the composition of the flexi-
bility mix and the design of the organizational conditions.

The underlying premises of these configuration strategies are that (cf. Ref. [33]):

(i) the strategic behaviors of organizations are best described in terms of configurations of the composition of the flexibility mix and design of organizational conditions;

(ii) in particular, strategy formation is an episodic process in which a particular configuration engages in a particular form of the process for a distinguishable period of time;

(iii) accordingly, each configuration must be found at its own time and in its own context;

(iv) these periods of the clustered dimensions tend to sequence themselves over time in patterned ways that define common trajectories of transformation.

In this connection, the ‘rigid configuration’ has a very restricted flexibility mix and the controllability or responsiveness of the organization is low. Its flexibility mix is dominated by simple routines. In addition, its choice and variation possibilities are limited; improvisation is forbidden in the organization. The mature technology (routine), the functionalized and centralized structure with many hierarchical layers (mechanistic), and the monotonous and narrow-minded culture (conservative) do not allow potential for flexibility and result in a fragile and vulnerable organization. The ‘rigid configuration’ reflects our first hypothesis (H.1).

The ‘planned configuration’ also has a narrow flexibility mix, but its variety of routines and organizational responsiveness are less limited than in the ‘rigid organization.’ The flexibility mix consists mainly of specific rules and detailed procedures, which are sophisticated and complex and require an extensive information-processing capacity. Moreover, for every possible change, management has developed a certain routine (superior operational flexibility). The rigidity of this organizational form is not a result of the technology or the basic organizational structure, but of strong process regulations such as standardization, formalization and specialization, and very detailed planning and control systems. Also, the shared cultural beliefs and assumptions of its members give very little leeway for deviant interpretations of the environment, and dissonance is potentially threatening to the organization’s integrity. As long as the organization encounters no unexpected changes, its controllability is high. However, if changes occur that are not anticipated in the planning repertoire and are threatening to the idea system shared by its members, the result is a situation known as ‘strategic drift’, in which consciously managed incremental changes do not necessarily keep pace with environmental changes [23] (p. 88). The incremental changes result only in further attempts by the firm to perfect its process regulations and basic beliefs and assumptions, which are the very sources of inertia. Accordingly, slowness of response is characteristic of the ‘planned configuration.’ This organizational form corresponds with our second hypothesis (H.2).

The ‘chaotic configuration’ has a very extensive flexibility mix dominated by strategic flexibility, but is totally uncontrollable. In organizations with this configuration, the possibilities for variation are unlimited because there is no anchorage within a set of basic organizational conditions. The innumerable initiatives for change are impossible to implement. Chaotic organizations have no distinct technology, stable administrative structures, or basic ‘shared values’ stemming from their organizational culture. Consequently, the environment can push a chaotic organization in any direction. In other words, the organization is controlled by the environment. A chaotic organization’s lack of administrative stability is caused by ‘strategic neglect,’ which denotes the deliberate tendency of managers not to pay attention to the administrative structure of the organization [8] (pp. 234–237). Strategic neglect can lead to severe and disruptive administrative problems. In his study of new internal corporate ventures, Burgelman [8] concluded that the inherent administrative instability of these ventures is often exacerbated by lack of strong strategic orientation that can address opportunistic behavior by participants in the venture. The range of possible capabilities that a chaotic form can develop is so large that making a choice is very difficult and manager’s decision-making capacity is greatly reduced [16] (p. 41) [42]. Decisions are delayed although the situation requires an immediate decision.

The ‘flexible configuration,’ finally, has an extensive flexibility mix dominated by strategic and struc-
tural flexibility. In addition, its ability to change its organizational conditions is reasonably high. It adapts effectively to disturbances without the organization losing its distinctiveness. Resistance to signals of threat to the idea system is low; the firm can constructively incorporate new perspective. It implements change easily through adaptations within the current (non-routine) technology and (organic) structure [4]. At the same time, it develops some dominance over its environment to preserve its identity, and effects a balance between change and preservation. The flexible configuration complies with our third hypothesis (H.3).

5.2. Trajectories of transformation

Each of the modes of our typology reflects a particular configuration strategy (deliberate or emergent) of dealing with the change/preservation paradox at a certain point in time. In both the rigid and the planned mode, there is a lack of structural and strategic flexibility caused by a preference for preservation rather than change. In the flexible and the chaotic mode, the dominance of structural and strategic flexibility indicates a competency for change. From this organizational typology, therefore, different strategic trajectories of transformation can be obtained for dealing with the change/preservation paradox over time.

Our hypotheses are the following.

**H.4. The risk of the ‘planned mode’ is the transformation into the ‘rigid organization’ as a result of ‘strategic drift.’**

The surplus of operational flexibility, consisting of sophisticated routines, creates inertia in the form of a very mechanistic structure and a very narrowly focused culture. The growing resistance to ‘deviant’ interpretations of the environment reflects a tendency toward ‘overbalance’ of the planned mode.

**H.5. The risk of the ‘flexible mode’ is turning into a ‘chaotic organization’ as a result of ‘strategic neglect.’**

The surplus of structural and strategic flexibility leads to unfocused actions with disconstructive results. The lack of administrative structures, sense of direction, shared beliefs, and institutional leadership is characteristic of a tendency towards ‘underbalance’ of the flexible mode.

**H.6. In order to survive, an organization has to shift from the ‘planned’ towards the ‘flexible’ mode and vice versa in line with changes in the level of environmental turbulence.**

It is important to understand that the planned and the flexible mode are different stages in a cyclical process. Mintzberg [32], too, showed how organizations not only go through periods of strategy adjustment characterized by continuity, flux, or incremental change, but also require more global changes. In addition, Greiner [19] charted periods of evolution and revolution in corporate development. Moreover, the tenor of this hypothesis is in line with the ‘classic’ of Burns and Stalker [9], who concluded as early as then that the organic form was temporary because the internal dynamics necessary for its success could not be sustained. Their speculations of an oscillating organizational mode are supported by many other scholars (e.g., Refs. [12,14,43,50]).

6. The FAR method in practice

So far, we have developed a theoretical basis for the paradox of flexibility, a conceptual model for describing flexible configurations, and a typology of configuration strategies. From this, we postulated hypotheses about the configuration of flexible organizations (H.1, H.2, H.3) and strategic trajectories of change for dealing with the flexibility paradox over time (H.4, H.5, H.6). To develop a usable method for diagnosing and improving organizational flexibility, however, we need a better understanding of consulting processes of organizational diagnosis, redesign, and change in general. Hence, we used a clinical approach of acquiring knowledge by describing and classifying the activities of skilled practitioners. On the basis of a global thinking model, we conducted 22 interviews with management consultants in which their consulting processes were examined. The consequent clinical understanding of the diagnosis, redesign, and change process, together
with our conceptual model and organizational typology of flexibility, was integrated in an enriched process model of flexibility improvement (see Fig. 4). This process model, along with the observation and analysis instruments, forms the basis of a method for diagnosing organizational flexibility and guiding the transition process.

This so-called FAR method provides the practitioner with instructions for systematically describing, analyzing, and assessing the organization’s actual flexibility relative to its desired flexibility. Moreover, this method helps the consultant to derive recommendations for changing management’s flexibility mix and redesigning the organization. In the various phases of the process of flexibility improvement, the FAR method poses the following questions.

**Orientation:** What is the point of departure of the organizational unit (strategic group, stakeholders analysis, adequacy of flexibility label, boundary decisions, and history)?

**Analysis:** (a) What are the inputs, throughputs, and outputs of the organizational unit and which external elements or constituents are important for attaining these inputs and disposing of the outputs (specification of primary process)? (b) How flexible does the organizational unit have to be (desired state depending on the degree of environmental turbulence)? (c) How flexible is the organization at the moment (current state depending on the actual flexibility mix and flexibility potential within the organizational conditions)?

**Assessment:** Is there a gap between the required flexibility mix and the actual flexibility mix? (dis-

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**Fig. 4.** The process model of the FAR method.
crepancy analysis. If so, what are the relevant flexibility aspects, types of flexibility, and lacking information activities?

**Redesign:** How should a more flexible organization be redesigned? (a) What are possible design variables for varying the flexibility potential of the organization (technological, structural, and/or cultural design variables)? (b) What steps have to be taken (strategic trajectories of change)? (c) What persons and resources should be involved and at what time (management of change)?

The FAR method is an integral curative instrument which in situations S of a perceived lack or surplus of flexibility supports the manager or consultant in the following.

**R.1.** In generating a diagnosis of actual flexibility from a perspective of effectiveness.

**R.2.** In specifying areas of attention for management in order to improve management’s flexibility mix.

**R.3.** In providing recommendations for organizational redesign in order to accomplish this improvement.

These empirical claims can be guaranteed only if the unit of analysis meets the following conditions, which act as constraints C on the organizational reach of the FAR method.

**C.1.** The unit of analysis must be an independent organization, or an organizational partsystem which is relatively autonomous.

**C.2.** The organizational unit may consist of not more than three hierarchical levels and not more than a hundred persons.

**C.3.** The users of the FAR method, who may be competent managers or qualified consultants, have to possess at least a professional quality orientation and apply a mixed expert/process approach.

In a multi-case longitudinal study, based on theoretical sampling, we showed that our empirical claims of the FAR method and most of our hypotheses were confirmed. For these flexibility studies within the Dutch Postbank, Philips Semiconductors and the Dutch National Gas we refer to Volberda [46,49]. Of course, we have to realize that on the basis of three extreme cases, it is often difficult to test the hypotheses with much complexity, and their empirical grounding is likely to be insufficient (cf. Ref. [15]). Still, with the theoretical foundation of these hypotheses and the empirical study, our hypotheses are at least logically and empirically plausible. Nonetheless, the application of the FAR method is very time-consuming for the consultant, and therefore very expensive for the organization. Hence, in a new research project we developed a system that supports consultants in the application of the FAR method and helps them to derive a better solution for the organizational flexibility problem [6,7]. This tool, called FARSYS, supports the data-gathering (FARSYS I) as well as the decision-making process of the consultant (FARSYS II).

The advice support system offers the following functions to the users:

- the automation of the information-gathering process,
- a user interface for the explication and elaboration of solutions,
- a knowledge bank to support the consultant in choosing and evaluating his solution,
- a utility function to measure the effect of the solutions chosen by the consultant.

They will be discussed in the next sections. Because the tool had to be flexible (the unstructured part of the FAR method asked for a design that was easy to change and easy to adapt) and robust (it was going to be used by people with minimal computer knowledge), the main part of the tool was built in an object-oriented environment (Visual Works).

**7. FARSYS I: automation of the information process**

**7.1. Adapting a questionnaire**

The FAR-method uses pre-defined questionnaires to get information about relevant organizational issues. These questionnaires are composed by the consultant in the light of the intake which has already
taken place. Organizational participants are asked to answer these questions. The questioning is carried out by the consultant. This activity is very time-consuming for the consultant as well as for the organizational participants, and therefore very expensive for the organization. Automation of the information gathering seems to offer reduction in time and costs. However, automation of this process will have some severe disadvantages. The main one is the omission of personal contact between consultant and organization participants. This means that the questioner, who according to the FAR-method would be the consultant, cannot as before sense hesitations or intonations in the spoken answers. Another disadvantage is that the questioner cannot be asked to give an explanation. Neither can he, as a result of a given answer, decide to skip a number of questions, or ask more if certain answers are unclear.

To overcome most of these problems, the automation of the information gathering process requires that FARSYS should include the following features:

- a ‘good’ questionnaire available as a standard;
- the ability to obtain a new questionnaire by duplicating the closest one from a list of options;
- a user interface for adapting this questionnaire to one’s own use;

| Environmental Checklist | Does your unit/department mainly manufacture?
<table>
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<tr>
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<tbody>
<tr>
<td>With regard to basic materials complexity</td>
<td>How many products does your unit/department manufacture?</td>
</tr>
<tr>
<td>Basic material markets dynamism(......)</td>
<td>Are the products complementary or can they</td>
</tr>
<tr>
<td>Unpredictability</td>
<td>Do the products consist of similar component</td>
</tr>
</tbody>
</table>

How many products does your unit/department manufacture?

Choose one of the following answers:
- Only one product
- 2-3 products
- 4-10 products
- 10-15 products
- Over 15 products

Linked to:
- Environmental turbulence profile
- Workload
- Number of factors

Fig. 5. Questionnaire editor.
- an option for adding background information to a question;
- route specification: the ordering of questions, which can vary according to the answers given to previous questions.

A new questionnaire can be obtained by copying the closest one from the list of organizations. To adapt a questionnaire in order to obtain his own version, the consultant has the user interface shown in Fig. 5 at his disposal. He can change, add or remove questions, change the order of the questions or, for every question, add, change or remove background information. The interface shows a listing of topics in the upper left section, with a listing of all questions matching the selected topic in the right upper section. All information about the selected question will be viewed in the bottom part of the interface window. User menus can be displayed in every part of the window (see Fig. 5).

### 7.2. The user of the questionnaire

After adapting a questionnaire the consultant wants the questions to be answered by organizational participants without himself needing to attend. This

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![Characteristics of Case V](image)

**Fig. 6. An environmental turbulence profile.**
task is accomplished by an autonomous subsystem. Just as the questionnaire was able to create and specify a subsystem for the consultant, this present subsystem also should be very user friendly — more so in fact, because the questions have to be answered without any personal support other than the background information added by the consultant, and a very brief manual. To ensure that this subsystem is self-supporting the following is required:
- no hardware restrictions: the subsystem should run on any Windows computer;
- a built-in function for system-help, obtainable at any time;
- the ability to alter given answers;
- the availability of background information about jargon in the question;
- the ability to quit the program temporarily, saving the answers given, such that the last question will be asked first when the program is restarted;
- the ability to comment on any question or on system-use at any time;
- mouse-support for convenient use.

<table>
<thead>
<tr>
<th>Characteristics of Case V</th>
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</thead>
<tbody>
<tr>
<td>Environment</td>
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<tr>
<td>Raw material markets</td>
</tr>
<tr>
<td>Suppliers</td>
</tr>
<tr>
<td>Workload</td>
</tr>
<tr>
<td>Labor markets</td>
</tr>
<tr>
<td>Outer technologies</td>
</tr>
<tr>
<td>Production system</td>
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<tr>
<td>Information system</td>
</tr>
<tr>
<td>Inventories</td>
</tr>
<tr>
<td>Products/services</td>
</tr>
<tr>
<td>Personnel</td>
</tr>
<tr>
<td>Financial resources</td>
</tr>
<tr>
<td>Internal customers/clients</td>
</tr>
<tr>
<td>External customers/clients</td>
</tr>
<tr>
<td>Product-market combinations</td>
</tr>
</tbody>
</table>

F external = 31.68   F internal = 46.67   I = 48.8

Fig. 7. A flexibility profile.
The floppy disks containing this subsystem will be sent to the organizational participants. With the above stated features implemented it should not be too difficult for organizational participants to find some time to answer the questions and, if necessary, to add their comments. Upon completion they can return the questionnaire to the consultant. The answers can then be added to the results in the main system of FARSYS.

7.3. Processing of organizational data

The answers from received questionnaires are read in and added to FARSYS. This organizational data is collected and represented in exactly the same way as in the FAR-method. FARSYS makes five diagrams: an environmental turbulence profile (see Fig. 6), a flexibility profile (see Fig. 7), a culture characteristic (see Fig. 8), a structure characteristic (see Fig. 9) and a technology characteristic (see Fig. 10).

By dividing the firm’s competitive environment into competitive forces on its input and output sides, the consultant lays the foundation of the environmental turbulence scan. On the basis of a questionnaire filled in by organization members who perform boundary functions within the firm (e.g., marketing managers, purchase managers, or general managers), the system scans each competitive force on three dimensions, namely dynamism of changes (frequency and intensity), complexity of changes (the number of elements and their relatedness), and the unpredictability of these changes (unknown causes/effects). The result of this scan is presented in a

![Characteristics of Case Y](image)

Fig. 8. A culture characteristic.
turbulence profile, which indicates the minimum level of required flexibility.

Subsequently, the management team of the organization is asked to complete the flexibility scan, which is a systematic enumeration of all-possible flexibility capabilities and information activities with respect to the aspects of the primary process. From the scores of this quick survey, a flexibility profile can be derived that reflects management’s actual flexibility mix; it is the repertoire of flexible capabilities activated by management in order to adjust the organization (internal flexibility) or shape the competitive forces (external flexibility). Each flexibility score in this profile indicates the percentage of flexible capabilities activated by management in relation to the total number of flexible capabilities.

Implementation of more flexibility-increasing management capabilities is not always feasible and is demarcated by the organizational conditions. In the final stage of the analysis, the system therefore has to classify the flexibility potential available within the firm by locating the organization on the various

Fig. 9. A structure characteristic.
dimensions of technology, structure, and culture. On the basis of a series of standardized questionnaires, the system is able to develop a technology, a structure, and a culture characteristic. These organization characteristics show certain technological, structural, and cultural barriers to flexibility improvement. Scanning these three characteristics results in a survey of all possible restrictions on the organizational flexibility.

The questions in the questionnaires are related to the turbulence components, flexibility aspects, and organizational dimensions as shown in the diagrams above. The score for every item is determined by an algorithm based on the impact of the question on this item and the answers given by the management participants (see Appendix A).

8. FARSYS II: the decision matrix as advice support system

The subsystem that has been described for the information gathering process results in a database with organizational data, and a graphical representation of this data into five diagrams. As mentioned before this phase was a very straightforward one. So far, the consultant deduces his advice simply on his personal interpretation of the profiles and characteristics presented by FARSYS. This will be done on the basis of his personal experience and discussions with the management team of the organization.

To support the consultant during the advice formulating process, a special user interface was designed: a decision support matrix (see Fig. 11). The decision matrix offers the following functions:

- eye-catcher for every cell with a great discrepancy;
- access to the turbulence and flexibility profile;
- view of the composition of the environmental turbulence component;
- browsing questions determining the turbulence of a component;
- consulting answers given and collected by the questionnaire;
- browsing a list of flexibility capabilities for every flexibility aspect.

By using this interface the consultant is able to call in all given answers on questions related to a specific turbulence component and obtain a view of its subdimensions (complexity, dynamism, and unpredictability). More information can be obtained for each flexibility aspect: a listing of flexibility-defining capabilities for this aspect, and the degree of
actual activation of these capabilities by the organization.

In order to compare the turbulence components with the flexibility aspects in more detail, the consultant can divide his flexibility problem area into smaller domains. Each domain corresponds with a cell in the matrix, which connects a turbulence component with a flexibility aspect. Every cell contains relevant information about this connection such as the composition of the turbulence, the listing of flexibility defining capabilities (either operational, structural, strategic or a combination of them) and the degree to which these capabilities have already been activated by management. The consultant can draw his conclusions by selecting some of the flexibility-increasing capabilities presented in the listings. As stated in the FAR-method the implementation of each and every procedure can be restricted to a certain extent by the organizational conditions. While adding a procedure to the advice process, FARSYS asks the consultant for an estimation of the expected implementation feasibility of that procedure considering the given organizational conditions. These estimations are passed on in two ways:

- To an overall feasibility score that gives an indication of the difficulties to be experienced by the organization in implementing the proposed management capabilities contained in the consult. Apart from this overall feasibility score there is an overall discrepancy score. This is a measure for the success of the management capabilities if implemented properly. On the basis of the introduced scores, and in the light of his own experience the consultant can compare one solution with another. The best solution should correspond with the highest possible feasibility score and the lowest possible remaining discrepancy score.

- To a knowledge base. With this information to be collected it might be possible to extend FARSYS in the near future with a rule base for automatic generation of an advice for the redesign process (see Section 9).

The final decision is of course reserved for the responsible consultant. When the user has composed...
his advice in the form of a list of management capabilities, the expected impact can be shown in the decision matrix and the flexibility profile. In this way multiple advises can be compared in order to choose the best one.

9. The Farsys Knowledge System

The Farsys Knowledge System (FKS) can be used by a consultant to support the evaluation of direct and indirect effects of the procedures he will propose. This support includes an indication of the scope and the feasibility of solutions in relation to the current design characteristics of the organization. On the basis of these scope and feasibility measures, the consultant can select starting points for design modifications. Furthermore, the module is capable of storing relevant information about procedures that increase flexibility. This information is needed in order to be able to provide the desired support; it also represents the acquisition function of the model.

The knowledge module is linked to a database, which includes information on procedures that increase flexibility. This information is structured as follows.

- Feasibility intervals are given for the organization characteristics. These intervals provide the design adequacy set by the procedure with respect to the subdimensions of the structure, culture and technology of a given organization.
- The influence of a procedure by mentioning all the places in the decision matrix where the procedure has an impact. In other words, which environmental components are affected by the procedure, in relation to which aspects of flexibility?
- The effectiveness of the procedure and factors that determine the context of its effectiveness.
- The level of impact by indicating whether the measure is effective on an operational, structural or strategic level.

![Table: Characteristics of Case V](image.png)

Fig. 12. Feasibility intervals for flexibility procedure in case y.
The possibility that is offered by the system to incorporate or adapt this information enables us to store the consultants’ knowledge about the collection of procedures that increase flexibility. As a result, this knowledge becomes transferable. In the evaluation process, the consultant feeds the above-mentioned information on the solutions he has chosen into the model, in so far as this information has not yet been incorporated (the acquisition function of the model).

A knowledge base that is built up in this way can provide the desired support. The first form of support offered by the module is the possibility to indicate the scope of each procedure in the collection of procedures that increase flexibility. With the scope of the procedure, we mean the number of different combinations of flexibility aspects and turbulence components that are affected by the procedure. This influence can either be positive or negative. It is positive if the procedure, which increases flexibility, is able (partly) to compensate a lack of flexibility. The influence is negative if the procedure affects a combination of flexibility aspects and turbulence components that is not characterized by a lack of flexibility. As a consequence, a flexibility surplus may arise in another cell. The influence is dependent on the level of the procedure. For instance, the procedure only has effect (either positive or negative) if the level of the procedure is aimed at combating the main type of turbulence, which becomes manifest in the relevant turbulence component. These positive and negative effects of a given procedure are expressed visually in this model, by means of color changes in relevant cells.

In addition, the module can offer support by means of feasibility intervals. As an example, in Fig. 12 the feasibility intervals are shown for the flexible procedure to apply horizontal extension of responsibilities in order to improve the versatility of employees, specifically for very vulnerable tasks. With these feasibility intervals, the system examines the organizational barriers (technological, structural, cultural) to evaluate how feasible it is to implement the specified procedure. Because the model projects feasibility intervals onto the design of the organization, it is possible to identify those subdimensions of culture, structure and technology for which the organization design needs to be modified (design limitations or design variables). Organization redesign in this context is not restricted to developing new technologies or transforming structures, but also includes intervening in organizational cultures.

10. Summary and conclusions

In this article, we have developed a definition for the paradox of flexibility, a conceptual model for describing flexible configurations, and a typology of configuration strategies. This allowed us to postulate hypotheses about the configuration of flexible organizations and trajectories of strategic change for dealing with the flexibility paradox over time.

Furthermore, the clinical understanding of consulting processes, together with our conceptual model and organizational typology, was integrated in an enriched process model of flexibility improvement. In combination with the observation and analysis instruments, the process model formed the basis of the FAR method for diagnosing organizational flexibility and guiding related transition processes.

The FAR-method is implemented in the software system FARSYS, which is able to execute a question survey of an organization with the consultant as initiator. By applying FARSYS I, the consultant creates a database of organizational data that facilitates the diagnosis phase through graphical representations of organizational flexibility: a turbulence profile, a flexibility profile, and characteristics of the organizational conditions. The processing of organizational data collected in this way is fully automated. A great advantage of the automation of the information gathering is the possibility of statistical analyses on the collected data.

Linking the FKS-knowledge base to FARSYS will offer better support for the consultant in formulating his advice (see Fig. 13). The consultant can use the profiles of FARSYS I, together with the knowledge base offered by FARSYS II, in order to derive recommendations for the transition process. The FKS was applied and further developed in flexibility audits of KLM Cargo, TNT Post Group, Ericsson The Netherlands, and Van Ommeren Tank Storage.

To conclude, the concrete output of the FAR research project is a knowledge-based system with a
strongly theoretical, conceptual, process-oriented, and instrumental basis. From an analytical point of view, the study contributed ‘universal knowledge’ to the scientific discipline of strategic management in terms of theoretically and empirically plausible hypotheses. That is, the study generated validly generalizable knowledge stating under which environmental characteristics certain configuration strategies are likely to be found, and also which strategic trajectories of transformation for improving flexibility are appropriate.

From a clinical point of view, the study contributed ‘existential knowledge’ to the practice of management as a profession. That is, the study provided situationally dependent knowledge as to how to change the management repertoire in terms of types of flexibility and how to redesign the organization in given contexts so as to achieve and maintain improved flexibility as measured by the FAR method. The resulting knowledge-based system pinpoints how an organization should create new flexible capabilities and reconfigure itself to reduce certain technological, structural, or cultural barriers.

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Appendix A. Algorithm for determining scores

The modus given on a multiple-choice question is scaled from 0 to 100. The effect of this answer on a certain flexibility aspect of the flexibility profile or dimension of the culture characteristic, structure characteristic, or technology characteristic is measured by a coefficient (an integer value from 1 to 10). The final result for the corresponding flexibility aspect or organization dimension is derived as follows.

Say: \( A_i = \text{modus answer on question } i \) of a certain aspect or dimension as a percentage; \( c_i = \text{corresponding coefficient} \); \( i \) runs from 1 to the number of questions related to the aspect or dimension.

Then: \( \text{result} = \frac{\sum(c_i A_i)}{\sum(c_i)} \).

The algorithm for determining the turbulence scores of the turbulence components is slightly different. Every turbulence score is a composition of three dimensions: complexity, dynamism, and unpredictability. Each of these dimensions is divided in two relevant variables. The questions are related by a coefficient to these variables instead of to the dimensions. A result is derived for every variable in the same way as described above. These results will lead to the results for the dimensions as follows.

Complexity has two variables: number of factors (NF), and relatedness (R).

Resulting complexity = \( \frac{1}{3} \times \text{result on NF} + \frac{2}{3} \times \text{result on R} \).

Dynamism has also two relevant variables: frequency (F), and intensity (I).

Resulting dynamism = \( \frac{11}{20} \times \text{result on F} + \frac{9}{20} \times \text{result on I} \).

Unpredictability has the variables: predictability of changes (PC), and availability of information (AI).

Resulting unpredictability = \( \frac{1}{2} \times \text{result on AI} \) if result on AI > 25; \( \frac{1}{2} \times \text{result on PC} \) if result on AI ≤ 25; 50 + \( \frac{1}{2} \times \text{result on AI} \).

The final turbulence score is derived by taking the mean result of its dimensions:

\[ \text{result} = \frac{\sum(\text{complexity, dynamism, unpredictability})}{3}. \]

References


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